

Sahajeevan Shikshan Sanstha's

**Shrimati Indira Mahadev Beharay College of Arts,
Shriman Chandulal Sheth College of Commerce,
Shrimati Shobhanatai Chandulal Sheth College of Science,
Khed-Ratnagiri, Maharashtra, India.**



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मराठी भाषा आणि तंत्रज्ञान

डॉ. संजय शामराव पाटोळे आय.सी.एस.कोलेज, खेड. जि. रत्नागिरी.

सारांश :

मराठी भाषेस महाराष्ट्र राज्याची राज्य भाषा आहे. तिला प्राचीन परंपरा आहे. अगदी ठिकाणी सुरवातीच्या कालात विवेकसिंधू, लीळाचरित्रासारखे तत्वज्ञानग्रंथ निर्माण झाले. अभंग, ओवी, भारुड, गवळण, पोवाडा, लावणी, अख्यानकाव्य, कथा, कादंबरी, नाटक, कविता इत्यादी विपुल साहित्य निर्मिती झाली आहे. मराठी भाषा महाराष्ट्र व महाराष्ट्राबाहेर विविध राज्यात, देशाबाहेर हि अनेक ठिकाणी बोलली जाते. महाराष्ट्र संस्कृती जतन केली जाते. असे असतानाही इंग्रजी भाषेच्या प्रभावाने मराठी भाषा मातृ भाषा असणाऱ्या ९ कोटी ते १० कोटी लोक असतानाही आपल्या भाषेविषयी अनस्था निर्माण झाली आहे. याला अनेक कारणे आहेत. संगणकाचा वापर आधुनिकीकरण इत्यादीचा विचार करून प्रत्येकाने आपल्या भाषेला समृद्ध करण्यासाठी पर्यन्त करणे गरजेचे आहे.

प्रस्तावना :

आज जगातील सर्व भाषेसमोर मोठे आव्हान उभे राहिले आहे. याचे मुख्य कारण आहे. जागतिकीकरण, प्रत्येक दिवसाला प्रत्येक क्षेत्रात नवनवे शोध लागत असल्याने होणारे बदल. जगातील एकही भाषा स्वतंत्र राहिली नाही. प्रत्येकाला आपली भाषा टिकवण्यासाठी प्रयत्नशील राहणे लागत आहे. मराठी भाषेचा विचार करावयाचा झाल्यास मराठीला मोठी परंपरा आहे. भूत काळाचा विचार केल्यास महाराष्ट्रातील सुरवाती पासूनच अनेक परकीय आक्रमणे झालेली आहेत. याचा परिणाम इथल्या संस्कृतीक, सामाजिक, राजकीयतेवर पडता तसाच भाषेवरही अपिहारपणे पडला आहे. मराठी भाषेत इंग्रजी, हिंदी, कन्नड, गुजराती अश्या अनेक भाषेचा प्रभाव पडल्याचे दिसून येत आहे. त्यातल्या त्यात इंग्रजी भाषेचे प्राबल्य मोठ्या प्रमाणात झाले आहे. आज जगात आधुनिक तंत्रज्ञानाचा वापर प्रत्येक क्षेत्रात होत आहे. शिक्षण, नोकरी, व्यापार, कार्यालयामध्ये नव तंत्रज्ञान वापरात येत आहे. या स्पर्धेच्या युगात आपले अस्तित्व टिकवणे हे मराठीसमोरील मोठे आव्हान आहे. आज खेड्यापाड्यात दूरदर्शन, मोबाईल सोव पोहचले आहे. माणूस रोजच्या व्यवहारात या नव्या तंत्रज्ञानाचा वापर करू लागला आहे. याचा परिणाम माणूस आपल्या भावना व्यक्त करण्यासाठी समोर हिंदीचा माणूस भेटलाकी हिंदीत बोलतो, इंग्रजी बोलणारा भेटलाकी इंग्रजी, जवळपास आपली मातृभाषा विसरत चालला आहे. दिवसेंदिवस आपल्या भाषेचा वापरच कमी होत चालला आहे. आपल्या मातृभाषेतून आपली संस्कृती, संस्कार, अस्मिता टिकून ठेवली जाते. जोपर्यंत आपण या सर्व गोष्टी टिकवून ठेवण्याकरता प्रयत्न तोपर्यंत आपल्या भाषेला काहीही होवू शकत नाही. पण असे मानून डोळे बंद करून बसणे योग्य नाही. इंग्रजीचा वाढता प्रभाव स्थानिक भाषेन मारक ठरत आहे. महाराष्ट्रातील शासकीय मराठी शाळेना घर घर लागली आहे. असेच झाले तर मराठी भाषेच्या दृष्टीने धोक्याचे आहे. शाळाही भाषा व संस्कृतीच्या दृष्टीने महत्वाचे केंद्र आहे. भाषावृद्धी व भाषाशुद्धीचे शाळचे केंद्र आहे. आज शिक्षणासाठी आधुनिक तंत्रज्ञानाचा वापर मोठ्या प्रमाणात केला जात आहे हे तंत्रज्ञान इंग्रजी भाषेमधून उपलब्ध आहे. परिणामी आजचा पालक मुलाच्या भवितव्याचा विचार करून मराठी एवजी इंग्रजी माध्यमाच्या शाळेकडे ओढला जात आहे. या मध्ये पालकांना फक्त दोष देऊन चालणार नाही. असे होत गेले तर मराठी भाषेचे अस्तित्व धोक्यात आल्याशिवाय राहणार नाही. अश्या परीस्थितीत मराठी भाषेपुढे आधुनिक तंत्रज्ञानाची कोणती आव्हाने आहेत याचा शोध घेऊन त्याची थोडक्यात मांडणी करण्याचा प्रयत्न या शोधनिबंधात कोला आहे.

• शोधनिबंधाचा हेतू :

१. मराठी भाषेसमोरील आव्हानांचा शोध घेणे व त्यावर उपाय शोधणे .
२. आधुनिक तंत्र ज्ञाना मध्ये मराठीचे स्थान शोधणे व मराठी भाषेच्या विकासास उपाय शोधणे.

• मराठी भाषेची परंपरा :

भाषा हा माणसाच्या जीवनातील एक अविभाज्य घटक आहे. जीवनाच्या सर्व क्षेत्रांत माणूस भाषेच्या माध्यमातून व्यवहार करत असतो. इतकेच काय, तर विचारसुद्धा भाषेतच करतो, स्वप्नसुद्धा भाषेतच पहातो. ज्याला भाषा येत नाही असा मानव समूह पृथ्वीवर नाही. मानवेत्तर पाण्याच्या पेक्षा मानवाला भाषेची देणगी असल्याने स्वतःची प्रगती करू शकला. भाषा एक संकेत प्रणाली आहे. भाषेतील शब्दप्रयोग आपण अनेक अर्थाने वापरतो. हावभावाची भाषा, रस्त्यावरील सिग्नलची भाषा, संगणकाची भाषा, या ठिकाणी भाषा हा शब्दप्रयोग नेहमीच्या अर्थाने न वापरता 'संकेताची पद्धती' किंवा 'संकेत प्रणाली' या अर्थाने वापरतात.

प्रत्येक भाषेला परंपरा असतेच, तसिच मराठीलाही मोठी परंपरा आहे. मराठीचा उत्पत्तीकाल ठरविताना तिची जनक भाषा ठरविणे क्रमप्राप्त ठरते. आर्यभारतिय भाषाकालातील भाषांच्या परंपरेतील मराठी हा शेवटचा दुवा मानला जातो. प्राचीनकाळातील विविध नाणी, शिलालेख, ताम्रपत्र, भूर्जपत्र, ग्रंथगत पुरावे इत्यादी भिन्न-भिन्न रुपामध्ये मिळू शकते. उदाहरणार्थ निजामशाहीतील उन्केश्रचा शिलालेख (इ.स.११२८), परळचा शिलालेख (इ.स.११२८), पळसदेव येथील शिलालेख, इ.स.११५७ हा मराठीचा उत्पत्ती काळ मानला जातो. पण मराठीचा उत्पत्तीकाळ पूर्वीची एखादी प्राकृत वा अपभ्रंश भाषे इतकिच तपासून चालत नाही. कारण मराठीचे भाषिक स्वरूप संमिश्र आहे. शौवसेनीपासून हिंदी भाषा, मागधीपासून 'बंगाली' या भाषा जश्या उभयुभ तयार झाल्या तसे मराठीचे नाही संस्कृत, प्राकृत

त्यांचे अपभ्रंश यांसह काही द्रविडी भाषा यांच्यातील भाषिक वीशिष्टे मराठीने घेतली आहेत. मराठी वापरात आल्या पासून पुरावे कोणत्या काळातील सापडतात यावरून मराठी भाषेचा उत्पत्ती काल निश्चित केला जातो.

मराठीच्या अस्तित्वाचे पुरावे(इ.स.१२९०) 'ज्ञानेश्वरी', (इ.स.१२६३) चक्रधरादिकाचे महानुभाव वाड.मय., (इ.स.११८८) मुकुंदराजाचा 'विवेकसिंधू' या पूर्वीचे मराठीच्या अस्तित्वाचे पुरावे मोठ्या कष्टाने मिळतात. कोणतीही भाषा प्रथम बोली म्हणून सुरु होते. नंतर लेखन सुरु होते.पण मराठीच्या बाबतीत बोलीपाठीपाठ लगेच लेखनाचाही संसार सुरु झाला असावा. मराठीच्या जन्मापूर्वी चार पाच -शतके शंकराचार्यांनी वैदिक धर्माचे पुनरुज्जीवनकेले. त्यापासून संस्कृत भाषेला पुन्हा महत्व आले. त्याचा परिणाम मराठीमध्ये संस्कृत भाषेतील शब्दाचा भरणा अधिक होता. वररुची व हेमचंद्र यांनी प्राकृत भाषेची व्याकरण संस्कृतमधूनच लिहिले. म्हणजे या काळात प्रथलेखनाची भाषा म्हणून संस्कृतचे महत्व होते. महाराष्ट्रातील चालुक्य व यादव राजवटीत संस्कृत भाषेलाच प्रोत्साहन दिले. याचा परिणाम मराठी हि बोलीभाषा 'सुसंस्कृत' झाली. ज्ञानदेव, दामोदर पंडीत हे प्रथम संस्कृतमध्ये पारंगत झाले. कारण त्यांना संस्कृतमधील ज्ञान मराठीतून सर्वसामान्य लोकांपर्यंत पोहचवायचे होते. याचा परिणाम मराठीत अनेक संस्कृत शब्द आले आहेत.

भाषा सतत बदलत असते. परिवर्तन 'काळ' आणि 'संरचना' भाषेची संरचना हि काळाच्या अक्षरावरील बदलांशी नाते ठेवून समांतर असते. मराठीमध्ये राजकीय, सामाजिक, वैचारिक इत्यादी कारणाने किंवा भाषेची उपजत प्रवृत्ती म्हणूनही जे भाषिक प्रवर्तन झाले त्या नुसार मराठीचे तीन कालिक भेद पाडले जातात.प्रारंभ ते मराठीचा आदीकाल इ.स. १३५० पर्यंत चा 'आदिकाल', इ.स. १३५० ते इ.स. १८५० मध्यकाल, आणि इ.स. १८५० पासून पुढीलकाल या कालखंडातील भाषेचा अभ्यास करावयाचा आदिकालचा असल्यास भाषेतील स्वनविचार,रूपविचार,विभक्ती, भाषेतील सामान्यरूप,सर्वनामे, विशेषणे, विभक्ती, शब्दसिध्दी, शब्दसंग्रह, वाक्यरचना, अर्थविचार याच्या दृष्टीने विचार करणे गरजेचे आहे. मध्येकालासाठी शिलालेख व ताम्रपट, गद्य व पद्य ग्रंथ, ऐतिहासिक पत्रव्यवहार, सर्वसामान्य लोकांची व्यवहारातील भाषा, विविध बोली, तिचे स्वरूप, युरोपियन मराठी, अरबी, तुर्की, फार्सी भाषेचा मराठीवर झालेले परिणाम याच्याबरोबरीने व्याकरणिक निकषांवर अभ्यास करावा लागेल.

मराठीचा आधुनिककालातील मराठी भाषेची जडणघडण झाली ती एकोणीसाव्या शतकाच्यापहिल्या सुमारे पाऊणशे वर्षांमध्ये झाली. इ.स. १८८० च्या सुमारास तिला अर्वाचीन मराठी किंवा आधुनिक मराठी म्हणून ओळखले जाते.या कळात भारतात क्रांती सर्व क्षेत्रात मोठी झाली.याचे कारण अव्वल इंग्रजी काळात शिक्षण क्षेत्रात अमुलाग्र बदल झाला. कमी अधिक प्रमाणात शाळा सुरु झाल्या. मुद्रणकलेचा प्रवेश व संस्कृत व इंग्रजी यांच्या प्रभावाने मराठी गंधाला मिळालेले. वळण या कारणामुळे मराठी आधुनिक स्वरूपाची बनली असे म्हणता येते. मुद्रणकलेचा उदय झाल्याने विविध नियतकालीकाना प्रोत्साहन मिळाले. या मधून समाजप्रबोधन करण्याच्या हेतूने मा,जोतीबा फुले, आगरकर,टिळक, डॉ.बाबासाहेब आंबेडकर इत्यादी सुधारणा वादी विचार वंतानी अग्रलेख लिहिले. राष्ट्रवाद, साम्यवादी विचार समाजामध्ये रुजवण्याचे महत्वाचे कार्य केले.

मराठी भाषेत विवेकसिंधू,लिळाचरित्र, श्रीऋधीपुरवर्णन, स्मृतीस्थळे, दृष्टांतपाठ, धवळे, ज्ञानेश्वरी, अमृतानुभव, दासबोध,या सारखे ग्रंथ निर्माण झाले. अभंग,ओवी,गवळण, भारुड, आख्यानकाव्य, बखर,शाहिरी कविता (पोवाडे, लावणी) इत्यादी साहित्यिक परंपरा समृद्ध आहे. आधुनिक काळात मराठीमध्ये दलित,ग्रामीण, स्त्रीवादी, महानगरीय, आदीवासी, विज्ञान, प्रवाह आले. कथा,कादंबरी, नाटक,प्रवासवर्णन, चरित्र, मुक्तकाव्य, गझल, अनुवादित साहित्य असे अनेक प्रकारचे साहित्य आज मराठी भाषेत विपुल प्रमाणात उपलब्ध आहे.

मराठीमध्ये लिपीचा शोध लागल्याने आपण बोलू शकतो, लिहूनही दाखवतो. लिपीचा शोध लागल्याने लेखन शक्य झाले. मराठीमध्ये देवनागरी लिपी वापरली जाते. हि उभ्या आडव्या,तिरप्या, गोलसर अशा रेषांनी बनलेली आहे. लेखन डावीकडून उजवीकडे केले जाते. या लिपीत प्रत्येक ध्वनी स्वतंत्र चिन्हाने दाखवला जातो व प्रत्येक वर्णाला एकापेक्षा जास्त ध्वनी नसतात. त्या दृष्टीने हि लिपी आदर्श व पुष्कळशी दोन पूर्ण आहे. यातील 'इ'व 'उ' स्वर सोडले तर इतर स्वरांचे दीर्घ उच्चार दाखवण्याची सोय नाही. शिवाय 'च' 'त्य', 'ज', 'झ' हे वर्ण दोन्ही त-हेने उच्चारले जातात. हे दोष सोडले तर देवनागरी लिपीत बहुतेक ध्वनीना स्वतंत्र वर्ण आहेत. देवनागरी लिपीमध्ये (मराठीत) उच्चारातील बिनचूकपणा लक्षात येतो. सामान्यता:आपण जे जे उच्चार करतो त्याना स्वतंत्र व बिनचूक असे लिखित िचन्ह देवनागरी लिपीत आहे. मराठीत एकूण ४८ वर्ण आहेत. या वर्णांचा उपयोग करून आपणाला उच्चारातील स्पष्टता, स्वच्छता व बिनचूकपणा व जोडाक्षरांच्या उच्चारातीलस्वच्छता व स्पष्टता आणता येते.

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• मराठी शिक्षणाची आजची स्थिती. :

भारत बहुभाषी देश आहे. प्रत्येक राज्याची विभागणी भाषेवर झाली आहे. भारतामधील प्राथमिक शिक्षण त्या त्या राज्याच्या भाषेत दिले जाते. महाराष्ट्रात देखील प्रत्येक गावात जि.प. प्राथमिक शाळा आहेत. या शाळांची आजची स्थिती बरी नाही. याची अनेक कारणे आहेत. या शाळेमध्ये चार वर्गांना दोन, किव्हा तीन शिक्षक, एका खोलीत दोन तीन वर्गाचे विद्यार्थी बसतात. शासनाचे असमाधानी पालकांची नाराजी, अश्या परीस्थितीत शैक्षणिक दर्जा दूरच राहू,भाषा समृद्धी तरी कशी होणार? हा प्रश्नच आहे. आज शहरा बरोबर ग्रामीण भागातही मराठी माध्यमाच्या प्राथमिक व माध्यमिक शाळा बंद पडत चालल्या आहेत. हे वास्तव आहे.

• इंग्रजी भाषेचा प्रभाव :

इंग्रजी भाषा ज्ञान भाषा म्हणून जागतिक दर्ज्याची झाली असल्याने 'इंग्रजी शिवाय आज किंत्याही क्षेत्रात तरणोपाय नाही' अशी परीस्थितीत मराठी पालक व पाल्य यांच्या मनात निर्माण झाली आहे. हे कटू सत्य सर्वानाच स्वीकारले पाहिजे. आज पाल्याकडू अपेक्षा वाढल्या आहेत. आपला मुलगा डॉक्टर किंवा इंजिनिअर्सच झाला पाहिजे. याकरिता अंगणवाडी(आताचा प्ले ग्रुप, ज्युनिअरकेजी)

पासूनच इंग्रजी माध्यमातून शिक्षण देण्याचा कल वाढत आहे. याचा परिणाम पालक इंग्रजीच्या प्रेमापोटी प्रसंगी वीस, पंचवीस किंलोमीटरवर पाल्याला शाळेत धालत आहे, याचा परिणाम ग्रामीण भागातील मराठी माध्येमाच्या शाळा झपाट्याने बंद होत आहेत. मुलांना इंग्रजी शाळेत पाठवणा-या पालकांना इंग्रजी येत नाही. इंग्रजी माध्येमात असल्याने आपल्या मातृ भाषेकडे दुर्लक्ष होते. 'एक ना धड भाराभर चिंघा' अशा द्विधावस्थेत आजचा विद्यार्थी शिकत आहे. 'सायन्स, गणित, शास्त्र, व इतर ज्ञान इंग्रजीतून घ्यावे लागते. , नव्या तंत्रज्ञानाचा वापर करावयाचे असेलतर इंग्रजी भाषा अनिवार्य आहे. कारण संगणकची भाषा इंग्रजीच बरीचशी हिच आहे. अलीकडे अनेक व्यक्तींनी पर्यन्त करून संगणकावर मराठी भाषा आणण्यासाठी यशस्वी झाले आहेत. दुसरे करण जागतिकीकरणाने अनेक भाषा बोलणारे, शिक्षण, नोकरी व व्यापार करण्याच्या हेतूने जवळ येत आहेत. याकारणाने भाषेची देवाणघेवाण होत आहे, इतर भाषेतील अनेक शब्द मराठीत येत आहेत. मराठीमधील मूळ शब्द कालबाह्य होत आहेत. परिणामी मराठी भाषा हळूहळू नष्ट होत चालली आहे.

• मराठी समोरील आव्हाने:

मराठी समोरील मोठे आव्हान कोणते असेल तर ते स्वभाषीकानाच मातृभाषेविषयीची उदासीनता. मराठी माणूस मराठी माणसाबरोबर बोलत असताना. मोडकी तोडकी हिंदी अथवा इंग्रजी भाषेचा वापर करतो, आपण दुस-या भाषेत बोललो कि हुशार आहे अशी समजूत करून घेतले आहे. स्वतःच्या भाषेचा अभिमान याचा अर्थ इंग्रजी अथवा दुस-या भाषेचा द्वेष करणे नव्हे. आपणा कोठे कमी पडतो याचा शोध घेतला पाहिजे. इंग्रजीत शब्दकोश दर दोन वर्षाने अध्यावत केला जातो. मराठीत तस नाही. भारत बहुभाषिक असल्याने ब-याच भारतातील भाषेचे नुकसान झाले आहे. भारतात सर्वच राज्यातील बहुसंख्य लोक इंग्रजी भाषेचाच वापर करतात. असे असले तरी त्याची विचार करण्याची भाषा मातृ भाषेच असते. याचाच अर्थ मातृ भाषाच ज्ञानभाषा असते. मराठी माणूस हेच विसरत आहे. याचा परिणाम मराठी भाषे समोर अनेक आव्हाने उभी ठाकली आहेत. युनोस्कोच्या मते कोणतेही शिक्षण मातृभाषेतूनच चांगल्याप्रकारे देता येते. पण आज तेच होत नाही. पालक आपल्या पाल्याला अंगणवाडी(प्लेग्रुप) पासूनच इंग्रजी माध्येमाच्या शाळेत घालतात. त्या मुलाला धड मातृभाषा येत नाही कि दुसरी. आज हेच खरे आव्हान मराठी समोरील आहे.

भाषेचे अनुशासन आज खीळखिळे होत चालले आहे. याचे खरे कारण सामाजिक संस्कृती, सामाजिक व्यवहार आणि समाजमुल्यावर आधारित साहित्याचे अनुशासन असते. त्याची मजबुती टिकवणे हे मोठे आव्हान आहे. भाषेचे अनुशासन आज खीळखिळे होत चालले आहे. व्यवहार व्यवसायामध्ये प्रचंड बदल होत आहे. याचा प्रभाव समाजजीवनावर होत आहे तसाच साहित्यावर आणि पर्यायाने भाषेवरही होत आहे. भाषेवरील हा परकीय प्रभाव थांबवणे आजचे आव्हान आहे. परकीय भाषेची आक्रमणे मातृभाषेतील ज्ञानासाठी व आपल्या सांस्कृतिक मूल्यवृद्धीसाठी अडथळे ठरत आहेत. परक्या भाषेमधून आपल्या संस्कृतीमध्ये येणारे मुल्ये समाजाला विस्कळीत करतात. समाज विस्कळीत झाला कि भाषा विस्कळीत होते. हे थांबवणे आव्हानच आहे. हे आव्हान स्वीकारत असताना इंग्रजी व इतर भाषेचा द्वेष करणे किंवा इतर भाषेचा त्याग करणे नव्हे. इतर भाषेप्रमाणे मराठी भाषेत आधुनिक तंत्र ज्ञान आणणे, जे नवनवीन शोध लागतात त्यांना मराठी भाषेतील शब्द निर्माण करणे गरजेचे आहे. अन्यथा जागतिकीकरणाच्या स्पर्धेत मराठी भाषा टिकणे कठीण आहे.

• मराठी भाषेमध्ये तंत्रज्ञान वापर :

आजचे युग तंत्र ज्ञानाचे आहे. आजची शिक्षणपद्धती तंत्रज्ञानावरच आधारित आहे. जगात अनेक कोर्सेस ऑनलाइन सुरु झाले आहेत. त्याच प्रमाणे लॉर्ड बिल भरण्या पासून गाड्यांचे रिझर्वेशन, मोबाईल वरून आपणास हवे असणा-या वस्तू घरातूनच मागवणे, आजचा शेतकरी सुधा शेतीमध्ये नवीन तंत्र ज्ञानाचा वापर करत आहे. ग्रामीण भागातही इंटरनेट, वायफाय, ची सुविधा उपलब्ध झाली आहे. जग झपाट्याने बदलत आहे. लहाना पासून ते वयस्कर देखील मोबाइलच्या आहारी गेला आहेत. तंत्र ज्ञानात जसे शोध लागतात त्याप्रमाणे तंत्रज्ञानाची एक नवीन भाषा निर्माण होते. जि भाषा हे तंत्रज्ञान अवगत करते तिच स्पर्धेच्या युगात टिकते अन्यथा ती लोप पावण्यास वेळ लागत नाही.

आजच्या परिस्थितीचा विचार केलातर जगावर कोरोनाचे मोठे संकट आले आहे. यामध्ये सर्व व्यवहार जवळपास बंद झाले आसताना हि घरी बसून ऑनलाइन शिक्षण, कंपनीची कामे सुरु आहेत. विद्यार्थी परीक्षा देतात. त्याचे निकालही लागत आहेत. यासाठी मराठी भाषा सक्षम करायची असेल तर तिला संगणकावर तेवढ्याच ताकदीने आणणे गरजेचे आहे. मराठी भाषेला मोठी परंपरा आहे. देशातील अनेक राज्यात व देशाबाहेरही अनेक देशात मराठी बोलली जाते. महाराष्ट्रातील वेगवेगळ्या बोली हे मराठीचे खास वैशिष्ट्य आहे. अहिराणी, कोकणी, वाढवळी, व-हाडी, नागपुरी, अश्या जवळपास साठ बोली आहेत. या सर्व देवनागरी लिपीत लिहिल्या जातात, पूर्वी एकेकाळी मोडी लिपीचा वापर केला जात होता. त्यामुळे देवनागरीची मुळाक्षरे हीच बहुसंख्य मराठीची मुळाक्षरे होत. यात १९ स्वर आणि ३२ व्यंजने आहेत. मराठीत नसलेली दीर्घ 'ऋ', 'लृ' दंततालव्य 'च', 'छ', 'झ' आणि '-य', '-ह,' ही मराठीत अक्षरे आहेत. याचा वापर मराठी लिहिण्यासाठी वापर केला जातो. जेव्हा आपण संगणक वापरतो तेव्हा संगणकावरील टंकलेखन पद्धतीचा वापर करावा लागतो. सुरुवातीच्या काळात मराठी लेखनासाठी विविध आडचणी होत्या. प्रथम मराठीत छपाई क्षेत्रात वापरल्या जाणा-या विविध विविध मराठी मुद्रांमध्ये एकात्मता नसल्याने सुसंगती नव्हती. टंकणयंत्रावरील मराठी लिपीसाठीचा कळफलक अजून प्रमाणित होऊ शकलेला नव्हता. त्यामुळे माणूस अनेक टंक वापरू शकत नाही. आशय परस्तीतीत राज्य मराठी विकास संस्थेने प्रयत्न केले. सुरुवातीला मराठी फॉन्ट व्यापारी तत्वावर तयार केल्याने ते महाग होते. त्याकारणे वापर कमी होत होता. 'सी डॅक' या संस्थेने केलेले टंक फुकट होते पण ते मर्यादित होते. हे व्यापारी मराठी फॉन्ट विकताना ग्राहकाच्या गरजेनुसार त्याला टंकमध्ये ANIS ते UNICODE असा पर्याय पुरवत नाहीत. पण आंतरजालावर शोध घेण्यासाठी युनिकोड वापर गुगल सारख्या शोध यंत्र मध्ये करता

येतो. आपोआप डाऊनलोड होणारे डायनामिक टंक युनिकोड कॅम्पॅटिबल नसल्याने शोध यंत्रणा कॅअलत नाही.

युनिकोड धर्तीवर टंक विडोज २००० व त्या पुढील प्रणालीबरोबर मुळातच असतात. जुन्या विडोज प्रणाली वापरणा-यांना युनिकोड वापरणे जड जाते. परंतु लिनक्सवर आधारित सचलन प्रणालीत युनिकोडचा मूळ म्हणून वापर केल्याने अशा संगणकावर मराठी वापरताना कमी समस्या येतात. हे टंक देवनागरी लिपीसाठी तयार केलेले असल्याने ते हिंदी छपाईसाठी उत्तम कॅअलतात. परंतु काही अक्षरे मराठीसाठी विशेष आहेत. ती सगळी टाईप करता येतील असे टंक कमी आहेत.

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सध्या युनिकोडमुळे मराठी ही संगणकावर बरीच स्थिरस्थावर झालेली आहे. मराठी टंकलेखनाचे अनेक पर्याय उपलब्ध आहेत. काळानुसार आणि वापरलेल्या ज्ञानानुसार संगणकावरील टंकलेखन पध्तीचा पूर्व-टंकलेखनपद्धती आणि आधुनिक टंकलेखनपद्धती असे दोन प्रकार करता येतील. पूर्वटंकलेखन पद्धतीत इंग्रजी फॉन्टच्या जो मराठी फॉन्ट टाईप करता येतो उदा. शिवाजी, ऋतीदेव, किरण इत्यादी non फॉन्ट आहेत. तसेच पूर्वप्राथमिक अवस्थेत मराठी भाषेत टंकलेखनासाठी अनेक softwares बनवण्यात आली होती. आधुनिक टंकन पद्धतीत युनिकोड टंक व त्या विविध keyboard layout याचा समावेश होतो. या दोन्ही टंकलेखनपद्धतीत फार थोडा फरक आहे. देवनागरी इनस्क्रिप्ट ज्यांना पारंपरिक टंकनयंत्रावर टंकलेखनाचा सराव आहे. अशासाठी देवनागरी इनस्क्रिप्ट हा पर्याय विडोज आणि लिनक्स या परिचालन प्रणालीवर मिळते. आधुनिक टंकलेखन पध्तीमध्ये लिप्यंतर तंत्रज्ञानाचा वापर करून software च्या माध्यमातून मराठी टंकन करतात. ही पद्धती खासकरून कुठलेही प्रशिक्षण न घेता टंकन करणा-या लोकांमध्ये प्रसिद्ध व लोकप्रिय आहे. Microsoft indic Tool हे. Microsoft या कंपनीने विकसित केले आहे. हे windows XP Vista, windows ७, ८, ९, १०, बरोबरच गुगल ब्राउजरच्या साहाय्याने कुठलीही प्रणाली चालू शकते. OCR तंत्रज्ञानाच्या माध्यमातून मराठीतील स्कॅन केलेले दस्तऐवज छायाचित्राचे स्वयंचलित पद्धतीने टंकन करता येते. लिनक्स प्रणाली, मायक्रोसॉफ्ट विडोज, आणि ऑपल मॅकओएस या परिचालन प्रणाली मधेही मराठी भाषा कमी-अधिक प्रमाणात उपलब्ध आहे.

मराठी संगणक प्रणालीवर आणण्यासाठी अशा अनेक प्रणाली उपलब्ध आहेत. मराठी भाषेला तंत्रज्ञानात समृद्ध करावयाची असेल तर. फेसबुक, युटूबचा वापर योग्य प्रकारे करून आज मराठीमधील अजून जे ग्रंथ विकीपीडिया वर आलेले नाहीत त्यांना आणून सोशलमिडीयावर जतन करून ठेवणे. शास्त्रीय इंग्रजी भाषेतील शब्दाना पर्यायी मराठी शब्द शोधून मराठी शब्दसंग्रह वाढवून मराठी भाषा समृद्ध करणे गरजेचे आहे.

▪ उपाययोजना:-

१. मराठी भाषेविषयी आवड नर्माण करणे गरजेचे आहे.
२. इंग्रजी प्रमाणे मराठीमधील संगणकिय सॉफ्टवेअर तयार करावेत.
३. विकिपीडियावर मराठी मधील ज्यास्तीत ज्यास्त ग्रंथ आणणे.
४. मराठी भाषेमधून सर्व प्रकारचे शिक्षणासाठी अभ्यासक्रम तज्ञांच्या कडून तयार करून घ्यावा.
५. विकिपीडियावर बोलीभाषे मधील लोकसाहित्या, कथा, कादंबरी, नाटक, प्रवासवर्णन इत्यादी साहित्य आणणे गरजेचे आहे.
६. भाषा स्मृतीसाठी संगणकाचा ज्यास्तीत ज्यास्त वापर करणे.
७. परभाषेचा द्वेश करण्यापेक्षा स्वभाषेचा विकास केला पाहिजे.

▪ निष्कर्ष:

१. मराठी भाषेची परंपरा फार प्राचीन आहे.
२. मराठी महाराष्ट्राची राज्य भाषा ज्ञाना आहे.
३. इंग्रजी भाषेचा प्रभाव मराठीवर पडल्याने मराठी शाळा बंद होण्याच्या मार्गावर आहेत.
४. पालक व पाल्य यांच्यामध्ये मराठी भाषे विषयी अनवस्थ आहे.
५. संगणकिय अधुनिक तंत्र ज्ञान जगात विकासीत झाल्याने मराठी भाषा मागे पडत आहे.
६. संगणक प्रणालीवर मराठी पेक्षा इंग्रजी भाषेचा मोठ्या प्रमाणात वापरसुलभ केला जातो.
७. मराठीमधील अनेक संकल्प संगणकावर स्पष्ट करता येत नाहीत.

संदर्भ:

१. कांबळे उत्तम, आमची श्रवणी 'अंक २२ लेख - जागतिकीकरण मराठी भाषा व साहित्य सध्यस्थिती आणि भवितव्य', धुळे, क. स. वाणी, प्रगत अध्ययनसंस्था धुळे.
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४. मटकरडॉ. अलका, मराठी भाषेचा भाषा वैज्ञानिक अभ्यास, शब्दालय प्रकाशन, श्रीरामपूर.

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ROLE ENGLISH LANGUAGE IN INFORMATION TECHNOLOGY

Dr. Balasaheb Gopal Yadav Department of English I.C.S. College Khed Dist- Ratnagiri
(Maharashtra)

Abstract: With the aid of various means such as radio, television, CD, computer, Internet, electronic media, email, and blogs, audio cassettes, PowerPoint videos, and DVD, information technology is playing an important role in learning and teaching English language. There has been a movement in the last two decades. Due to the advent of technology, the dynamics of various industries have changed, and it has affected the industries and has had an effect on the market as well as how people communicate and function in society. The rapid rise and growth of information technology has provided a stronger pattern for investigating a new teaching model. As a consequence, technology plays a critical role in the teaching and learning of English. Colleges and schools have been suspended due to Covid-19. Digital Cooperatives rely heavily on technology. Digital Colleges and Schools are heavily reliant on technology. This paper aims to examine the importance of multimedia technology in language teaching as well as the challenges that come with its use. It also aims to make English teachers aware of successful methods for using it

Key Words: Covid-19, multimedia, technology, s, English, language, learning, teaching.

Introduction

The implementation of creative methods, tools, materials, devices, systems, and strategies that are directly applicable to English language teaching and lead to the achievement of the desired goals is generally described as using modern technology in teaching English. As a result, though technology is now widely recognized as a significant educational and auxiliary tool in a variety of disciplines. It is especially true in English language teaching because it provides a range of possible opportunities to improve both the content and delivery of conventional English language pedagogies. This is accomplished mainly by allowing the student and/or instructor to return to troublesome material until it is completely comprehended and assimilated. Familiarity with the idea of using new technology extends beyond the use of modern appliances and devices to the implementation of innovative teaching systems and methods that allow faster and more thorough learning progression. According to current pedagogical hypotheses, students are best prepared to learn when they use technology's learning ability. The integration of the modern means method and its interaction with other elements, as well as the use of technology in teaching English, benefits students by producing the desired results. As a result, the use of modern technology in English language teaching has become essential, particularly in light of unprecedented developments in a variety of fields and disciplines. To refine English language instruction and equip teachers to communicate with classroom language learners in a systematic and advanced way. The education sector must keep pace with the global technological transition by embracing modern technological means such as computerization, multi-media devices, cell phones, audio/visual effects applications, and social media. The Internet provides easy, immediate, and virtually unlimited access to software, applications, and a host of ancillary platforms and materials which can expedite English teaching and learning. While these affordances may be widely available to all. It is noted that teachers often play a key role in operating the different tools and teaching methods. Moreover, many such programmes are specifically designed to promote effective English teaching whilst simultaneously increasing learner understanding and attainment of English language skills. 2. Previous Research Stepp-Greany (2002, p. 165) used.

The Study's Intent teaching and learning of English as a second language has become one of the most contentious topics in contemporary educational discourse, with research consistently demonstrating low levels of student achievement at all levels. Since the modern age is defined by the widespread usage of technology, it is unsurprising that technology has infiltrated the field of education on a global scale. In reality, as most educational institutions have now incorporated such technology into current and future curricula, technological and/or media-based pedagogies have gained significant traction as a result of demonstrated improved learning outcomes, especially when compared to traditional teaching methods. There are a variety of issues with outdated teaching methods, including the following: <http://ojs.scholink.org/index.php/fet> Vol. 2, No. 3, 2019 171 Frontiers of Education Technology SCHOLINK INC. is the publisher. 1) Traditional approaches use obsolete learning aids such as blackboards and textbooks to guide students through specific curriculum material. As a consequence, the instructor simply relays information without taking into account positive or negative outcomes. 2) Traditional teaching approaches rely on simplistic techniques that do not address the intent of learning or basic teaching needs. Since such teacher-centered pedagogies place the learner in the role of a receiver, the ultimate aim is for students to be able to reproduce knowledge without actually knowing it. 3) Instead of interacting and discussing with the instructor, students depend on the sounds and images they are given. 4) In contrast to modern technical teaching methods, which provide various rewards that increase the probability of acquiring English language skills in a timely and efficient manner, student accreditation by set texts tends to promote boredom, lack of motivation, and attention in attainment. The current study was conducted to ring-fence the root causes of the

Happiness of human being with reference to the poem entitled to the poem "In the pool of Bliss" by Saint Tukaram

Dr. Balasaheb Gopal Yadav

Department of English I.C.S. College, Khed, (M.S.) India

Abstract

Happiness, defined as the pursuit of well-being and a decent life, has been one of humanity's most lasting pursuits throughout history. The answers, as evident as they may appear, are not so easy or uniform, and they have been extremely varied: some people desired love and the pleasures of intimate relationships, while others sought sensual pleasure. Some have strived to reach their full potential, while others have sought the tranquilly of mindfulness and spirituality. Despite the significance of this search, the question of how to define and attain these objectives remains one of the most persistent issues to this day. We pursue a career, success, love, spirituality, fortune, or anything else because we feel it will make us happy and increase our happiness and joy in life. Most of the people are running after spiritual happiness. Saint Tukaram composed his spiritual experience in his poem entitled in His poem "In the pool of Bliss".

Key Words: Happiness, pursuit, Desire, Potential, Love, experience

Introduction

Happiness is the meaning and purpose of life, the whole aim and end of human existence. Aristotle. While working on this paper, I kept discovering new and interesting things. One of the most important things to remember is that happiness isn't merely a stroke of luck, nor is it something we acquire or discover. It is a continuous and active process of realising one's true nature and pursuing one's virtues, which entails living as one was born to live. Happiness is a state that we are meant to achieve. Recognizing that our desire to increase happiness and live a happy life is not merely wishful thinking is one of the first stages in achieving happiness. It is a critical aim that we all have the ability to accomplish. Saint Tukaram revealed his experience in the following lines:

In the pool of bliss,

Bliss is all ripples.
Bliss is the body
Of bliss (Says Tuka, 210)¹

What is happiness?

Happiness is the perfection of human nature. Since man is a rational animal, human happiness depends on the exercise of his reason. Aristotle

Its subjectivity is what makes it so difficult to answer. Happiness can mean different things to different people, and it can also mean different things in different industries.

Happiness, according to behaviourists, is a combination of emotions we feel when we accomplish something excellent. Happiness, according to neurologists, is the sensation of hormones being released in the brain as a reward for good behaviour. Happiness, according to many religions, signifies the presence of God.

Many thinkers throughout history, including Plato, Aristotle, the Dalai Lama, Saint Tukaram, and others, have all agreed that the goal of life is to attain happiness. Happiness gives our lives purpose. It is valued higher than other desirable personal outcomes like as riches, attractiveness, or celebrity. It is essential to our well-being but difficult to achieve, which is why so many individuals have dedicated their lives to it. There is no one-size-fits-all solution to happiness. It necessitates a clear understanding of what it is, a willingness to act, and perseverance.

If we tried to put it in simple terms, happiness is that illusive state of mind or condition of well-being that entails living a good life with a sense of significance, joy, and deep contentment. This is a state of mind that should be practised and felt. Happiness, like love or empathy, cannot be sought; it must be a natural result of our thoughts and actions. This is why it lacks a university.

If we were to try to explain it in simple words we might say that happiness is that elusive state of mind or a state of well-being that comprises living a good life with a sense of meaning, joy and deep contentment. This state of mind ought to be trained and felt. Happiness is like love or empathy, it cannot be pursued; it must ensue from our thoughts and actions. This is why it doesn't have a universal, right and wrong definition; it is highly subjective.

In psychology, there are two schools of thought: hedonism and eudemonic². Happiness, according to the first, is the polar opposite of suffering and misery. The goal of a hedonist's life is to obtain happiness (happiness as a destination). The emphasis for the eudemonic is on having a full and

satisfying life (happiness as a journey). It defines happiness as "the quest of being a better person" and "the pursuit of happiness as "the pursuit of becoming a better person." They achieve this by pushing themselves academically or participating in activities that enrich their spiritual lives. Happiness is derived externally for hedonists, but eudemonic reflects the belief that happiness is derived from within.

Viktor Frankl stated it this way:

One must have a reason to be happy

In fact, happiness does not come from bouncing from one joy to the next in search of pleasure and attempting to maintain a constant state of contentment. This may give the illusion of happiness, but it isn't one that lasts. The happiness I'm referring to is one that is consistent and long-lasting, despite life's ups and downs and mood swings.

Happiness comes from the constant, daily practice of positive thinking and doing. It may also include periods of considerable discomfort and distress but we accept it as a necessary part of our life journey

.What determines happiness?

What we believe would make a huge difference in our lives actually, makes only a small difference, while we overlook the true sources of personal happiness and well-being, Sonia Lyubomirsky³.

It is believed that we have been socially conditioned to believe that doing the wrong things will offer us long-term happiness. Modern society appears to virtually command happiness, yet scientific data suggests that we are frequently mistaken about what provides us true happiness rather than fleeting pleasure. As a result, we

occasionally work hard to achieve goals that don't make us happy. The most prevalent mistake is that we believe that positive occurrences, such as a new job, more money, a better physical appearance, fame, or victories by our sports teams, will bring us much more enjoyment than they actually do, which drives people to strive for more. They're crucial, but only to a point: money offers you freedom from having to worry about the necessities of life, such as food, housing, education, and health. When the fundamentals are met, the excess of money doesn't provide a permanent increase in happiness. Why is it so hard for us to believe that money doesn't make us happy? Because the truth is that money does make us happy. But our misunderstanding is that we think it will bring us a lot of happiness for a long time, and it brings a little happiness for a short time. Meanwhile, we end up ignoring other more effective routes to lasting happiness. Knowing what is important in our life, knowing our life purpose, we can tailor our activities, and the time and energy we want to spend on each of them. When the essentials are satisfied, having more money does not guarantee a long-term rise in happiness. Why is it so difficult for us to accept that money does not bring us happiness? Because, let's face it, money makes us happy. Our mistake is that we believe it will provide us with a lot of happiness for a long period, but it just provides us with a small amount of happiness for a short time. Meanwhile, we tend to overlook other issues.

We could all be a lot happier if we changed the way we thought and act. This would provide us with a sense of fulfilment, tranquilly, and well-being. We don't know

the boundaries of human ability for growth and adaptation to new circumstances, but happiness teaches us that change is possible since we have power over our thoughts, feelings, and actions.

What are the advantages of being happy?

Happiness appears to have enormous positive benefits in all aspects of life. It improves our energy levels and strengthens our immune systems; it increases our social and professional engagement; and it increases our productivity and creativity. Even individuals who live happy lives have a longer life expectancy. Saint Tukaram said real happiness in the following lines:

When mother craves,
It's the unborn's fancy.
What grows inside
Is reflected out.

We strengthen our feelings of self-worth and inner contentment as we become happier, which increases our sense of self-confidence and self-esteem. We begin to believe that we are worthy of human beings and that we can achieve success. We benefit not only ourselves, but also our partners, families, communities, and even society, when we become happier. This happiness denotes inside body and outside body. Man becomes balancing. Universal power is circulating in his body. His aim of life is love, sacrifice, be good and do good.

Some may believe that living a life centred on finding happiness is selfish. Not always; it all depends on how we go about it and what we concentrate on. People who are unhappy are usually self-centered, socially isolated, and even antagonistic or destructive.

Happy people are generally found to be more sociable, flexible and resourceful. They are more able to tolerate daily doldrums and turn negative into positive situations. And, most importantly, they are found to be more loving and forgiving than unhappy people.

How is feeling of mind when waves of soul coming from your soul, Saint Tukaram explained this in the following lines:

Says Taka,
What I pour out
Into this mould
Is the face of innermost
Experience.

This is when the client and the coach are both dancing in a new good scenario, with fresh clarity, new energy, and new motivation. To support this new learning and allow the change to evolve, a specific plan must be devised. Now that the first seed of change has been planted, it's time to rejoice. The job

hasn't been completed yet. It has only recently begun, and it is now a daily practise.

Change is made up of many small steps, and we don't have to know all of them before we begin, but we must take the first one.

In the universe of possibility you set the context and let the life unfold. Ben Zander⁴

Conclusion:

Our minds are quite powerful. We can construct a wonderful, joyous life by understanding how to use it and generating varied feelings and behaviours. We can modify our view of reality and build the life we want. If we know what we want to achieve and why. Happiness enables people to make positive changes in their life and realise their full potential. Happiness is not a one-time event; it is a continuous process that encompasses both efforts and beauty. Pursuing it and cultivating it on a daily basis will give their lives new meaning and delight.

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Social Aspect with Reference to the Novel *Fakira* by Annabhau Sathe

Balasaheb Gopal Yadav

Department of English, I.C.S. College Khed, (M.S.) India

Abstract

Sociologists define society as a group of people who share common values and lifestyles. Social aspects are an important part of the foundation of the society. Annabhau Sathe has with scientific frame of mind. He interrogates faith, a way of life and sometimes a whole tradition. His criticism is blind adherence to religious dogmatic belief and ruthlessness of tradition. He presented the misery of his fellow men and women and a considerable part of his novel is dedicated to the real freedom of human being. Annabhau Sathe liked to portray in his writing the way we live and what we think about life. The people he wrote about in his work were those he had seen in real life and he portrayed the way those people lived with great simplicity. In his works there is an attempt to give strength and respect to people who were looked down upon by the society. All the characters in *Fakira* novel whether they are rural or urban, male or female were all other Dalits, tribal or the oppressed classes. Those people who were frowned upon by the Indian caste system. The male character in Annabhau's work also ensures that women are never treated with disrespect. They do not play with her dignity. When *Fakira* comes to loot the grains in the government store the manager locks womenfolk in a room and fearing that *Fakira* might molest them. *Fakira* asks the manager to open the door of the room and when he sees the womenfolk looked there in a frightened condition. He tells them "Mother I have come to take the grains and the money. I am not here to molest you. Starving people do not feed their empty stomach by looting dignity of women". Annabhau's heroines offer an inspiration to the mind and also motivation in life while his hero's inspire us for patriot, love for society and struggle. They are valiant in their struggle to achieve the goal.

Key Words: Knowledge of freedom, modern novelist, human relationship, dream, existence, motivation, struggle

Ancient Indian society:

Indian caste system is among the world's oldest forms of surviving social stratification. The system which divides Hindus into rigid hierarchical groups based on their Karma (work) and dharma (duty) is generally accepted to be more. The caste system divides Hindus into four main categories: Brahmins, Kshatriya, Vaishya's

and Shudras. Many believe that the group originated from Brahmin, the Hindu God of creation.

At the top level of the hierarchy were the Brahmins who were mainly teachers and intellectuals and are believed to have come from the Kshatriyas, or the warriors and rulers, supposedly from his arms. The third slot went to the Vaishya, or his thighs. At the

bottom came from the Shudras, who came from Brahmins feet and did all the meaningful jobs. Rural communities have long been arranged on the basis of castes-the upper and lower castes almost always lived in segregated colonies, the water well were not shared Brahmins would not accept food of drink from the Shudras, and one could marry only within one's caste.

Independent India's constitution banned discrimination on the basis of caste, and in an attempt to correct historical injustices and provide a level playing field to the tradition disadvantaged the authorities announced quotas in government job and educational institutions for schedule castes and tribes, the lowest in the cast hierarchy, in 1950.

Despite the obstacles, however some Dalit's and other low caste Indians, such as Dr. B. R. Ambedkar who authored the Indian constitution and K.R. Narayanan he became the nation first Dalit president, have risen to hold prestigious positions in the country.

Annabhau Sathe as born in the village of Wategaon near Sangli in the family belonging to the Dalit community. Poverty has prevented Sathe from obtaining formal education. Despite lack of formal education, Annabhau wrote in Marathi 35 novels, one among which Fakira (1959). Fakira which is currently in the 19th edition received a state government award (1961) Vajjanta is the remarkable one.

There are 15 collection of Scathe's short stories. A large number of his short stories have been translated into many endian and as many as 27 non-Indian languages. Besides novels and short stories Sathe wrote

a play, a travelogue on Russia, 12 screenplay, and directly from his experiences in life and his novel celebrate the fighting spirit in their character who works against all odds in life.

The novel Fakira shows how the downtrodden community participated in freedom fighting movement in their own way. During the pre-independence India the downtrodden, middle class community on trifles and sometimes without any cause whatever from both side one from social discrimination another from injustices of British government.

Fakira the prize winning novel of Annabhau depicts the social reality of how historically Dalit's occupied the social periphery, and have been excluded from core of politics and economy. It is the most encouraging, moving, realistic delineation of the Dalit life, troubles, tortures, the exploitations by the upper caste so called authorities in the villages and yet the intact moral values among Dalit's the strong favor to live life and not to give up hopes are the aspects of the novel Fakira. Though the upper castes here have piled up infliction, exploitation and torture. Annaba's character love their country. India is the notable aspect of Fakira. The story Fakira locates in Wategaon and has a rural setting. The people in Wategaon strongly believe and practice the tradition.

The story begins with a tradition of 'Yogini' meaning a small yellow colour bowl possession of which means a matter of great pride and an honour of hosting the Jabra a religious fest in the village. A hamlet Saigon has the possession of 'Yogini' and with great delight, they are organizing the fest.

Shankara Patil of the Wategaon is highly restless with fest and thought that there is no single tradition programme in Wategaon who could strongly fight against Saigon and bring the Join in Wategaon. He exposes this secret to Rania, the young active angry young Mange. Rania seriously thoughts over Joins and wants to take risk to snatch out the Yogini to his village among all the people of Saigon. It was dangerous task as breaking the tradition of Yogini. In the Fest all alert villagers would be ready with weapon and as per the traditional consensus if any outsider dares to take away the Yogini, and is caught within the boundary of the village, he would be beheaded, but would earn great respect and glory if turns out to be victory in taking away the Yogini successfully. Hence arriving at any conclusion was an intricate for Rania, he reflects on the worse thing if caught brutal death but glory, proud and happiness for the whole village of Wategaon if he turns out to fight and die rather than just think and leave it. Without informing his father Daulat, wife Radha, his sons Fakira and Saddhu. On the day of Yatra the religious fest Rania alone with great courage and perfect plan of taking Yogini away rides towards Shigoan. There he entails a responsibility to inform Shankar Patil and Vishnupant Kulkarni form his village to march towards Shigoan to receive Rania with Yogini. He deploy the people walking with Yogini and in the vicinity of the on narrow passage, he dives in the Flocks of the people and killed the most powerful person and taking advantage of the night disappear from the spot and with the speed of lightening move towards Wategaon meanwhile, getting the clue of Rania, a huge mob of Shigoan villagers run with weapons

ready to kill him. Rania by faraway goes beyond the boundary of Shigoan and enters the Wategaon area. But breaking the rule Shigoan villagers chase him, kill his faithful horse 'Gabrya' and beheaded Rania: the warrior, violating the traditional rule.

Generally unaware and sloppy about manmade, the place where Mange community resides with their poverty stricken life, the entire village with great respect for Rania decides to take revenge of this incident. Ranoji's death, people are united. But after an apology and getting Ranoji's head back the matter is closed down, and Rania cremated by the Wategaon villagers. Later Fakira the elder son of Rania a young man having superior skills than his father, muscular, sympathetic towards every troubled person, hence becomes the leader of the Dalit and the village. After the ten years the Shigoan's youth plans to attack and get back the Yogini, Fakira had an inclination of the possible attack and he not successfully retaliate the attack but let the youth go out of Wategaon and then then chasing him successfully cuts his hands from the wrist and completes the vengeance of his Father's murder yet spares the youth, though legally Fakira could slain him. He chose to teach him lesson by cutting his hand from wrist and earns reverence of his magnanimity for granting life to youth. As Alexander pope says: 'to err is human to forgive is divine'. Annabahu's character Fakira here teaches Humanity and values like forgive by awarding life to the youth, sacrificing his rightful pray and vengeance of his father's murder.

The novel also attempts to demonstrate the path towards the communal

harmony and strength of the unity. How Visnupant Kulkarni the upper caste senior of the village support the Dalit's and closely associated with the feeling and up and down in the life of Dalit's. But Patil family made politics to make survive their life. . Fakira was against the law which declared the innocent Dalit community as criminal. It is clear reflection of the internal politics of upper caste community in the village towards Dalit. Fakira dares to challenge it

Baburao Bagul a senior Dalit writer has contributed to Dalit literature his excellent stories, novels, poems editorials

etc. He depicted real life Dalit from 'Jeva mi Jat Chorali Hoti'. (When I steal caste).

Overall the novel Fakira is the finest example of Dalit society and great lesson and model reflecting the rarest grit to live even in an utmost adversity. The Mange- Mahar unity is one of the most salient features of Annabhau Sathes's masterpiece. Novel Fakira deals with Dalit expression, misfortunes, looted wealth, murder morally upright and ideal individual. It would be in the interest of knowledge of Indian society, Dalit's and history to hold Annabhau Scathe's literature to inspect the class-caste dimension in Maharashtra.

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Spirituality and Ethics with Reference to the Poem, "Don't kill a snake" by Saint Tukaram

Dr. Balasaheb Gopal Yadav

Department of English I.C.S. College, Khed, (M.S.) India

Abstract

The aim of this study is to explore how spirituality relates to ethics and leaders'/employees' ethical actions at work by reviewing the literature on spirituality and ethics. Within this scope, the present paper focuses on inner purification reflect on human character and leadership. Spirituality and ethics were also investigated in terms of decision-making, development, the role they can play in global issues, faith, and secularism. This paper discusses the impact of spirituality on organizational ethics and ethical practices, as well as guidelines and suggestions for incorporating spirituality to help spread ethics at work.

Key Words: spirituality, ethics, leaders, scope, decision making, guidelines and work

Introduction:

Spirituality is becoming more prominent in organizational research. The concept "spirituality" was first studied in relation to "the self" and then in relation to its impact in the workplace in "workplace spirituality" studies. Spirituality has been studied in relation to organizational effectiveness, efficiency, resilience, and leadership as a result of growing interest. In this light, there has been an increase in the number on studies of organizational spirituality and ethics (e.g. Corner, 2009; Ayoun, Rowe, Yassine, 2015; Ananthram, Chan, 2016). In response to the a interest in spirituality and ethics, we take poem of saint Tukaram Don't kill a snake on spirituality and ethics, as well as an examination of how spirituality relates to workplace ethics and behaviors. Saint Tukaram advised spirituality and ethic in the following lines:

Don't kill a snake
Before the eyes of saint
For the saint being

Include all living thing
And he's easily
Hurt. (191)¹

Saint Tukaram advised all subjects that God is residing in the heart of all animals. All the universe is one. He further said that:

A single hair
Plucked from the body
Causes instant pain
And the soul that perceives
Life as a community
Always suffer.

Today, there are movements taking spiritual and ethical ideals into industry, as profit is no longer the only bottom line, giving way to a "triple bottom line," or a dedication to "people, earth, and profit." McLaughlin (McLaughlin, 2005)². As a result, the quest for workplace spirituality has an ethical component, as it attempts to redefine balancing principles for oneself, culture, humanity, and the environment.

Humanity needs to shift its lenses from a materialist perspective on production and

producers. The ideas associated with the philosophy of spirituality at work usually reject humanity's materialistic stance and encourage personal development. Humanity is referred to as "Homo moralist" rather than "Homo economics" by Dhiman (2016)³. According to McPherson (2015)⁴, who describes humanity as "homo religious," spiritual people exist. Spirituality is gradually being proposed as a possible counter to the issue of materialism or profiting at the cost of "being a good person" in this regard (McGhee and Grant, 2017, p. 160)⁵. However, finding spiritual liberation and a spiritual mentality in the face of materialism necessitates a significant shift in mindset.

The term "spiritual" refers to an inner existence that is intimately linked to religious forms or in some way to humanistic psychology in order to realize one's full potential (Roof, 2003, p.138)⁶. Melé & Fontrodona (2017)⁷ state that nowadays, spirituality is described independently of religion. Isa and Pick (2011)⁸, who draw attention to various conceptions of spirituality in relation to religion, (Melé & Fontrodona, 2017). Isa and Pick (2011), who attracts attention to different interpretations of spirituality in religious and secular terms, point out the need for some people at modern workplace to develop meaning for their work and potential through their spirituality understanding and application, be it religious or secular.

Spirituality and deep spirituality are two terms that are often used interchangeably. According to him, spirituality can be divided into two types: shallow spirituality, which is the most, common, and deep spirituality,

which goes beyond ordinary experiences and transcends mass cultural patterns. Religious and aesthetic spirituality was distinguished by Isa and Pick (2011). Spirituality of religion consists of Aesthetic spirituality involves sincerity, love, unity, dignity, help, and equilibrium, as well as prayers, belief in miracles, and valuing, including divine reality, striving for truth. Tukaram explained spirituality and ethics in the following lines:

To those who equate
Their being
With everything even the
other
Is a sensation
Of the self.

As the literature is examined, the qualities of spirituality are primarily "a bond with the Creator/Power, transcendence of the self/a deep emotional state, an inner existence surfaced in one's life, serving a superior purpose, finding the calling/meaning in one's life," and "serving a superior goal, seeking the calling/meaning in one's life." They all point to one thing: people strive to relate their inner lives and values to the outside world. In their actions, thoughts, and decisions, they behave either secretly or openly. McGhee and Grant (2017, p. 160)⁸ identified four themes in their explanation of spirituality: (1) transcendence (rise beyond one's self and/or context), (2) interconnectedness (deeper relation with others), sense (finding a reason in life), and (4) a developmental aspect (innerness)

When it comes to defining spirituality in the workplace, there are a few different perspectives. For others, spirituality simply means integrating personal values such as

ethics, morality, and high-quality work, according to McLaughlin (2005). For some, it entails treating coworkers with respect and responsibility. For another, it is about engaging in spiritual activities such as prayer, meditation, and so on. Or others, it means doing ethically sound business in a socially conscious manner in order to have a positive effect on the environment and support the society in order to make the world a better place. Spirituality is one of the most powerful forces in human life, influencing the values, community, customs, and decisions of the majority of societies. It enables people to comprehend their surroundings and give meaning to their lives and nature, as well as forming one's ethical, moral principles, attitudes, and values (Creighton-Smith et al., 2017). As a result, there are a number of priorities that shape our lives and guide our ethical decisions. According to Edwards (2016)⁹, there are many variables that influence the degree of value: 1) God and individual thinking souls, 2) acts of love, grace, and justice, and 3) systemic facts or truths, convictions, rules, and formalities. Spirituality, which also means God and conscious souls, is inextricably linked to God and conscious souls.

The ethical decision-making process in relation to spirituality often manifests itself in purchasing practices that can harm the environment directly or indirectly. The findings indicate that the higher a consumer's moral consciousness, the more likely he or she is to have an ethical bent (Vitell et al. 2016, p.147)¹⁰. Spirituality, according to another report, may be a predictor of green-purchase in the future.

Vitell et al. (2016) have discovered that an individual's faith and moral identity power have a significant impact on how they determine ethical customer circumstances. How to follow ethics and spiritually saint Tukaram revealed in the following lines:

Says Tuka
I give you
The very root
Of ethics
Be happy to worship
The lord of all
In your own being

Secularization has dominated for a long time, but it is now giving way to spirituality. Many studies have attempted to determine the impact of faith on ethical conduct and the connection between spirituality and ethics over the years. In the context of Islam, spirituality and ethics are examined. (2017, Suib & Said)¹¹ Both words in Islam are connected by seven principles, according to them (care, generous, honesty, justice, loyalty, respect, and responsible). They also say that ethics improve service quality, inspire staff, and increase consumer satisfaction and benefit, and that spirituality promotes positive energy, improves performance, motivates people to do good deeds, improves self-awareness, and increases cohesion. And fosters a sense of social responsibility. Similarly, in his thesis on postmodernity, spirituality, and ethics, Escobar (2011, p.59)¹² argues that ethics and spirituality are interdependent since they form and are fundamental to each other. According to Isa and Pick (2011), there is a strong connection and relationship between ethics, spirituality, and aesthetics. Burkhardt (2010), who delves deeply into spiritual religiosity, claims that the spiritual

component of ethics is lost if there is no submission or adherence to God's will.

Literature has commonly acknowledged the distinction between faith and spirituality while the terms spirituality and religion are sometimes used interchangeably, the latter is more formal, institutionalized, and structured. McPherson is a character in the film *McPherson* (2015) spirituality, they say, contributes to organized and agreed-upon rituals in the broadest sense, which are shared by other adherents. The birth of modern faith-like groupings and cults may be seen as examples, which are founded on the spiritual quest of different individuals coming together and forming new forms, but these groups are not necessarily based on either religion and can include adherents from various religions.) Though spirituality is usually on a personal level, religion can also be understood on a personal level. If both words can be regarded as one or two distinct definitions, one must exercise extreme caution when making decisions in the realm of spirituality final thoughts

Conclusion:

The relationship between spirituality and ethics has yielded a variety of findings. Although most writers agree on the philosophical relationship between spirituality and ethics, there is little agreement among the writers on empirical studies that suggest a sound relationship

between the two words. However, empirical studies that claim a substantial association between the words outnumber those that deny the existence of such a relationship. As a result, it can be concluded that there is a growing positive consensus in the studies on the empirically validated relationship between spirituality and ethics. An organization's spirituality or spiritual life is shared by its members. Spirituality is thought to influence decision-making not only in the corporate or organizational sense, but also in larger-scale issues such as environmental issues. Spirituality is often seen as a significant influence on customer habits and decisions. Spirituality will undoubtedly play an important role in the long-term survival and resolution of new world problems, particularly in light of new trends. So it's no surprise that spirituality and ethics will play an increasingly important role in a person's well-being as well as humanity's/the world's overall wellbeing in the coming decades. Spirituality and religiosity have a lot in common, despite the fact that much of the literature considers them to be separate. Spirituality, though a rather personal idea, can contribute to the formation of groups or systems that are similar to religious structures. There have also been several spiritual classifications, one of which is more associated with secular viewpoints and the other with more indigenous perspectives.

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STAGES OF SOCIO-ECONOMIC DEVELOPMENT IN RATNAGIRI DISTRICT (1981 TO 2011)

Dr. Anita J. Awati Associate Professor, Department of Geography, ICS Arts, Commerce & Science College, Khed, Ratnagiri (MS)

Mr. Rajesh S. Kamble Research Scholar, Dr. B. A. M. University Aurangabad (MS)

ABSTRACT:

The development of socio-economic infrastructure indicates the quality of life of people of a particular area. Therefore the level of development of socio-economic facilities reflects the economic set up of the region. The present study is based on primary and secondary data. The main aim of this study is to understand spatial-temporal patterns of socio-economic development in district of Konkan division and tehsil level of Ratnagiri district during 1981-2011. For measuring their socio-economic development twelve indicators are selected for district level and eleven for the tehsil level. For assessing the overall change in the levels of socio-economic development composite indexes are constructed of district and tehsil levels. After arranging composite index values in descending order they are divided into three categories for district and tehsil level. Also for analysis various methods has been used i.e. statistical techniques and GIS software (QGIS 3.16) for this study.

Keywords: Composite index, socio-economic indicators, Stages of Development

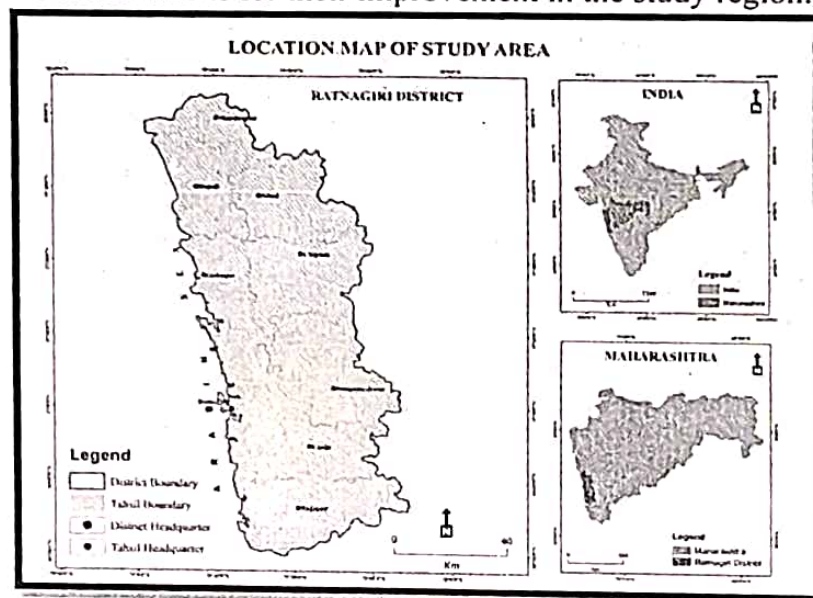
Introduction

Development is by definition means a process by which a societal problem is to be solved by implementing a systematic and well-defined change process. The Socio-Economic development is determined by the economic indicators of the region and different social amenities served to the people in a geographical region. The development of socio-economic infrastructure indicates the quality of life of people of a particular area. Therefore the level of development of socio-economic facilities reflects the economic set up of the region.

Objective

The present study has been undertaken with the subsequent specific objectives.

1. To assess the stages of socio-economic development at district and tehsil level.
2. To understand spatial-temporal patterns of socio-economic development in district of Konkan division and tehsil level of Ratnagiri district during 1981 to 2011
3. To suggest recommendations for their improvement in the study region.



Study Area

Ratnagiri district is located in the Konkan region of Maharashtra. Ratnagiri district lies between 15° 36' north to 18° 5' north latitude and between 73° 5' east to 74° 36' east longitude. It is located in Konkan region and Mumbai administrative area. The total area of Ratnagiri district is 8208 sq.km. The Arabian Sea is to the west of the district while to the east is a Satara, Sangali and Kolhapur district, in the south lies Sindhudurg and to the north Raigad district is located. In the eastern part of Sahyadri mountain ranges are present which about 180 km is and it possesses coastline of about 167 km. There are nine tehsils places in Ratnagiri district, such as Chiplun, Khed, Sangmeshwar, Dapoli, Mandangad, Guhagar, Rajapur and Lanja.

Research Methodology

The present study is based on primary and secondary data. The main aim of this study is to understand spatial-temporal patterns of socio-economic development in district of Konkan division and tehsil level of Ratnagiri district during the thirty years period (1981-2011). For measuring their socio-economic development twelve indicators are selected for district level and eleven for the tehsil level. For assessing the overall change in the levels of socio-economic development composite indexes are constructed of district and tehsil levels. After arranging composite index values in descending order they are divided into three categories for district and tehsil level as given below -
1. Developed Stage 2. Moderately developed Stage 3. Backward Stage.

Discussion and Result

For measuring their socio-economic development twelve indicators are selected for district and eleven indicators for tehsil level.

District level composite indexes of development are based on following twelve socio-economic indicators are selected for assessing their socio-economic development, that are represented in Part-A; while tehsil level development indexes are presented in Part-B.

Table No.1

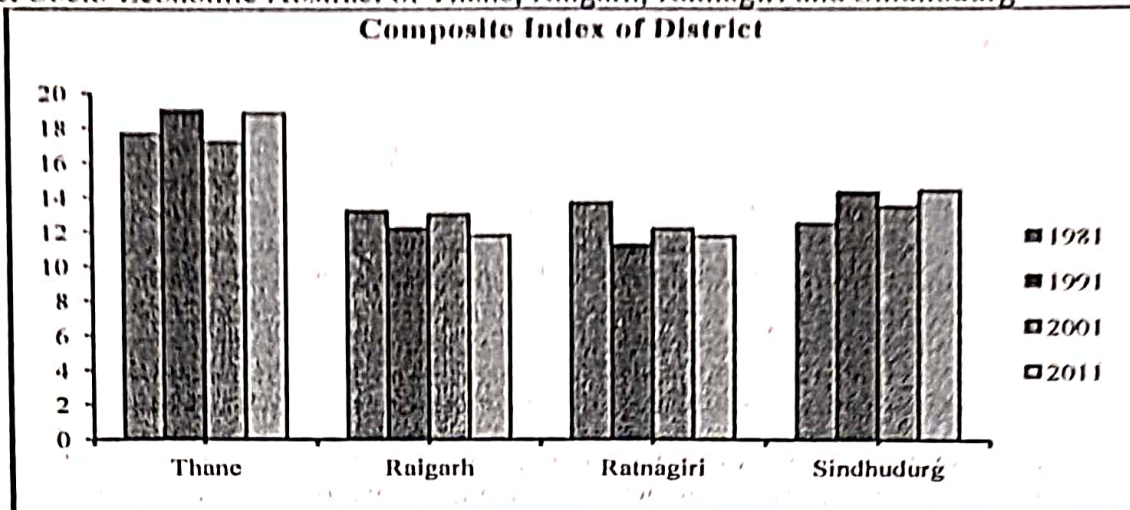
Sr. No.	Part-A District Level Socio-Economic Development Indicators	Sr. No.	Part-B Tehsil Level Socio-Economic Development Indicators
1	Percentage of population in a district to the total population of the Konkan division	1	Percentage of Population in a tehsil to the total population of the Konkan division
2	Population Density	2	Population Density
3	Literacy rate	3	Literacy rate
4	Percentage of villages with Electricity Supply	4	Percentage of villages with Education Facilities
5	Communication facilities per 10,000 Populations	5	Percentage of villages with Medical Services
6	Hospitals per 1, 000, 00 Population	6	Percentage of villages with Drinking Water Supply
7	Primary Health Centers per 10,000 populations	7	Communication facilities per 10, 000 Populations
8	Beds in Hospital per 1, 00,000 populations	8	Percentage of villages with Electricity Supply
9	Dispensaries per 10,000 populations	9	Work Participation Rate
10	Number of banks per 10,000 populations	10	Percentage of Area under Irrigation
11	Percentage of area under irrigation	11	Approach by Pucca Road
12	Road length per 100 sq. km area		

Table No.2

Year	Composite Index of District			
	Thane	Raigad	Ratnagiri	Sindhudurg
1981	17.68	13.28	13.69	12.51
1991	19.04	12.29	11.23	14.32

2001	17.23	13.07	12.16	13.51
2011	18.89	11.82	11.73	14.43

Source: Socio-Economic Abstract of Thane, Raigarh, Ratnagiri and Sindhudurg



District Wise Stages of Socio-Economic Development of Konkan Division (1981)

Developed	Thane
Moderately Developed	Raigad Ratnagiri
Backward	Sindhudurg

Table No. 2 show that among four district of the region Thane is the most developed and Sindhudurg is the backward district in terms of 14 indicators of socio-economic development. Thane district is the main urban centre so, the composite index of the district was high (17.68). Composite index of remaining two districts i.e. Ratnagiri (13.59) and Raigad (13.28) were recorded as moderately developed. (Fig) Sindhudurg district was bifurcated in the same year from Ratnagiri district. Ratnagiri district remained in 2 nd position in 1981. In Ratnagiri district the ration of health facilities i.e. hospitals, available beds and dispensaries were increased hence socio-economic status reserved in moderately developed district.

District Wise Stages of Socio-Economic Development of Konkan Division (1991)

Developed	Thane
Moderately Developed	Sindhudurg
Backward	Raigad, Ratnagiri

According to 1991, composite index values of Thane district was increased from 17.68 to 19.04. Because there was a increased in road length, power supply, total population density and literacy rate in the district in 1991 than 1981. The composite index values of socio-economic development of Raigad and Ratnagiri district have decreased in 1991 than last decade so, the district of Raigad and Ratnagiri were came down from moderately developed to the backward category. Because growth of population was very slow in the district so, ratio of health facilities i.e. hospitals, available beds, dispensaries and economic facilities like numbers of bank, road length and area under irrigation was high among four district of the Konkan region.

District Wise Stages of Socio-Economic Development of Konkan Division (2001)

Developed	Thane
Moderately Developed	Raigad, Sindhudurg
Backward	Ratnagiri

As per 2001, Thane district was in developed category but composite index of the district was decreased by 19.04 to 17.23 from 1991 to 2001. Composite index values of Thane district was decreased from 1991 to 2001. Because percentage of population density, literacy rate was increased but socio-economic factors such as health, communication facilities and number of banks not

increased with growth of population rate. Therefore, ratio between population and socio-economic facilities came down. Sindhudurg district continuously remained in moderately developed category in 2001 but due to decline in percentage of some social and economic factors composite index of district was slightly decreased by 14.33 to 13.51 from 1991 to 2001. Composite index of Raigad district was slightly increased by 13.29 to 13.07 because of increased in population density and number of industrial activities in the district. So, Raigad district shifted from backward to moderately developed category.

Ratnagiri district continuously remained in backward category in 2001 because of decreased in population density, percentage of power supply and numbers of banks; but due to increased percentage of urban population, number of public health centre, dispensaries and number of hospital beds composite index district increased by 12.16 than 1991 (11.23).

District Wise Stages of Socio-Economic Development of Konkan Division (2011)

Developed	Thane
Moderately Developed	Sindhudurg
Backward	Raigad, Ratnagiri

As per 2011, composite index of Thane district was increased by 18.89 than last decade (17.23) and continuously remained in developed category from 1981 to 2011. Sindhudurg district was continuously remained in moderately developed category from 1991 to 2011 except 1981. Public health facilities (hospital beds, dispensaries), literacy rate are higher than other district of the region. Hence, composite index of the district was increased from 13.51 to 14.43 in 2011. Raigad district is an adjoining district of Thane district. Nevertheless, northern part of the Raigad district connected with local trains to Mumbai and Thane district. Also percentages of population density, number of industrial activities but other social factor are not increasing compare to increasing population characteristics. Therefore, Raigad district shifted from moderately developed category to backward category in 2011 than 2001.

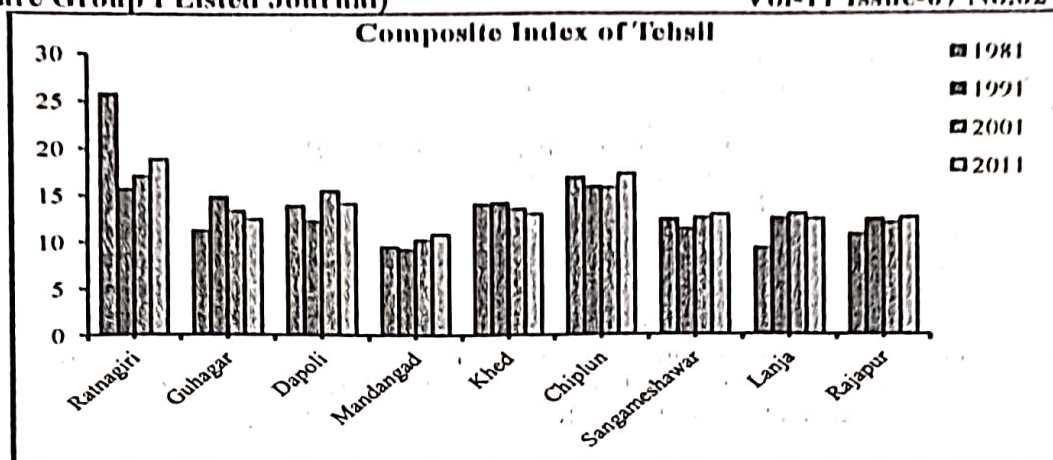
The Composite index of Ratnagiri district is decreased by 12.16 to 11.73 in 2011 than previous decade. So, district remained backward category in 2011. The Percentage of urban population, Percentage of population density, low rate of socio-economic indicators and industrialization than Raigad and Sindhudurg district so Ratnagiri district remained in bottom position in the Konkan region in 2011.

Tehsil Wise Stages of Socio-Economic Development in Ratnagiri district 1981 to 2011

Table No. 3

District	Composite Index of District			
	1981	1991	2001	2011
Ratnagiri	25.79	15.70	17.05	18.81
Guhagar	11.14	14.71	13.19	12.31
Dapoli	13.70	12.13	15.33	13.99
Mandangad	09.38	09.12	10.14	10.73
Khed	13.96	14.12	13.50	12.90
Chiplun	16.85	15.89	15.75	17.22
Sangameshwar	12.34	11.31	12.49	12.80
Lanja	09.27	12.45	12.92	12.36
Rajapur	10.72	12.32	11.91	12.47

Source: Census Handbook of Ratnagiri District (1981-2011)



Tehsil Wise Stages of Socio-Economic Development in Ratnagiri district (1981)

Developed	Ratnagiri, Chiplun
Moderately Developed	Dapoli, Khed, Sangameshwar
Backward	Mandangad, Lanja, Rajapur, Guhagar

In 1981, Ratnagiri and Chiplun tehsils has been grouped in the developed category. The factors responsible for the development of these tehsils are high percentage of proportion of population, literacy rate, percentage of area under irrigation, transport and communication facilities for both tehsils. Dapoli, Khed and Sangameshwar tehsils remained in moderately developed category. Out of these, medical facilities, communication facilities are comparatively good in Khed tahsil. Remaining four tehsils namely Rajapur, Mandangad, Lanja and Guhagar are in backward category. This is because of the lowest percentage of transportation facilities, pucca road, and electricity and health facilities.

Tehsil Wise Stages of Socio-Economic Development in Ratnagiri district (1991)

Developed	Ratnagiri, Chiplun
Moderately Developed	Guhagar, Dapoli, Khed, Lanja, Rajapur
Backward	Mandangad, Sangameshwar

As per 1991, Ratnagiri tehsil continuously remained in developed category in 1991. But composite index of Ratnagiri district was drastically decreased by 15.70 than 1981 (25.79) because decreased in communication facilities and area under irrigation. In the same year Chiplun tehsil is also in developed category but composite index slightly decline by 16.85 to 15.89. This is because of decreased in percentage of area under irrigation and electricity. Dapoli and Khed tehsil remained in moderately developed category in 1991. Due to improvement in educational, communication, pucca road and power supply facilities Guhagar, Lanja and Rajapur tahsils shifted from backward to moderately developed category. It is observed that Sangameshwar tehsil shifted from moderately developed to backward category in 1991. Mandangad tehsil remained in backward category in the same year.

Tehsil Wise Stages of Socio-Economic Development in Ratnagiri district (2001)

Developed	Ratnagiri, Chiplun, Dapoli
Moderately Developed	Guhagar, Khed, Sangameshwar, Lanja
Backward	Mandangad, Rajapur

According to 2001, Ratnagiri and Chiplun tehsil constantly remained in developed category but composite index values of Ratnagiri tehsil slightly increased by 15.70 to 17.05 from 1991 to 2001. Composite index values of Dapoli tehsil was increased by 12.13 to 15.33 between 1991 to 2001. Hence first time Dapoli tehsil shifted from moderately developed to developed category in 2001. Rajapur tehsil came down from moderately developed category to backward category (12.32 to

11.91) and Sangameshawar tehsil shifted from backward to moderately developed category (11.31 to 12.49) between 1991 to 2001.

Tehsil Wise Stages of Socio-Economic Development in Ratnagiri district (2011)

Developed	Ratnagiri, Chiplun
Moderately Developed	Guhagar, Dapoli, Khed, Sangameshawar, Lanja, Rajapur
Backward	Mandangad

As per 2011, Ratnagiri and Chiplun tehsil continuously reserved in developed category during 1991 to 2011. Because Ratnagiri is the headquarters of Ratnagiri district and Chiplun is industrially developing region. Composite index values of Dapoli tehsil decreased by 1.34 (15.33 to 13.99) during 2001 to 2011. Therefore, Dapoli tehsil came down from developed to moderately developed category. Mandangad tehsil always remained in backward category but the composite index values slightly increased by 0.56 (11.91 to 12.47) in the same period.

Conclusion

From the above discussion, it can be seen that the socio-economic development of Ratnagiri district is limited to Ratnagiri and Chiplun tehsils. Apart from Mandangad tehsil in the northern part of the district, other tehsils are in the developed stage, while the tehsils in the southern part of the district namely Lanja, Sangameshwar and Rajapur are in the backward stage of development. Mandangad is one of the most backward tehsil in the district. Urban areas are at the peak of socio-economic development. Therefore, Ratnagiri and Chiplun tehsils in Ratnagiri district are at the forefront of socio-economic development as compared to other tehsils. Hence, Ratnagiri and Chiplun tehsils are developed while the rest of the tehsils are moderately developed or backward. All this shows that the result of the tehsil development process in Ratnagiri district is positive but not as significant.

Suggestions

1. It is possible to develop industries based on local resources mainly in the less developed tehsils of the district.
2. The development process of backward tehsils can be enhanced with the help of agro based (Alphanso mango, Cashew nut processing industries) and Coir Industry, Fish Canning Industry, Tourism Industry etc.
3. There is need of enhancing the activities of animal husbandry along with the agricultural development.
4. Irrigation facilities should be provided in most of the low developed tehsils for the cultivation of crops.
5. Efforts should be made to reduce the dropout rate from the primary schools by setting more and more formal and non-formal education centres.

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Sustainable Coastal Tourism Development in Ratnagiri District

¹Mr. Rajesh S. Kamble, ²Dr. Anita. Awati

¹Research Scholar, Dr. B. A. M. University Aurangabad (MS)

²Associate Professor, Department of Geography, ICS Arts, Commerce & Science College,
Khed, Ratnagiri (MS)

Abstract

Tourism is one of the largest and fastest growing global industry with much of the growing market focused around pristine natural and cultural environment. These include marine areas, forts, temples, forests, wildlife sanctuaries, waterfalls, beaches and different cultures. Ratnagiri district is an important district on the Konkan coast of Maharashtra. The district has potential for natural and cultural tourism. In recent times, increasing tourism along the Konkan coast has been the main reason for the development of the coastal area and it is also responsible for many of the current coastal problems. For this, it is necessary to develop sustainable tourism on the coast of Ratnagiri district. Sustainable tourism is consciously planned to benefit local residents, respect local culture, conserve natural resources and educate both tourists and local residents about the importance of conservation. So, the present research paper focuses on the sustainable tourism development in Ratnagiri district (coastal area). The present research work has based on both primary and secondary data.

Keywords: Natural & cultural environment, Sustainable tourism, Sustainable Development

Introduction

Tourism is playing an important role in the economic development of a developing country like India. Employment opportunities are created in the service industries related to transportation, hospitality and entertainment. Tourism provides employment to the locals and can also benefit the government. However, tourism can pose a threat to habitats, wildlife, water quality, congestion and disruption of local culture. As a result, the resources on which tourism depends can be destroyed. In contrast, sustainable tourism benefits local residents, respects local culture, conserves natural resources, maximizes profits for the local community, and educates tourists and locals about the importance of conservation.

Ratnagiri district is located on the Arabian coast in the south-western part of Maharashtra, India. It is a part of the Konkan region of Maharashtra. Ratnagiri attracts many historical temples, monuments and vast beaches. In addition, the beauty of the waves, tides, sandy beaches as well as the sunset and sunrise with a healthy and comfortable climate also attracts tourists. Konkani culture and festivals are another reason to attract tourists. This feature of the ethnicity of the Ratnagiri people invites tourists for a rich and varied experience. This is the reason for developing the region as a tourist destination.

As per the District Tourism Plan 2013, detailed information about the current state of tourism in Ratnagiri district and recommendations for improvement has been made. Ratnagiri district has potential opportunities for natural beauty, historical sites and temples, beautiful beaches, creeks, forts etc. to promote tourism domestically and internationally. Many of these places are especially suitable for beach tourism. But there is an opportunity to develop sustainable tourism that will not harm the conservation of marine habitats and natural beauty while creating tourism for employment generation or as a source of income for the local people.

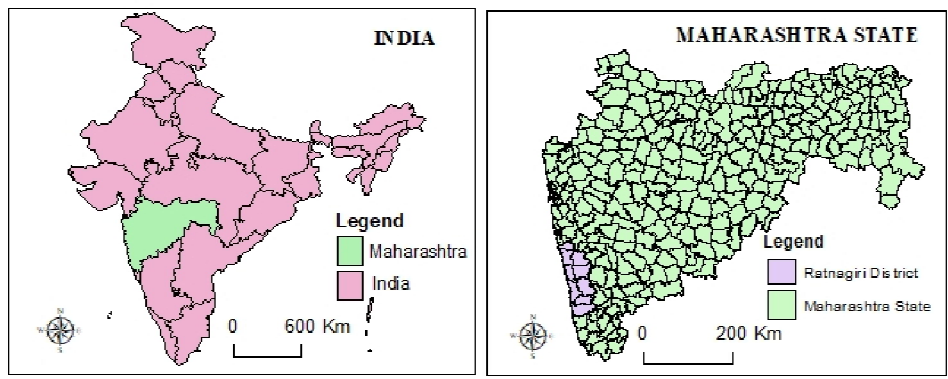
Meaning of Tourism

The World Tourism Organization defines tourists as people "travelling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business and other purposes" (World Tourism Organization). Tourism, in general, is travel for recreational, leisure or business purposes.

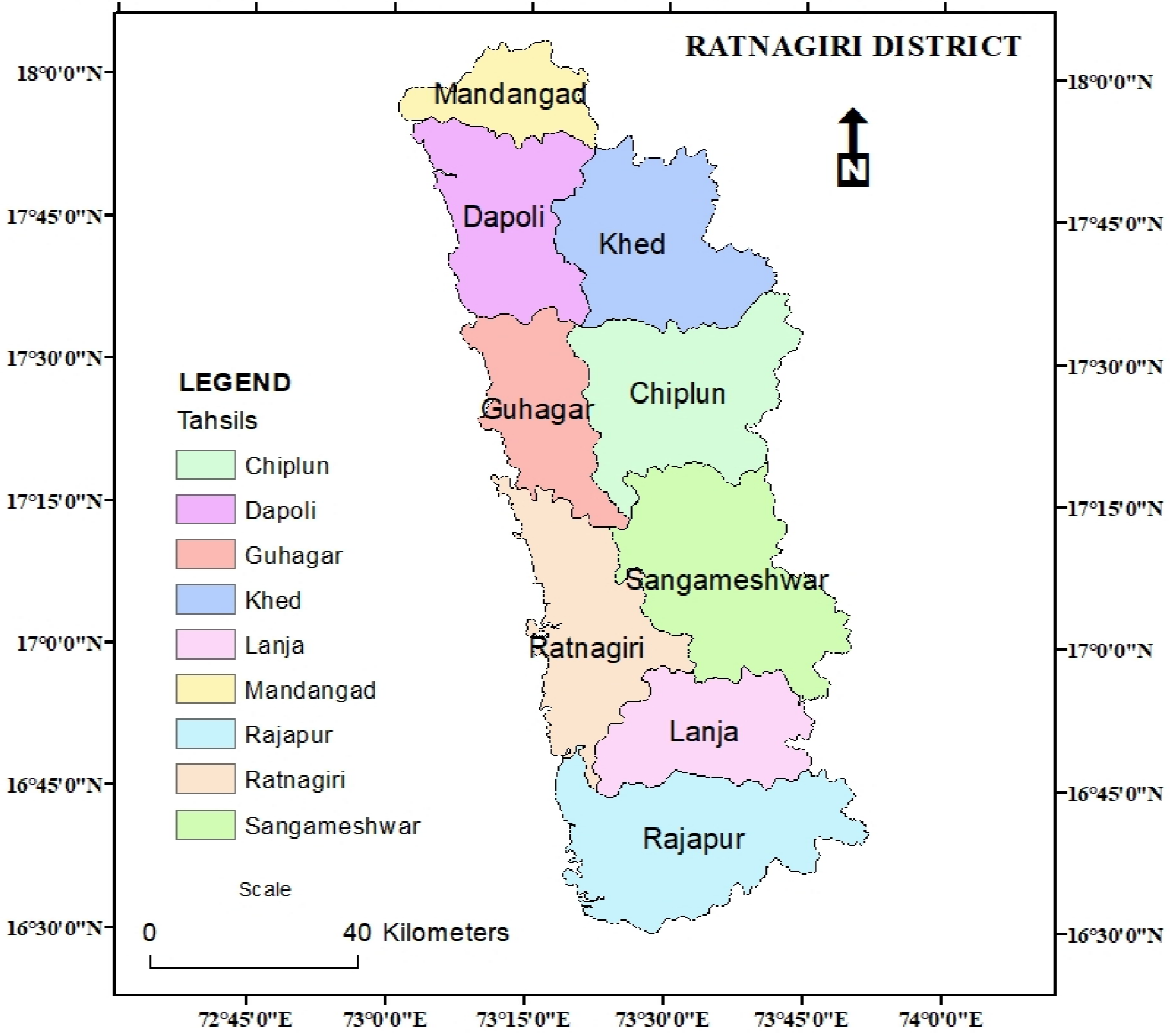
Meaning of Sustainable tourism

Sustainable development means "the needs of the present are met without compromising the ability of future generations to meet their own needs". Sustainable tourism is an approach that has recently gained much popularity in the academic and business world. The concept of sustainable tourism is a system that balances tourism with its partner relationships, taking advantage of the strengths and opportunities of the consequences of globalization. Countries with culture and nature like India have adopted the path of sustainable tourism. E.g. Turkey, China, Thailand and Malaysia etc.

LOCATION MAP OF STUDY AREA



72°30'0"E 72°45'0"E 73°0'0"E 73°15'0"E 73°30'0"E 73°45'0"E 74°0'0"E



Objectives

The present study has concentrated on to the sustainable tourism development of the Ratnagiri district. Therefore, the objectives of the current study are given below.

- 1) To take review the major challenges in the development of tourism in Ratnagiri district
- 2) To do SWOT analysis of the tourism of the Ratnagiri district
- 3) To suggest measures for Sustainable Tourism Development in Ratnagiri district

Study Area

For the present research paper, Ratnagiri district is selected as a study region. Ratnagiri district is well-known due to its geography, culture, history, etc. Ratnagiri district is located in the konkan region of Maharashtra. Ratnagiri district lies between $15^{\circ} 36'$ north to $18^{\circ} 5'$ north latitude and between $73^{\circ} 5'$ east to $74^{\circ} 36'$ east longitude. It is located in konkan region and Mumbai administrative area. The total area of Ratnagiri district is 8208 km^2 . To the west of the district is Arabian Sea to the east is Satara, Sangali and Kolhapur to the south lies Sindhudurg and to the north lies Raigad district. In the eastern part of sahyadri mountain ranges are present which about 180 km is and it possesses coastline of about 167 km. There are nine tehsils places in the distractive Ratnagiri, Chiplun, Khed, Sangmeshwar, Dapoli, Mandangad, Guhagar, Rajapur and Lanja.

Research Methodology

The present research work is based on both primary and secondary data. This work is mainly based on field observation. It consists mainly of tourists and local peoples, and informal discussions with those who provide support facilities to tourists. Most of the research work was based on secondary information. That is, district census booklets, statistical abstract and other reliable publications, SOI topographical articles, news reports, prints, maps, journals, several websites etc.

Potential Tourist Destination in Ratnagiri District

The potential tourist destinations in Ratnagiri district are classified into three sections namely Religious, Historical and Natural Tourist. Natural tourist destinations are subdivided into four categories: waterfalls, beaches and hot springs and hill stations. These places have been categorized according to the priority capacity of some of the potential tourist destinations in the district.

Table No. 1

Sr. No.	Types of Tourism Potential	Name of the Potential Tourist Places
1	Religious	Anjarle, Dabhol, Asud, Adivare, Velneshwar, Kasheli, Hatis, Chinchkhari, Tikleshwar, Kasba, Ambav, Burband, Gondhale, Turambav, Bharane
2	Historical	Harnei, Panhalekazi, Govalkot-Govindgad, Sumargad, Gopalgad, Palshet, Bankot Jaigad, Ambolgad, Purnagad, Malgund, Kasba, Mahipatgad, , Rasalgad, , Mahipatgad, Ambdav
3	Naturals	
	1) Hill Stations	Machal, Ambet
	2) Beaches	Ganeshgule, Ladghar, Kolthare, Rohile , Tawsal, Madban, Ade, Karde, Undi, Malgund, Ambolgad, , Ambolgad, Bhandarpule, Ambet, Warwade, Karambavane
	3) Waterfalls	Nivali, Adare, Chuna-kolvan, Sawat Sada, Tivare
	4) Hot Springs	Unhavare, Rajewadi, Aravali,

Major Challenges of Tourism in Ratnagiri District

Being close to Goa, Ratnagiri could have capitalized on its natural capital but the potential remains locked due to the following factors:

1) Lack of proper marketing: with little promotion of tourist circuits, cultivation of good tourism sector operators within and outside the district to attract foreign and domestic tourists, the value from tourism has not been materialized for the districts beyond ad hoc tourist arrivals that remain unplanned and unregulated.

2) Poor Transportation linkages: current tourism is based on tourists having their own vehicles as public transportation is not oriented toward promoting tourism. Rail linkages are not adequate to serve tourism needs, and the nearest airports are at some distance.

3) Lack of Infrastructure, particularly in tourist areas: the absence of adequate services like a good range of hotels and eating houses, besides related water and sanitation, public transport and reliable electricity services have constrained the tourism industry. Tourists are also deprived of good banking services, poor signage's and tourist information, and a lack of tourist operators.

4) Existing tourism products are underutilized: even though there are good locations naturally, and some that have been developed to some extent, their potential has not been systematically harnessed. On the other hand, there may be a rush of tourists to some locations, but the parking and local traffic and hygiene management is wanting.

5) Limited Integration of Local Communities: leading to opportunities lost for realizing the benefits of tourism for local people. The exposure and training to local people on how to promote and manage tourism has been limited and larger operators seek to maximize the potential in areas like Goa and Karnataka. Local biodiversity conservation committees can be constituted and operationalized to regulate specific locations and promote local stakes in tourism.

6) Tourism has been inadequately resourced and funded: despite declaring this as a Tourism district, govt. funding made available to provide infrastructure and promote tourism has been vastly unequal to that required to harness the district's potential. Even when plans were drawn up, these were not funded well or prioritized for implementation.

SWOT Analysis

Tourism is an important industry in Ratnagiri district. The industry can develop based on local resources. This development can be seen as beneficial in terms of sustainable economic development but there are strengths, weaknesses, opportunities and risks in relying on tourism for sustainable economic development. However, an attempt is made to the SWOT analysis of the Ratnagiri district tourism for its sustainable development.

Strengths

- 1) Availability of various tourist attractions such as beaches, waterfalls, natural beauty, religious places, forts, creeks, adventure sites, heritage monuments.
- 2) Alfonso is a region famous for mango and cashew production.
- 3) Good railway and road connectivity with major cities in India.
- 4) GI for Alfonso Mango

Weaknesses

- 1) Lack of awareness among stakeholders about the potential of tourism in Ratnagiri district.

- 2) Failure to convey tourism products and experience to tourists.
- 3) Major problem of road facilities and public transport connectivity in the district.
- 4) Lack of marketing in tourism sector
- 5) Hotel accommodation facilities for tourists are not properly developed
- 6) Lack of wayside facilities for tourists in the district.
- 7) Psychology of the local people is the weakness for the sustainable tourism development in the locality.

Opportunities

- 1) The coastline of Ratnagiri district could emerge as a great 'Geotourism' destination. 'Geotourism' can definitely be enhanced by identifying such various places on the coast and giving them the status of Geosites and converting them into Geoparks.
- 2) Existing beaches and creeks can be utilized for promotion of water based tourism, adventure sports and related recreational facilities.
- 3) Tourists going to Goa from Mumbai and Pune via Ratnagiri can stop at Ratnagiri.
- 4) A large number of tourists visiting Ganapatipule and Marleshwar can be encouraged to visit other places in the district.
- 5) Biodiversity can be conserved by developing 'nature tourism' in collaboration with the local community.
- 6) Integrated circuit of various tourist destinations can be advertised to provide complete tourism experience.

Threats

- 1) The beaches in Sindhudurg and Goa are more scenic and developed so tourists have options.
- 2) Loss of beauty through the developmental projects in the locality, e.g. Thermal Energy Plants, Atomic Power Plants, etc.
- 3) Environmental degradation due to conventional tourism development is also a threat that may affect on sustainability of the tourism in the locality.

Measures for promotion and improvement of sustainable tourism development in Ratnagiri district

From the SWOT analysis, it is evident that the Ratnagiri district has the great potentiality and opportunities for the development of tourism as a base of economic development. The Ratnagiri district can take advantage of its strengths for its opportunities for the sustainable

development of tourism by using sustainable tourism development approach. The following are the major measures for the sustainable tourism development that take advantage of its strengths and opportunities while reducing its threats and weaknesses.

1) Tourism in Ratnagiri district can be multi-faceted - regional culture, natural beauty, religious and historical resources as well as new health facilities, weekend tourism and nature tourism can provide new sources of employment to the local people and provide a source of entertainment to tourists.

2) Development of infrastructure in Ratnagiri district is a basic requirement for the development of tourism industry. The roads are in very bad condition which acts as a deterrent for many tourists. E.g. Improvement of travel routes - Roads / Railways / Airways are the basic requirements for the development of the tourism industry. It is also important to have better availability of banking, ATM and forex facilities.

3) In order to attract foreign tourists in Ratnagiri district, it is necessary to prepare information about tourist places and experiences on the international tourist map.

4) It is necessary to improve the quality of tourist infrastructure and services. The government needs to speed up the process of setting up more hotels with a decision at the policy level. E.g. Number and variety of living facilities, dining houses, roadside facilities and overall variety

5) Communication facilities need to be improved with easy access. E.g. Telephone / Fax / Internet etc. And there is a need for availability of communication guides with English and foreign languages as well as good provision of signs and information leaflets.

7) Security and safety system needs to be improved. Good parking facilities, side cleanliness and management of pilgrimage sites etc.

8) Development of environmentally sensitive tourism is necessary which will create employment opportunities for the local people and will not create human-animal conflict.

9) Passenger cruise ship service can be important for tourist attraction. This service has already started from Mumbai to Goa. There is also an opportunity to develop such services in Ratnagiri.

10) Some stakeholders suggest that the State Department is not capable of promoting and regulating tourism services at the local level. Therefore, planning and service regulation at the local level can be better if management is entrusted to local and private sector agencies to attract the private sector.

- 11) Co-benefits can be obtained by converting tourism with mangoes, cashews and related economic activities. There is potential for training and food-processing to develop Konkani products and markets.
- 12) Although the beaches are very beautiful, they are not kept clean. The culture of cleanliness should be implemented by the district administration.
- 13) The Ratnagiri district has the lack of trained qualitative human resources and it is harmful for the sustainable tourism development. Guide, language training courses should be taken for the local youth at the village level and professors should be appointed for these courses from reputed hospitality institutes. These courses should be started in all the tahsils of the district.
- 14) NGOs, private owners and local governments should encourage investment in the tourism industry. This can increase the potential of the tourism industry in the area. This way we can also get hospitality in group tours which are not available in most places at present.
- 15) Urgent need of Konkani Food Processing Training and tourism may create easy market to the Konkani food products and beverages.
- 16) The tourism information system will be useful for the planning and development of the tourism industry in Ratnagiri district and will lead to sustainable tourism development.
- 17) Publicity is essential for the development of tourism. This requires creating your own website. Local governments should create such websites and, if not affordable, use open sources of publicity like Facebook.
- 18) Given the need for sustainable tourism development, various stakeholders should focus on the use of environment friendly products. For this, strict laws must be enacted and enforced; otherwise sustainable tourism development will only be a dream.
- 19) MTDC is currently issuing licenses for tourist facilities (tourist resorts, tourist destinations and transportation). However, preference should be given only to trained persons who can provide quality services to tourists at the time of issuance of licenses.
- 20) Considering the environmental and cultural sustainability, we should focus on the conservation of our natural and cultural resources which is essential for the economic sustainability of the region.
- 21) For the sustainable development of tourism in the district, researchers should undertake projects such as tourism information systems, market profiling and analysis, sustainable tourism

policies and facts, economic impact assessment, environmental impact assessment, importance of micro-level tourism awareness programs, etc.

22) Public awareness is an important factor for the sustainable development of the tourism industry.

Conclusion

The study has shown that Ratnagiri district has more potential for tourism development and there is no doubt about it. There are some problems and obstacles in tourism development but, if tourism is properly planned, it will help increase income and create employment opportunities for the youth of Ratnagiri district which will reduce their migration to nearby cities.

From the above discussion, it is clear that Ratnagiri district has strengths and opportunities for sustainable tourism development and this will remove the weaknesses and threats in the region. If we consider the above recommendations, the sustainable development of the tourism industry in the district can be achieved with economic sustainability, environmental sustainability, social sustainability and cultural sustainability.

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Mahatma Gandhi's True Management Philosophy

Dr. Chandrashekhar R. Salunkhe
Mobile : 9422391724

In the present scenario management means success rather than satisfaction; similarly economic index of the country has considered as major criteria for the assessment of development. Industries success is being assessed on the basis of their economic power; while CSR has become a part of marketing strategy rather than sacrifice for the society. Satisfaction index is comparatively neglected by the most of countries including developed economies; therefore views of Mahatma Gandhi are more incredible in the present corporate environment. Rich people are becoming richer while poor don't have anything to loose. Development of all i.e. '*Sarvodaya*' should be the fundamental principle for any socio-economic project and it should be the mission for the management. Mahatma Gandhi; who had known as true leader and social reformer has advised as; management should act as care taker rather than the owner; it is nothing other than the trusteeship approach.

A Management is a science as well as an art that brings desired plans into reality. Management thinkers like Fayol, Drucker as well Taylor are known as pioneers in industrial management; their management philosophies are more focused towards methodologies and human behavior. While, Mahatma Gandhi as social reformer and was quite focused towards equality, trust sheep and true behaviour. As he mentioned; a manufacturer has no moral right to earn profit if he don't have further distribution plan for his

A SUSTAINABLE AGRICULTURAL DEVELOPMENT IN RAIGAD DISTRICT

**Mr. Rajendra M. Shingate & **Prof. Dr. Anita Awani*

**Assistant Professor, Dr. Patangrao Kadam Arts and Commerce College, Pen, Raigad, Maharashtra*

*** Professor & Head, Department of Geography, I.C.S. College, Khed, Ratnagiri, Maharashtra.*

Abstract:

Crop production, livestock, horticulture crops, and fisheries are all part of a comprehensive agricultural system. The current state of these combinations is determined by the predominant mode of these systems in a given location. As a result, important integrated farming systems with internal cost adjustment, return, revenue, and employment in the agricultural systems must be identified. The research was carried out in the Maharashtra district of Raigad in the year 2007 to 2012.

Keywords: *Agricultural Farming systems, Growth, Development, Marketing etc.*

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Introduction:

In Maharashtra's Konkan Division, the Raigad district is located on the western half of the state. The Arabian Sea lies to the west, while the Sahyadri Hills are to the east. The border districts are Thane, Pune, Satara, and Ratnagiri. Thane creek is located in the northwestern part of the city. The district stretches 160 kilometres north-west and 25 to 50 kilometres east-west. The district covers 7,162 square kilometres, or 2.32 percent of the state's total area. Raigad boasts a 240-kilometer stretch of lovely and pristine beach.

There are fifteen Talukas namely; Alibag, Pen, Panvel, Karjat, Uran, Khalapur, Roha, Sudhagad (Pali), Mangaon, Murud, Mhasala, Shrivardhan and Poladpur in Raigad District. Alibag is the administrative headquarters of Sarkhel Kahnoji Angre, as well as the ancient capital city.

Objective of the study:

The goal of research using Sustainable Agricultural Farming Systems view point is To investigate the rate of development and the potential for enhancing farmer income through mixed farming.

Methodology:

The district plan has been prepared having considered the different aspects in light of the aforesaid aims and standards. Horticulture, agriculture, fisheries, animal husbandry, dairy development, and other significant sectors/programmers are among them.

The data base is quantitative and qualitative, and it is gathered at the grampanchayat and taluka levels. Secondary sources, as well as observations and discussions with progressive farmers, Panchayat raj institutions (PRIs) at various levels, and voluntary and non-governmental organisations, were used to compile the data. The CDAP is based on the Planning Commission's proposed framework, which is a decentralised and integrated approach. According to this directive, the plan's creation began with stakeholder consultations at several levels, beginning at the village (grampanchayat) level. Throughout the creation of the CDAP, the district chiefs of several departments were actively involved. During the planning process, the relevant employees were also consulted.

Agro Conditions:

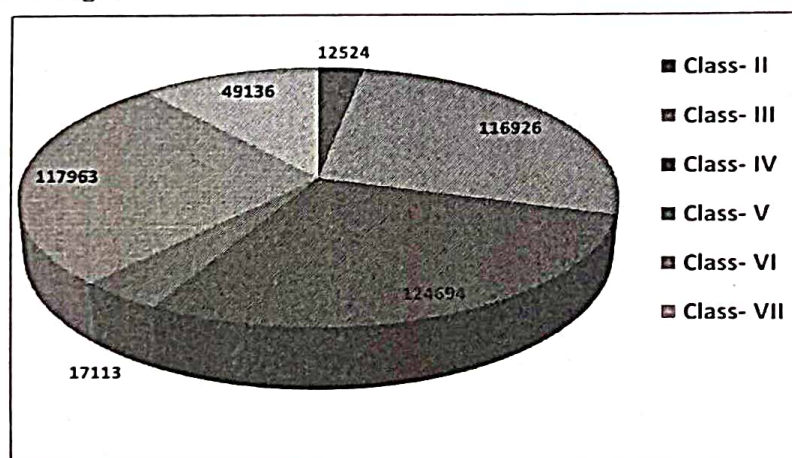
The district's soil is deep loamy along the coast and in the river basin, lateritic on hilltops, salty along the coast, medium in rice farmed areas, and shallow in the forest. Due to seawater flooding, about 30,000 acres of land has become salty and uncultivable. Kharland Research Station is located in Panvel.

Rice Boul was intended to be Raigad. Paddy crops cover around 60-70 percent of cultivable land. Although paddy is planted across the district, Nachani and Vari are grown in the Talukas of Roha, Mahad, and Poladpur. Coconut and arecanut plantations are developed on salty and sandy soils near the sea. In various areas of the district, Ratambi alias Kokam is also planted. Also grown are mangoes, cashews, and jackfruit.

Shriwardhan's arecanut, Alibag's white onion and small gourd, Murud's brinjal, and Korlai's sweet potato are also famous locally. In several places of the district, local wal is taken on leftover soil moisture, which commands a significant price for the farmers. Farmers in the talukas of Roha, Mangaon, and Sudhagad have recently started growing watermelon on a huge scale.

Land Use Capability Classification:

As the soils in the district are deep loamy at sea shore and river basin, lateritic on hill tops major soils in the district are in the class II, IV and VI. There are no class-I soils in the district. The graphic representation of various land classification is shown in fig.1.1 below.



Farmers are keenly aware of technological improvements. Farmers' present use of technology, such as horticulture plantations, hybrid paddy, fisheries, organic farming, and value addition, demonstrates their willingness and openness to ever-changing agricultural trends. Floods, unusually wet weather, and pest and disease outbreaks are all prevalent in the region, diminishing farmer enthusiasm. The district has very little irrigation water accessible due to its geographical position. Farmers' fortunes have deteriorated as a result of ineffective and changeable government policies, as well as a lack of agro-based firms and market locations in the area. In agriculture, it is advocated that farmers promote indigenous technology in order to increase their production and revenue.

Development of Agriculture sector:

Raigad's economy continues to be dominated by the agriculture industry. 1) Seashore regions with deep loamy soils covering B. Uran, Alibag, Murud, Mhasala, and Shrivardhan talukas; 2) Hill top regions with late rite soils covering Karjat, Khalapur, Sudhagad, Eastern part of Mangaon & Mahad, and Poladpur talukas; and 3) Hill top regions with late rite soils covering Karjat, Khalapur, Sudhagad, Eastern part 3) The Kharland region, which includes the eastern half of Uran, Panvel, Pen, and a portion of Alibag. Mhasala, Tala, and Shrivardhan Karjat are the district's most backward talukas, and these areas form the district's core, with modest infrastructural development, including irrigation.

Cereals cover 136800 hectares, pulses 13124 hectares, and oilseeds cover 800 hectares, yielding 344800, 7000, and 400 tonnes of grain, respectively. Mango, which covers 12250 ha, and cashew, which covers 3168 ha and produces 2376.50 tonne and 110.80 tonne respectively, are the two most important commercial crops planted in the district. The 2010 State Agricultural Policy intends to double agricultural productivity in the following ten years.

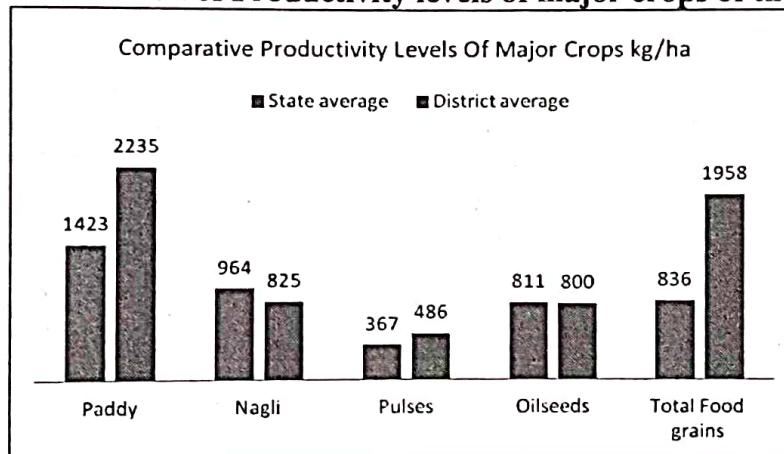
Infrastructure development:

During the cropping season farmers are busy in their agricultural related works hence, it becomes difficult for the farmers to come to the training centres and equip with the recent technologies, so it is proposed to provide a fully loaded audio visual vehicle to the district agricultural training centres or KVK. This will be taken to the village during the late evening/night hours so that farmers can be motivated with recent technologies with this media. Also, it is proposed to provide a well furnished hall for farmers in District Superintending offices. The budget required is around 428.40 lakhs.

Table 1.1 Comparative Productivity levels of major crops of the district(kg per ha)

Sl. No.	Crop	State average	District average
1.	Paddy	1423	2235
2.	Nagli	964	825
3.	Pulses	367	486
4.	Oilseeds	811	800
Total Food grains		836	1958

Figure 1.2 Graphical Presentation of Productivity levels of major crops of the district (kg per ha)



As seen the Table 1.1 and Figure 1.1 the paddy yield levels of the district are higher as compared to the state level average productivity levels. The major varieties that are maintained in cereals, pulses, oilseeds in the district are shown in Table 1.2.

Table 1.2 Crops/Varieties maintained in the district

Sl. No.	Crop	Breeds
1.	Paddy	Jaya, Ratna, Masuri, Suvarna, Indrayani, HMT Sona, Karjat-2, Karjat-3, Gujarat-4, Gujrat-11, Sahyadri Hybrids
2.	Nagli	Dapoli No-1, B-11, HR-374, IE28, Sharada
3.	Pulses	Cowpea- Kokan Sadabahar, Kokan Safed, PusaKomal, Mung- Pusa Vaishakhi, Vaibhav, Phule M-2, Wal- Kokan wal 1 & 2.
4.	Oilseeds	SB-11, TAG-24, Kokan Gaurav, TG 26

The district has very less irrigated area (1.90%) vis-à-vis the state (17%) as seen from the Table 1.3 The fertilizer consumption of the district is far less compared to the state average consumption. In comparison to the state average with respect to The farm size district has relatively lower farm size. The agriculture mechanisation is low in the district due to geographical situation

Table 1.3 State and District Average of Irrigated land, Fertilizer use, agriculture and Farm size.

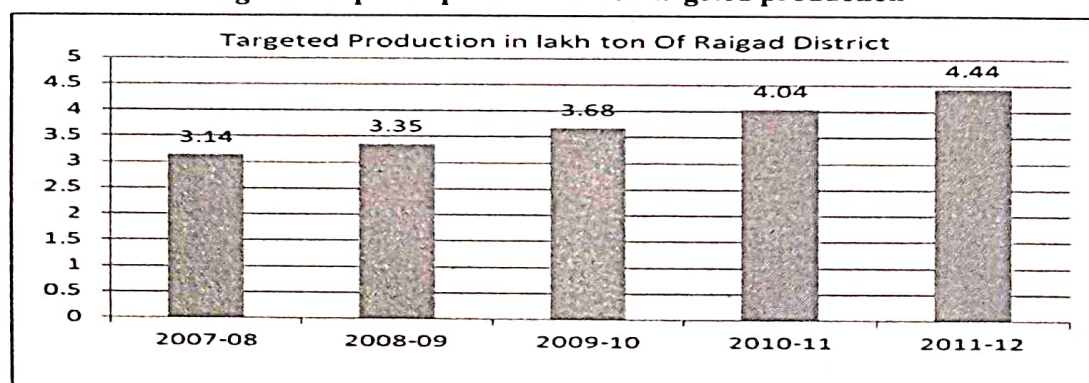
Sl. No.	Parameter	State Average	District Average
1.	Percentage Irrigated land to total District/state area	16.5%	2%
2.	Fertilizer use (in kg per ha): (2006)	94.2 kg/ha	81.9 kg/ha
3	Average farm size (in ha.)	1.87	1.20

The Table 1.4 clearly indicates the yield levels of the majority crops of the district are lower compared to their potential yield; efforts have been to find out the reasons for the yield gaps and technologies to be demonstrated to achieve the targeted productivity.

Table 1.4 Productivity gap analyses in major crops of the district

Crop	Yield gap (q/ha)			Reasons for yield gap	Technology to be demonstrated
	Dist. Avg.	Potential Yield	Farmers Yield		
Paddy	22.3	35.00	30.00	Small land holding, the main constraint in technology adoption	Seed treatment.
Nagali	8.25	15.00	10.00	Neglected cultivation, local varieties, tribal area	Improved varieties, Use of compost manure.
Pulses	4.89	12.00	8.00	No any pest control activities are followed	IPM and use of bio control in oilseeds crops.
Oilseeds	8.00	20.00	15.00	No any pest control activities are followed	Use of bio control in oilseeds crops.

Fig 1.3 Graphical presentation of targeted production



To achieve the agricultural growth rate of 4.5% in the district, targeted productions for the next five years is given in the fig 4.2. The targeted production for the year 2007-08 is 3.14 lakha tonnes, for 2008-09 it is 3.35 lakh tonnes, for 2009-10 it is 3.68 lakh tonnes, for 2010-11, it is 4.04 lakh tonnes and for 2011-12 it is 4.44 lakh tonnes.

Crop wise Constraints and Strategies.

Crops	Constraints	Strategies
Paddy	Small land holding in Konkan region which makes pest control difficult & costly. Paddy cultivation is traditional practice, there is problem of controlled irrigation	Farmers field schools.
Nagali	Mostly Nagli crop is cultivated in tribal area, on fallow land with insufficient availability organic manure.	Use of improved variety Dapoli, use of compost and fertilizer as basal dose, maintaining proper plant population.
Oilseeds	Use of local varieties, lack of plant protection majors, costly seed	Supply of mini kits.
Pulses	Moisture stress, Use of local varieties, lack of plant protection majors, costly seed.	Supply of mini kits.

Input Requirement in Agriculture Sector:

Seeds are important inputs which contribute to the production. The requirement of the certified as well as hybrid seeds as per the seed replacement rate is given in the Table 1.5.

Further, another important input which contributes to the production is the in-organic fertilizers, the requirement of the same nutrient wise is provided in the Table 1.5

Table 1.5 Annual input requirement projections in the district – Fertilizers (in metric tonnes)

Fertilizer	Requirement	Nutrients		
		Nitrogen	Phosphorous	Potash
1	2	3	4	5
Urea	21425	9941	-	-
DAP	1455	262	669	-
SSP	2830	-	453	-
MoP	985	-	-	591
Ammonium Sulphate	400	82	-	-
19:19:19	1360	258	258	258
15:15:15	14475	2171	2171	2171
12:32:16	756	91	242	121
10:26:26	870	87	226	226
23:23:00	220	51	51	-
18:18:18	140	25	25	25
Total	44916	12969	4096	3393

Growth Drivers Agriculture:

Crop production may be boosted by using micro irrigation technology to provide watering during important periods of crop growth. Farmers' rising interest in adopting micro irrigation technology must be addressed swiftly. This will boost agricultural productivity. Agricultural mechanisation is a significant driver in agriculture, since swiftly resolving farm operations under the current labour scarcity scenario is critical to effective farm output. Farm mechanisation is becoming increasingly important for improved crop development.

Agro processing must be promoted aggressively since agriculture is plagued by a slew of issues, including poor productivity, uncompetitive prices, and a lack of post-harvest infrastructure. As a result, farmer income is heavily dependent on crop yield and farm products.

Soil health must be maintained since it is a prerequisite for crop yield. Farmers must be educated on the proper application of fertilisers in accordance with the soil health card. This must be addressed by encouraging organic farming and aiding in the use of organic material on a broad scale, as well as replenishing the soil with micronutrients.

Input Requirement for Horticulture Development:

Since of favourable agro - climatic conditions and soil qualities, the district is well-known for horticultural production. This must be expanded in order to increase export-quality fruit crop output. Because raw materials are readily available, it is critical to promote the processing sector for fruits, particularly mangoes and cashews. The expansion of land under conventional cereal and fruit crop kinds need attention since there is a growing market demand for these crops. Planting horticulture crops at high density and intercropping.

Input Requirement for Sericulture Development:

Though the region is not traditionally associated with sericulture, the environment is conducive to making this a viable agro-based sector.

Input Requirement for Animal Husbandry Development:

The availability of dry feed throughout the year, as well as impending irrigation projects in the region, provide opportunities for animal husbandry activities. KMF and private agencies have well-established milk procurement networks.

Input Requirement for Fisheries Development:

For big fishing, the area comprises around 1,054.8 hectares. In Khopoli, there is one fish culture production centre. For sea fishing, there are 240 kilometres of seacoast spanning 104 communities. The area has registered cooperative societies, and there is a rising need for them. Fish may be used in both urban and rural regions to increase fish marketing.

Input Requirement for Innovative Interventions and schemes Agriculture:

- Seed production incentives for hybrid seed grower's 25 percent subsidy
- Supply of Urea DAP bracket with a 50% subsidy on a 10% area every year
- Supply of improved seed Wal, Gram, and Cowpea with a 50% subsidy on a 10% area per year
- 1 agro-polyclinic mobile van

Input Requirement for Horticulture Development:

- Provision of pheromone traps for the management of the coconut Red Palm Weevil at a 50% subsidy
- Supply of pheromone traps for the control of the coconut Rhinoceros beetle at a 50% subsidy
- Exposure visits/trainings for rural youth in preparation for the construction of Argo – Tourism centres

Input Requirement for Watershed Development:

- Construction of Farm ponds in rice field for protective irrigation.
- Lining of farm ponds

- In suit water and soil conservation through contour bundling, terracing, repair of oldpaddy bounds, continuous contour trenches etc.

Input Requirement for Fisheries Development:

Establishment of a fish seed farm, • Provision of a fishing subsidy Requirement - no mechanised boats, • Nylon Ties, • Development Agency for Fish Farmers (75 percent central Agency), • Tank construction, • Subsidy for input, • Training, • Beneficiaries, • Fishing Craft Mechanization (80 percent Central Assistance), • Mechanic Boats, • Vehicle Preservation, Transportation, and Marketing, • Ice Plant and Cold Storage, • Fishermen's Development Rebate on HsD Oil -Diesel, • Help with the installation of electronic safety devices on mechanised boats., • Development of infrastructure for fish landings, • Construction of Fishing Harbours, • BPL Fishermen in the Western Ghats Development Programme, • Development of BPL Fishermen's Villages.

Input Requirement for Animal Husbandry:

Establishment of Rashtriya Gokul Mission Gokul Grams • Establishment of Mobile Extension • Supply of mini setter and Hatchers with a capacity of 5000 eggs, • Mobile Advertising, • Market Facilitation, • Implementation of a power-driven chaff cutter, • Provision of Veterinary Mobile Units and Diagnostic Laboratories, • Gr. 1 modernization of veterinary dispensaries for online data entry, • RKVY's A.I. Delivery System, • Production of clean milk

- Farmers will receive a 25% subsidy to promote integrated live stalk cultivation., • Fodder seed distribution, • Establishment of a silage production unit, • Production of fodder from barren lands, • Construction of a hydroponics fodder producing unit, • Establishment of an Azolla manufacturing plant, • Establishment of 1000-bird capacity broiler units, • Punyashlok Ahiyadevi Maharashtra's stall fed 40+2 goat unit Mendi va Sheli vikas mahamandal vikas mahamandal vikas mahamandal vikas ma.

Input Requirement for Agricultural Marketing:

- Electronic weighing systems for Market Yards in the District.
- Cold storage, grading, standardisation and packaging facilities.

Result and Discussion:

For overall development of the farming sector, the district plan of Raigad emphasises on varied kind of activities to be taken up by different development departments. The main objective is to achieve the targeted growth rate and increasing the farmer's income.

In agriculture, the goal rate is attained by increasing cereal productivity by 4.0 percent, oilseed and pulse productivity by 10%, and vegetable production area and productivity by 10%. While the horticulture division must focus on expanding the region and implementing high-tech gardening. Sericulture is emerging as a successful agro-based sector in the district. Animal husbandry and agriculture work hand in hand, hence efforts are being made to develop the farming sector in order to incorporate this as an associated industry alongside agriculture. It is also important to practise fisheries whenever feasible. Credit facilities granted to the farming industry to carry out the aforementioned tasks also have a role.

As a result, the most important tasks before Raigad district agriculture are appropriate planning of region specific cropping patterns, proper crop management techniques, solid marketing facilities, good export technology, and its awareness.

Suggestions:

- To change the Mono cropping in paddy agriculture pattern or practises.
- To improve the Irrigation facilities.
- To adequate soil and water management.
- To adequate post-harvest facilities and agro-processing plants.
- To sufficient green fodder, local breeds, and veterinarian assistance.

- To hold labour migration to cities as a result of industrialization and urbanisation.

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Rajarshi Chhatrapati Shahu Maharaj : A Great Social Reformer

Dr. Anita Awati-Salunkhe
Mobile : 9960033567

Rajarshi Chhatrapati Shahu Maharaj, was a great king of his own time and is known as a social reformer more than a king. Shahu Maharaj was crowned as a King of Kolhapur State, on 2nd April, 1894 at the age of 20 years in the presence of Governor Lord Harris. Shahu Maharaj did not just enjoy a Royal family Life, but he had an extraordinary vision to see what was happening in the society or state. He had understood the problems of the grass root level people of his State. He was realized the difficulties of people, poverty, and social discrimination based on caste, religion etc. Hence, he preferred to remove poverty and such other difficulties faced by people in his state through his first order passed. The order was passed and read as " ... our people should be comfort with all the kinds of facilities and welfare. It is wished that our state should have to develop continuously. To fulfill these objectives all the small or big Jahagiridars, well-wishers, Sardars, Inamidars, Laborers, farmers, traders and all others should fully cooperate in the administration. "

By observing the status of education, Shahu Maharaja said that without education it is impossible to become free. Hence, it is necessary for India to provide free and compulsory education for all. He observed that only one caste has got education. And they are the Brahmins, under the Hindu religion. They were dominating the whole society, being the topmost class in the Varna System. Hence the castes other than Brahmins known as Non-Brahmins, lived

in such environment of ignorance, illiteracy, poverty and superstitions which gave them socio, economic and political backwardness.

The Maratha Community also had same thinking that they did not have right of education; which percolated down to the poor class. Hence Marathas, the Shudras and the women class was kept far away from the education. The 'decision' of English education by Lord Macaulay and other, benefited the Brahmins caste. They received basic vernacular education, due to which they had achieved position in the administration system. With the help of English education, Brahmins acquired almost all important administrative positions and dominated over the Indian society.

Mahatma Jyotiba Phule started his social movements in this situation. Mahatma Jyotiba Phule felt that the reason of overall backwardness of various communities is located in the illiteracy and superstition and only 'education' could be the best solution to eradicate the backwardness of society. Shahu Maharaj has followed the footsteps of Mahatma Jyotirao Phule and continued the activities of the Satyashodhak Movement. Being well aware of the exploitation of the non-Brahmin and backward classes, Shahu Maharaj had been associated with Arya Samaj, Satyashodhak Samaj, Prathana Samaj and was continuously attacking the domination Brahmins and eradication of the caste system. In between he realized that this reform movement would not change the status of the Bahujan Samaj immediately. So he decided to give the free education to all. The underprivileged people are not aware about the benefit to them of getting education, so Shahu Maharaj had taken initiative for the compulsion of education. Chhatrapati Shahu Maharaj believed that no any country had made progress without education, so it is essential to give free and compulsory education to the people to decentralize the power. He was the strongly believer of relationship between the education and economic empowerment. He started new schools in the temples,

'Dharmashalas', 'Chavadis' (Village Offices), wherever ready accommodation was available. He made compulsion to give some part of the income of the temple for the school expenditure and maintenance of the school building. This responsibility was given to the village officer.

In 1917 he announced that every parent should send their children to the school. For the providing primary education Chh. Shahu Maharaja had opened a separate division in the revenue department of his state and appointed Prof. Apate as Director. Shahu Maharaj forced the parents to send their children in school, and if they failed to send the children, they will have to pay fine of Rs. 1 to Mamledar for every month. This strategy had received good response and he succeeded in achieving the target of education to all. He charged educational cess on doctors, pleaders, officers, money lenders and Inamdars whose income was more than Rs. 100 to solve the problem of increased expenditure of education.

Chh. Shahu Maharaj has offered scholarships and free ships to the students to attract them towards the education. The scheme of Free and compulsory Education is not only for the specific persons but also it was for all masses. Chh. Shahu issued order that the schools and colleges are open to all castes and communities and the free ships were sanctioned for the boys especially from the lower classes.

After that he focused on women's education. He had taken significant efforts to provide education to the women from the backward classes and announced various scholarships for girl students in Kolhapur State. He was well aware about the backwardness and exploitation of women in the contemporary Indian society. As per the tradition of Hindu religion, women were totally depending on male. That time the backward community girls were hesitating to take education at the schools and colleges. He realized the problem of girls from backward communities and appointed the lady servants belonging to backward communities to ensure lady students. Chh. Shahu Maharaj also has taken lot of efforts to provide English language

education to the girl students. As per the slogan – 'Charity begins at Home' is a perfect example which suits to Shahu Maharaj. He has encouraged his widowed daughter in law Indumati for education. Shahu Maharaj experienced that women are exploited on large scale within the castes and by the higher classes.

Chh. Shahu Maharaj has realized the importance of not only the primary education but also the higher education. In the years 1910-11 and 1911-12 he sent many students for higher education at Bombay (Mumbai), Pune, Madras (Chennai) and other places also. Shahu Maharaj not only focused on the conventional education but also professional education like Medical Science, agricultural education, industrial and technical education also. He understood that without education, equality is not possible and for that education can be used as a weapon. Shahu Maharaj has started 23 Boarding Houses for spreading education and creating awareness among the masses. He urged them, "to learn, to unite and to fight for their rights."

The Laws made by him like, 'Child Marriage Prohibition Act', Inter caste and inter religious marriage and sanctioning of registered marriage. "Widow Remarriage Act", "Prohibition of Harassment/ Cruelty of Women Act", "Devdasi Prohibition Act" are the great contributions of Shahu Maharaj. In that time inter caste and inter religious marriages were not permitted by the society. Those who did such inter caste-religion marriages were punished in the form of out-casting, boycotting, torturing and exploiting. Under these circumstances, Chh. Shahu, took a bold step to remove the caste system and for the social integration. Widow remarriage Act gave a new life to the young widows of those days. The law relating to prohibition of harassment of women was meant to cover all those cruel behaviour and acts committed on women.

In case of divorcee too, the Act took care of the security of women rights, and after divorce, the Act took care of her maintenance. In case of problem relating to children of

the divorced parents, the Act decided regarding, who would take care of the children, their maintenance as also the responsibility of educating the children? Shahu Maharaj made the Devdasi Prohibition Act which was related a tradition of dedicating girls in the name of God, particularly in backward class. Under this tradition; the girl is dedicated in the name of God means that she becomes a child of god breaking all the relations with her natural parents. Chh. Shahu felt that these women would be liberated from cruel traditions and would be able to live free life through the help of this Act.

Conclusion

Chhtrapati Rajshri Shahu Maharaj was a great visionary king and he was a true follower of democracy .He was ambitious for social change through the education. He realized the importance of empowerment of the backward, empowerment of the women and socially disadvantaged people. He realized the concept of free and compulsory education to all in that era. He not only realized problems but also worked on these problems.

The Ideology of Shahu Maharaj is not over, still it has a relevance and need in present day also .All these things give idea why he is a great king of that time and revolutionary social reformer.

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Sane Guruji : A Great Social Worker

Arya Salunkhe

Dr. Anita Awati-Salunkhe

Mobile : 9960033567

Abstract :

Pandurang Sadashiv Sane alias Sane Guruji, is known for his social, political contribution in all over India. He was a great teacher, sensitive author, well known poet, philosopher and full of patriotism. He was greatly influenced by his mother and Mahatma Gandhiji. He started magazines, participated in various social, political movements. He was also a great speaker and journalist. He tried to build the bridge between the states through *Antar Bharati* for National Integration. His moral values are like mile stones for future generations. In this article an attempt is made to highlight his social contribution.

Introduction :

Pandurang Sadashiv Sane (1899-1950), who was also known as Sane Guruji, was born in Palgad, a small village of Dapoli Tehsil, District Ratnagiri of Konkan region in Maharashtra State. His father was a freedom fighter. He was greatly influenced by his mother's guidance from his childhood. He completed his schooling from A.G. High school, Dapoli. He graduated with a degree in Marathi and Sanskrit and achieved Master's degree in Philosophy. He decided to teach in the rural schools and he joined as a teacher in Pratap School of Khandesh Education Society Amalner, District Jalgoan.

Sane Guruji as Teacher :

In 1928, he started the monthly magazine named as Vidyarthi to provide such education, which is not taught in

schools. He wanted to build minds of students through this magazine. He also taught the cultural and moral values in the student community. He expressed his view about the teacher that a true teacher is one who attracts students just like the ants attract towards jaggery.

He was influenced by the ideology of great leaders such as Mahatma Gandhi, Pandit Nehru, Vinoba Bhave. He was also learnt political socialization and Political Maturity from many National Congress leaders, Communists and socialists. In his life he took the path of Gandhiji and started to use clothes made from Khadi. After the Dandi March conducted by Mahatma Gandhi in 1930, he resigned as a teacher and joined the nationalist movement.

Sane Guruji as a Freedom Fighter :

Sane Guruji participated in all the movements in the Gandhian Era as a political leader and thinker. He has created political awareness in politically backward societies of Khandesh. After that majority people participated in 'Shramik Aandolan' due to the inspiration, influence and impact of Sane Guruji's leadership. He was not ambitious to get any political post. He has entered in politics only for the social services which shows his greatness. In this time he got the responsibility of handling the weekly magazine Congress, striving to secure a tax holiday for farmers during famine and popularizing the freedom struggle.

Sane Guruji then joined in Quit Indian Movement- 1942. Mahatma Gandhiji gave the call of 'Do or die' to the people in his speech. He told people to work for freedom and be ready for sacrifice. The day of satyagraha was not fixed and there was no time to take proper decision. After passing of the Quit India resolution, the British government arrested most of the prominent leaders like Mahatma Gandhi, Vallabhbhai Patel, Maulana Azad, and Jawaharlal Nehru on 9th August 1942 early in the morning.

Sane Guruji took the responsibility of freedom movement and joined the underground movement against British Government since 9th August 1942 to October 1945.

He carried the activities like printing secret bulletins, running radio stations, cutting off telephone lines etc. This movement was even reached in small villages like Anturli (Edllabad), Amalner, Nanded, Gadkhamb, Dangari, Jalgaon, Savada, Faizpur, Raver, Parola, Chalisgaon, Waghali and other villages by Sane Guruji. Sane Guruji arrived in eastern Khandesh. As a result hundreds of common people and students joined in Quit Movement. Hence Jalgaon District Magistrate ordered as per police act 45 and prohibited Sane Guruji, not to live in Khandesh for the next two years. So that Sane Guruji decided to work as living underground. Then he went to a center of freedom fighters called Mahanubhav Ashram in east Khandesh and along with other leaders he guided the local people and freedom fighters how to face British Government and participate directly or support indirectly the volunteers in Quit India Movement. All his movements and struggles have received positive response by people. Sane Guruji's main objective was to bring social changes. He was very keen determinant about his way of life, so he never accepted any political benefits or grabbed opportunities for himself. Due to his moral impression thousands of his students, young people, women, social workers, reformers, peasants and common people joined to Indian Freedom Movement. Sane Guruji and some other members of Socialist Party established Rashtra Seva Dal to serve the nation through Quit India Movement. Many branches of Rashtra Seva Dal were founded all over the Maharashtra. During the period of 1930 to 1947, Sane Guruji participated in different agitations and was arrested on eight occasions and was imprisoned in the different jails at Dhule, Trichinopoly, Nask, Yeravada, and Jalgaon for a total duration of six years and seven months. He has also kept fast on seven different occasions. When Sane Guruji was imprisoned second time in the Trichnapalli jail, he learned Tamil and Bengali. He recognized the importance of learning Indian languages; particularly in the context of the problem of national integration. He translated the famous

work *Kurul* by Thiruvalluvar into Marathi.

Sane Guruji as a Social worker :

Sane Guruji participated in the campaigning for removing untouchability and travelled for nearly four months throughout Maharashtra. During this campaign he visited to Vitthal temple of Pandharpur and tried to open the temple for untouchables. He kept fast for 11 days and finally succeeded to open the temple. This attempt by Sane Guruji was for the social justice and equality for untouchables. He has also tried to solve the problem of workers.

After independence, he started Antar Bharati (Intra-Indian) movement in various States. This movement encouraged people to learn the culture and language of other States for national integration. He was strongly supported to exchange the Cultural elements i.e. arts, literature, cultural communication rather than the political and economical elements.

In 1948 he started the weekly magazine *Sadhana*. Sane Guruji played dominant role to design the principles and philosophy of *Rashtra Seva Dal*. The leaders and youths were influenced by socialistic philosophy of Sane Guruji. He has spread organization power, patriotism, social service, and labour dignity among the youths of the country.

Sane Guruji as an Author :

As like a great social reformer Sane Guruji was also a well-known writer. Guruji has written around 135 books and out of them 73 books have been published. Guruji's most of the books are related to children's literature. His most famous book in Marathi literature include *Shyamachi Aai* (श्यामची आई ; *Shyam's Mother*), which is translated in almost all the Indian languages as well as in Japanese and English also. Other famous books are *Bhartiya Sanskriti* (भारतीय संस्कृती : *Indian Culture*), *Stree Jeevan* and *Patri-the collection of various songs and poem*. One of his books '*Teen Muley*' is a heart touching story of three kids and is considered as one of the best books written in Marathi. Sane Guruji's literature has brought Social change

and values among the youths. His writing and books are the role models for youths in this country so after his death and number of editions of his books are published. Sane Guruji developed the tradition of journalism in Khadesh. His articles and writings were fully focused on humanity, nationalism, awareness, patriotism, public education, Renaissance, entertainment, empowerment action and motivation. Sane Guruji's most of programmes were for creating individual and national character building.

Conclusion :

Sane Guruji was known for his multi-dynamic personality. He was not a great philosopher but his philosophy of life will help to future generations for learning moral values. The Emotionality and humanity was the base of his philosophy. He was a famous politician. But he set an example by sacrificing lot of political benefits, opportunities and positions. This is a lesson for all the younger generations who are entering in politics mostly for political benefits. He worked for nation, society throughout his life. We will remember him as an Author, Teacher, Social Activist and Freedom Fighter and full of patriotism. In India, there are hundreds of national leaders, but Sane Guruji's moral, humanistic and emotional attitude makes him different from the others.

At last we can say that, the personality like Sane Guruji could be inspiration for thousands of youth in the field of social work, so the study of Sane Guruji's character should be included not only in schools syllabus but in college and universities also.

stakeholders including labours and customers. As per his view, owner and servant approach creates conflicts of interest; servants should be equally treated as co-partners. Mahatma Gandhi was not only activist; he has known for his ideologies which are accepted as true mankind approaches. Beyond to his political, social life Mahatma Gandhi has contributed to enrich management philosophy. His ideologies are more practical and represent conservation of human rights and professional ethics. Management as key person has to work for stakeholders with main intention of wellbeing of the society. Gandhi has appealed various mill operators of Ahmadabad & Mumbai to treat their labours as co-partner rather than paid servant. His management philosophy reflects various core approaches such as...

Economic and Social Equality :

Mahatma Gandhi has insisted a proper harmony between law of nature & economic laws; he has insisted; efforts to maintain proper harmony between these laws. Economic laws are region centric and mainly deal with material progress while laws of nature are universal. He had given more stress on decentralization of the economy and as a result has encouraged cottage industries & empowerment of agriculture. His desire was that every Indian village may be developed as a little self-sufficient republic. Instead of centric wealth maximization; he has given more weightage to wide distribution of the wealth for the cause of social empowerment. He has mentioned; that everyone has equal right to maintain better living; therefore he has highly demanded minimum wage code. Gandhi had a view that the economy should not be regulated by money; it plays insignificant role and becomes a mere instrument of exploitation of poor by the rich; therefore commodities should be exchanged against commodities.

Trusteeship approach :

Mahatma Gandhi was the follower of *Bhagwat Gita* in

his whole life. His trusteeship approach represents *aparigraha* i.e. non-possession; it is the out come of his believes. According to his views, management, board of directors should not treat them as owner. They are the mere trustee & have to act as caretaker of the business. Property of the business is the contribution of its stakeholders. Public money is being invested in the company and that should not be utilised to empower few people. According to him, the principle of trusteeship is bilateral. It is completely mutual affair of capital and labour; that determines that both are trustee. As trustee they are bound to the society. This was an attempt to build up a great structure of equality based on industrialism.

Minimum Resources Approach :

Gandhiji was very much conscious about the environmental issues and material resources including effective uses of manpower. The *Gandhian* perception of 'simple living', also attempt to put a check on consumption and mending exploitation of natural resources. He believed nature can fulfill our needs but not greed; therefore he was aware of conserving natural resources. He knew importance of producing good results even from limited resources. He believed that a greedy individual and modern technologies' exploitative nature will be the root cause for the destruction of natural resources. He admitted importance of law of nature and suggested natural processing at maximum for the recycling. Local raw materials should be processed locally with local mechanism. He was highly appreciated importance of labour as importance resource for the organization and propounded that, a good leader should recruit his team, not on the basis of who they are but on what result they can produce. He has also expressed; resource management should be the process of maximum output from minimum input including available local resources. Therefore he has promoted *khadi* and handloom industries as cottage industry.

Service approach : Service progress is being measured in terms of Corporate progress. *Gandhian* philosophy thinks differently; economic growth is a quantitative method and it does not assess the level of satisfaction. Businesses are the part of society and have to be works as services provider to fulfill needs & wants of the society. Organisations that adopt short cuts and works only with the intention of profit are evils for the society. According to Gandhi's view, business should not be market centric; human values should not be violated at any cost. Instead of targeting markets; needs of the society should be considered as primary object of the business. Income should be earned to meet the expenditures and not to maximize wealth. This philosophy governs humanity approach; which was the fundamental principal of Gandhi's believes.

Inclusiveness : According to Gandhi's ideology, success of a company or success of an individual dose not reflect the development till the resources are not mobilized including human, natural, technological and entrepreneurial to produce goods and services according to need of society and for the all members of the society i.e. 'Sarvodaya'. Gandhi was true insignia of Indian culture, which has always believed in promoting peace, co-operation among its people and among people of different nations of the world. According to him humanity is the beyond to colour, race, caste & religion as well as gender. Management should be more democratic in its functioning; policies should be inclusive and based on equality from top to bottom. *Gandhiji's* fight for freedom was the strong step against colonial rule for their divisiveness approach. Similarly his battle was continued against cast conflicts leaded by upper cast Indian.

Decentralisation : Gandhi had a democratic approach, which was different

than the so called formal western democracy. In reality very few could enjoy the benefit of political power under formal democracy. He advocated democracy as part of life by offering respect, power and authority of decision making. Employees should not be treated as only followers; but should be part of decision making. He has also opposed single unit based large scale production by big machines; production should be decentralised and therefore he has recommended cottage industries & cottage based machineries. As per his view decentralisation brings variety & innovations. Gandhi has also propounded political, social & resources decentralisation; and demanded more freedom to village *panchayat* as local managing authority and not to be ruled totally by the State. He was against the process of mass production and supported production by masses.

Business Ethics i.e. Honesty : Profit should not be sale outcome; it should be resulted through consumers' satisfaction. *Gandhiji* has always believed; a business could & should be conducted with complete honesty. He & his has family was associated with business and he personally attempted honesty as the best policy in business and his life. He accepted business as economic active and profit is one of the important motives for an operator; but he has no moral right to earn more money by the way of consumers and labours exploitation. According to Gandhi excess income should be returned to the society by the way of services. In the present scenario Gandhi's thoughts are more worthwhile; corporates are spending more on marketing, and advertising at the cost of consumer; charges additionally under different headings, it creates adverse impact on pricing.

Conclusion : In the age of globalisation and technology; business sector has developed as an instrument of empowerment. Developed countries are become dominant not only on the basis of their muscle strength; but they have maximum

industrial control. Whole world has divided on the basis of economic classes; it reflects lack of inclusiveness. Human values are being violated and economic exploitation, price war are become a matter of strategy. In such scenario Gandhi's management philosophy has become worthwhile to ensure peace, non-violence & *sarvodaya* i.e. universal development. So far, above mentioned principles can works as directive to bring Gandhi's philosophy in practice.

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17. Potential Horticultural Crops for the Regional Development in Ratnagiri District

Mr. Rajesh S. Kamble

Research Scholar, Dr. B. A. M. University Aurangabad (MS)

Dr. C. R. Salunkhe

Head, Department of Commerce, I.C.S. College of Arts, Commerce & Science, Khed, Ratnagiri.

Abstract

The economy of Ratnagiri district is mainly dependent on agriculture. The main crops are Paddy, Mango, Cashew nut, and Coconut which account for 78% of the total crop area in the district. Horticulture is also the main source of income in the district. e.g. Mango, Cashew Nut, Coconut, Kokum, Jackfruit and Coir etc. Soil and climatic conditions of the district are very suitable for horticulture crops. The world famous Alfonso mango has been grown in Konkan from many generations. And it is backbone of the district's horticultural economy. Later, improved cashew varieties developed by agricultural universities will also find a place in the economy.

These potential horticulture crops can contribute to the regional development of the district. Based on the secondary information and consultation with the major stakeholders in the district, these horticulture crops can give additional impetus to the economic growth of the entire district. In this study an attempt has been made to SWAT analysis related with above potential horticulture crops. It also discusses the challenges and opportunity of Cashew Nut and Alphonso Mango.

Key Words: Horticulture crops, Regional Development, SWAT analysis.

Introduction

The economy of Ratnagiri district is mainly dependent on agriculture. More than 50 per cent people are involved in agriculture. Agriculture is dependent on monsoon rain, so kharif is a major activity in the district. Horticulture is also the main source of income in the district. E.g. Mango, Cashew, Coconut, Kokum, jackfruit etc. The main crops are Paddy, Mango, Cashew nut, and Coconut which account for 78% of the total crop area in the district. The soil and climatic conditions of the district are very suitable for cultivation of cashew, mango. The world famous Alfonso mango has been grown in Konkan for many generations. And it is the backbone of the district's horticultural economy. Later, improved cashew varieties developed by agricultural

universities will also find a place in the economy. Recently cashew is produced and processed by the local community and sold in distant markets. The livelihood of the region is dependent on the mango and cashew based economy and is subsidized by the government.

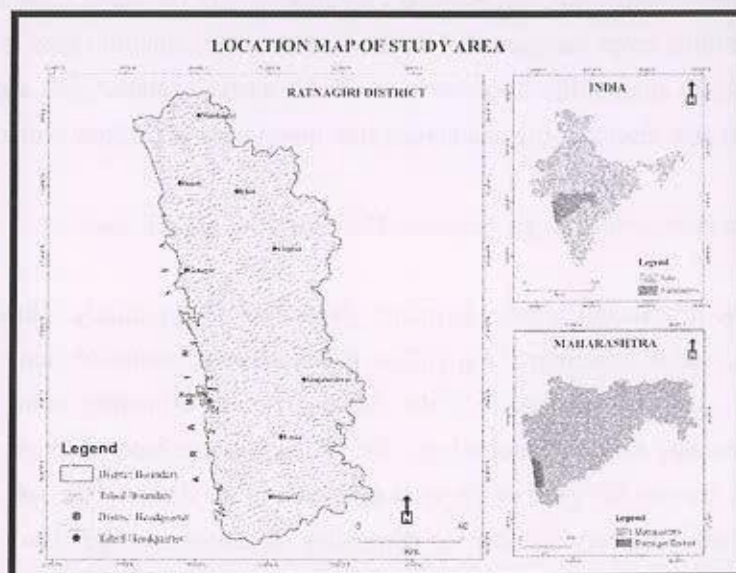
Objective

The present study has been undertaken with the subsequent specific objectives.

1. To assess the potential horticulture crops for regional development in the Ratnagiri district.
2. To understand the challenges and opportunity of Cashew Nut and Alphonso Mango.
3. SWAT analysis of potential horticulture crops.
4. To suggest recommendations for their improvement in the study region.

Study Area

Ratnagiri district is located in the Konkan region of Maharashtra. Ratnagiri district lies between $15^{\circ} 36'$ north to $18^{\circ} 5'$ north latitude and between $73^{\circ} 5'$ east to $74^{\circ} 36'$ east longitude. It is located in Konkan region and Mumbai administrative area. The total area of Ratnagiri district is 8208 sq.km. The Arabian Sea is to the west of the district while to the east is a Satara, Sangali and Kolhapur district, in the south lies Sindhudurg and to the north Raigad district is located. In the eastern part of Sahyadri mountain ranges are present which about 180 km is and it possesses coastline of about 167 km. There are nine tehsils places in Ratnagiri district, such as Chiplun, Khed, Sangmeshwar, Dapoli, Mandangad, Guhagar, Rajapur and Lanja.



Source: Prepare by researcher

Data Base and Methodology

The main research work is based on primary and secondary sources of data. The secondary data for Ratnagiri district collected from the district census handbook, district statistical abstract, statistics from governments, gazetteers, Socio- Economic abstract, and internet.

The Primary data is collected by the fieldwork with the help of different sources for which special interviews were conducted of various official persons and stakeholders. The present field work /survey was undertaken with the aim of assessing the role of potential horticulture crops (Alphonso mango, Cashew nut) for the development of the study region, generation of employment opportunities and can stop outmigration from the region. In this study an attempt has been made to SWAT analysis related with above potential horticulture crops.

So the information collected through the field work, personal interviews were also conducted, which enabled me a lot in obtaining considerable conclusions pertaining to this research work. The researcher proposes to examine the available data were processed and presented by various statistical and cartographic techniques such as maps and graphs are used. GIS software (ArcGIS (10.3), QGIS (3.16) used for map creation.

Crop wise details in Ratnagiri district (2012-13)

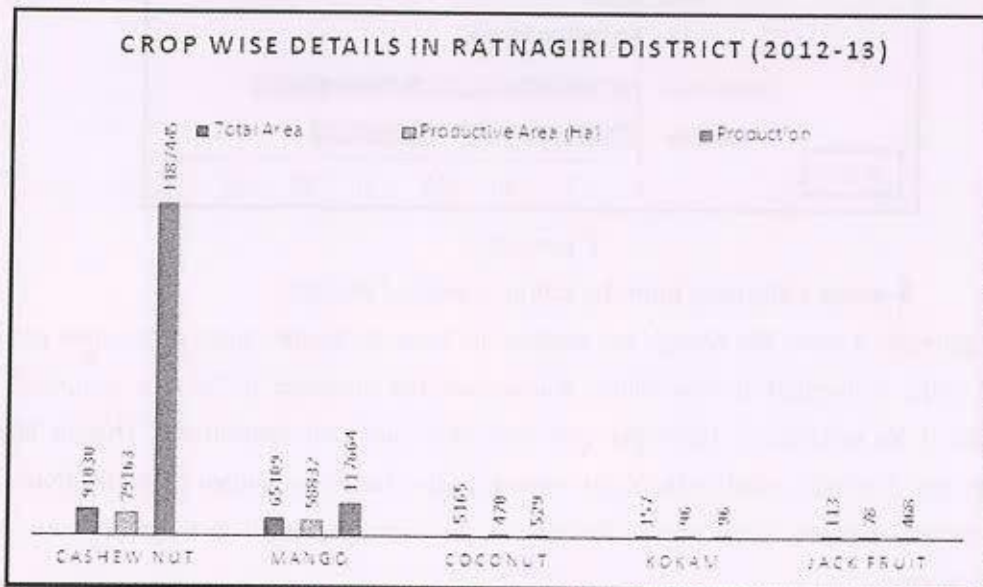


Figure no. 1

Source: Comprehensive District Agriculture Plan 2012-13

Percentage share of main crops with respect to area under crops in Ratnagiri District

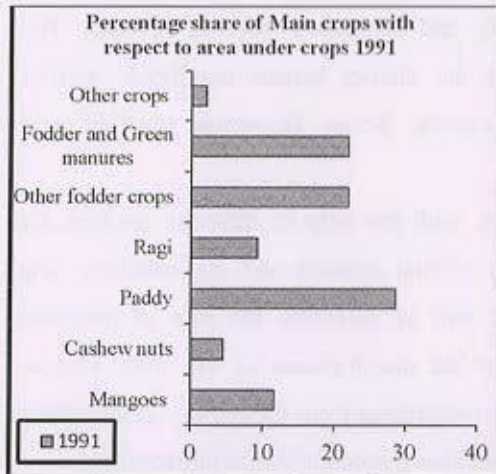


Figure no. 2

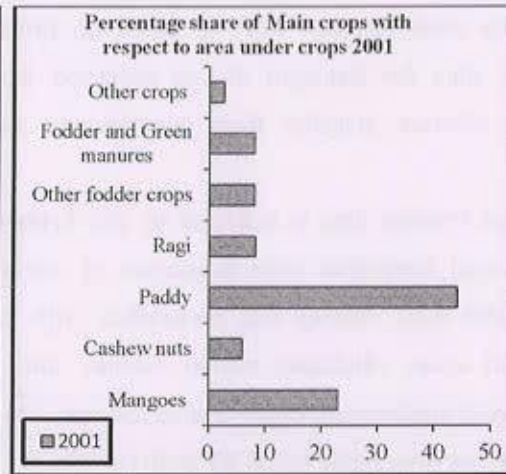


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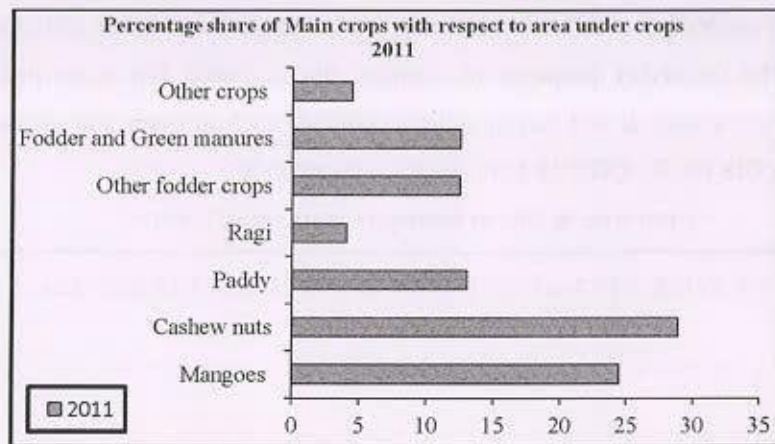


Figure no. 4

Source: Calculated from Agriculture Census-1991-2011

Figure no. 4 show that Mango and cashew nut have the highest share of all other crops. The area under cultivation of both mango and cashew has increased in 2011 as compared to 1991. This is an increase of 12.94 per cent and 24.46 per cent respectively. Due to latest machinery and fertilizers used in the study region, people have also shifted to horticulture for better financial strength. Some paddy fields have also been converted in to cashew nut and mango plantation.

Cashew Nuts

Cashew trees generally grow in hot humid regions. Therefore, cashew nuts are generally grown in the equatorial and coastal countries. In 2015-16, 10.34 lakh hectares of land was under cashew cultivation in India and about 6.70 lakh tonnes was produced. During 2015-16, Maharashtra had the highest production of cashew crop, followed by Andhra Pradesh and Odisha at 95,500 and 80,500 tonnes respectively. The total area under cashew cultivation in Maharashtra is 1.60 lakh hectares. More than 80 per cent (1.30 lakh tonnes) of the area under cultivation is in the South Konkan (Ratnagiri and Sindhudurg district) region of Maharashtra.

(SWOT Analysis)

An analysis of the strengths, weaknesses, opportunities and threats to the development of cashew nuts cultivation and processing in Ratnagiri district

Strengths

1. Temperature, soil, rainfall and humidity are available for cashew cultivation in the district.
2. The area under cultivation in the district is naturally organic. So the quality of cashew is maintained.
3. Nearby is a fruit research center (Vengurla, Sindhudurg) which produces new and different varieties of cashews.

Opportunities

1. If cold storages and other facilities are improved, there is an opportunity to increase processing centers in the district.
2. All types of cashew trees can be produced using different methods.
3. Cashew apples can be widely used for liquor industry.
4. Co-operative farming / contract farming can be done.

Weaknesses

1. Most of the cashew producers are small and unorganized. Fragmented land and land law suits are barriers to cashew production.
2. There is a lack of research and development in cashew apple integration.
3. There are no direct export facilities for cashew production at district level.
4. Lack of infrastructure for storage and marketing
5. Lack of transportation in small villages

Threats

1. Import of cheap cashew nuts from other countries is a problem for local cashew production.
2. There is a shortage of cheap labour in cashew cultivation and cashew processing.
3. Due to changing climate, there is a possibility of pest infestation on cashew nuts and production may decrease.
4. Subsidy-driven cashew promotion may result in loss of forest and biodiversity since forest are on private lands.

An analysis of the strengths, weaknesses, opportunities and threats to the development of Alphonso mango cultivation and processing in Ratnagiri district

Strengths

1. There are some mango processing units in the district. Many mango products are distributed all over India and also exported to the European and other countries.
2. Ratnagiri Alphonso Mango has different qualities due to morphological, physiochemical and genetic level.
3. Alphonso Mango has got the certificate of specific geographical origin and has got GI tag. So Alphonso Mango has a different quality and reputation.

Opportunities

1. GI tag can increase tourism in the region.
2. Potential export is possible if safety and quality standards are followed.

Weaknesses

1. Farmer and consumers do not know about GI.
2. Lack of organized system for production and marketing.
3. Manufacturers have to bear market based losses due to price manipulation by suppliers.
4. Lack of general storage facilities.
5. There is a lack of improvement in inputs like pesticides.

Threats

1. Subsidy-led growth in cultivation and insecurity due to climate change cause productivity fluctuations and deforestation.
2. Due to changing climate, there is a possibility of pest infestation on mango and production may decrease.
3. Large scale planting of mango trees can reduce forest cover.

Source: Find out by researcher

Challenges and Potential of Cashew Nuts

1. Most of the cashew producers in Ratnagiri district are small producers and they are unorganized.
2. Many small cashew processing companies have benefited from the government subsidy for cashew production. But, they did not have the necessary investment or knowledge.
3. Although the area under cashew has increased for some time, the market has changed due to low quality and poor processing.
4. The farmers in the district have to face common problems like non-availability of labor on time, high wages and pest and disease problems.
5. Cashew cultivation directly and indirectly provides employment to more than 5 lakh people especially in rural areas of Ratnagiri district.
6. Raw nuts, cashew kernel and cashew shell liquid are the three main cashew products while the cashew apple is generally processed and consumed locally in Ratnagiri district.

Challenges and opportunities for Alphonso mango cultivation and producers

Alphonso Mango is the identity of Konkan. The main component of the Konkan economy. Alphonso Mango is cultivated on 4 lakh acres in Konkan. Hapoos has a turnover of around Rs 3,000 crore. The livelihood of a few lakh farmers and their labours depends on this economy. Mango, the national fruit of the country, has an important place in our culture. Maharashtra is at the forefront of mango cultivation in our country. Hapoos and saffron mangoes from Maharashtra are tasted all over the world. Both Hapoos and Saffron varieties have got Geographical Index (GI) rating. Ratnagiri and Sindhudurg districts (Devgad Hapoos) have large number of Hapoos cultivators. Raigad, Palghar and Thane districts also have good mango production. Although Hapoos is a special identity of Konkan, Mango varieties like Raiwal, Rajapuri, Totapuri, Ratna, Sindhu, Payari, and Goa Mankur are also cultivated in Konkan.

1. Due to unseasonal rain, heat, more or less cold, climate change, increasing pest attacks, and excessive use of fungicides, mango farmers in Konkan in particular have been suffering from these problems for the last eight to ten years. so, production is declining sharply. In 2012, 3.4 lakh tonnes of mangoes reached the market, while in 2017 it was only 15,602 tonnes.
2. Rising temperature, humidity, pesticide attack and use of chemical fungicides have disrupted the flowering and fruit-setting cycles. So, it is affecting production.
3. Mango producers in Konkan are facing stiff competition in recent times, as mangoes in Karnataka are similar in appearance to Alphonso mangoes. But its taste is very different. In big markets like Mumbai and Pune, mangoes from Karnataka are called as

Ratnagiri or Sindhudurg (Devgad) Alphonso mangoes. It is sold by such fraud. So the problem has increased.

4. It is necessary to set up a large number of mango processing units in the district. This can improve its benefits and capabilities.
5. Mango producers in Konkan are always in trouble with middleman and traders. The trader's business should be in the hands of the farmers.

Conclusion

The study has shown that Cashew cultivation provides direct and indirect employment to more than 5 lakh people in rural areas of Ratnagiri district. Mango and cashew are the two major horticulture cash crops in the district. The area under cultivation of both mango and cashew has increased in 2011 as compared to 1991. This is an increase of 12.9 percent and 24.4 per cent respectively.

An analysis of secondary information and field visits reveals that mango and cashew are the two major cash crops in the district. There is a need to create a good marketing system for these cash crops along with market committees and other marketing channels. Farmers should be trained to produce good quality raw materials.

Recommendations for promotion and improvement of Cashew nuts and Alphonso mango cultivation in Ratnagiri district

1. Awareness programs are required for improved methods of production and processing of cashew nuts.
2. The 'contract farming' method can be tested for small and unorganized cashew producers in the district.
3. To promote cluster based cashew production and processing. This will benefit producers, laborers as well as processing and marketing.
4. Demand for 'Cashew Export Promotion Council of India' branch in Ratnagiri district.
5. It takes a lot of effort to process cashew apples.
6. Port development is required for easy export directly from the district.
7. To use modern techniques and new equipment for cashew cultivation.
8. To set up a separate nursery for organic cashew this can fetch good price in the international market.
9. Creating awareness among the farmers about GI Tag so that they understand the rights and opportunities available regarding GI Tag.
10. To implement awareness program for production and professionalized marketing among mango growers.
11. To try arrange leading and successful mango entrepreneurs to share success stories and techniques.

12. Special buses with built-in classrooms will be used to provide door-to-door training on UHDP techniques in mango cultivation to double the mango production and improve the living standards of the farmers. A similar project is underway in three Southern Indian states (Andhra Pradesh, Tamil Nadu and Karnataka).
13. Existing pesticides are regimen to pests, so there is a demand to develop methods for improved pest management.
14. Banks should create proper guidance to farmers for investment wisely and manage their finances properly.
15. Mango producers to come together and form groups to capture domestic and foreign markets. All marketing problems can be solved through these groups.
16. To connect every farmer with 'Mangonet' system and get its benefits.

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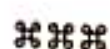
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18

An Analysis of Impact of Covid-19 pandemic on Education System with special reference to higher education in India

Mahadeo Keshav Kelkar
Department of Accountancy,
I.C.S.College, Khed, Ratnagiri

Abstract: -

A COVID-19 pandemic which was started in the month November 2019 in Wuhan city of China has reached almost every corner of the world. It has severally affected almost every sector of the economy and created a big challenge before them. The sector like aviation, tourism, education are the sectors which were worst affected by this pandemic situation. Especially taking about the education sector, this situation enforced the present education system to bring drastic changes in it and forced to shift towards online education system. The use of modern technology in the education sectors becomes the necessity. The whole process of teaching-learning-evaluation has undergone a drastic change. This leads creation of various challenges as well as opportunities for the education system. This present paper tries to focus not only on the different challenges faced by the education sectors but how this sector has accepted this challenge and created different opportunities to cope up the situation

Keywords: -Covid 19,Vaccination drive, Impact of Covid-19 on higher education, Role of Modern Technology in teaching and learning and evaluation.

Introduction: -

COVID-19 pandemic is proving to be the

most destructive natural calamity ever experienced by the mankind. This pandemic has adversely affected almost every nation over the globe over past two years. Millions of lives very affected all over the world causing to approximately 49,18,70,635 infection and approx. 61,76,628 death till 4th April 4, 2022. As far as India is concern 4,30,29,004 were total infection to the date while total death toll rose to 5,21,385.

Almost every sector of the economy was seriously affected by this situation and rate of unemployment was reached to the mark of 8% in Dec 2021. More than 01 cr. Indians becomes jobless. The sectors like education, tourism, transportation, aviation etc were considerably affected. The GDP was dropped down to 7.3% in 20-21 but it is revived and expected to be just below 10%.

As far as education sector is concern all education institution were forced down to shut their offline activities from march 2020 and were shifted towards the online mode. This has leads to various problems on part of faculty as well as learners. Due to lack of infrastructure or poor infrastructure, issue of poor internet connectivity in the remote area of the country it becomes difficult to conduct the online classes as well as to conduct the assessment of the students as well. Off course due to the pain taking efforts from the teachers community in form of technological adaption and use of various platforms by them like Youtube, Zoom, Teach-mint, whatsapp, Google Meet etc definitely helped them to reach their students by one way or another.

Significance of the study:-

This study puts an emphasis on how the Pandemic situation severally affected the higher education system in India in terms of quality education and how the internet technology played a significant role in filling this huge gap between the two ends i.e. teacher and student. This Study also tries to discuss the role of In-

dian government during the pandemic period. This study also tries to highlight the various problem or challenges that may arises during the post pandemic period.

Research Methodology:-

The present study in this research paper is mainly based upon the discussion with peer faculty members in education field as well as the published data in different form including Research papers, Research articles, News Papers at local as well as national levels, Websites etc.

Objective of the study:-

To study the impact of COVID-19 pandemic on higher education system.

To study the role of internet technology in the teaching-learning process especially during the pandemic period.

To study the role of Government of India during COVID-19 pandemic in respect of higher education.

To study challenges in the higher education post pandemic period.

Findings:-

Impact of COVID pandemic on higher education system:-

The impact of COVID crisis on higher education is unprecedented. From March 2020 all the educational institutions were forced to stop its offline sessions and were forced to shift towards online mode. Though the developed countries were having well infrastructure, the developing country like India was not at all ready to adopt this sudden change because of the lack of infrastructure facilities in the interior and the remote area of the country. Improper and insufficient infrastructure facilities created problem for the teaching as well as students community.

The practical session could not be held due this sudden shifts.

Not only the teaching and practical part of education was totally collapsed but the assessment part has also become the new problems for the universities and colleges.

Due to COVID crises there is another problem emerges that is reducing admission of the students because of the economic issues and delayed examinations.

Role of internet technology in the teaching-learning process during the Pandemic period:-

The emergence of pandemic situation all over the world had put restriction on the mobility of the people and created various challenges to almost every section of the society and every sector of the economy including the higher educational sector. The Traditional offline education system was totally collapsed not only in our country but across the world as well. The Offline education mode was suddenly stopped and shifted towards online education. Here the actual role of internet technology started. Though the faculty and students were very much familiar to the internet technology through Whatsapp, Facebook, Twitter, Instagram, Linked-in but the role of internet technology was slightly different here as these applicable were traditionally restricted in its use but now along with these apps the apps like Zoom, Google Meet, Teachmint, were the mainly used platforms for imparting the Online sessions.

Government of India Initiative during COVID phase and Higher education:-

Government of India was very much keen and taking cautious step in fighting with the pandemic situation right from the beginning of this pandemic in the month of January 2020, various restrictions were put on by the Government of India for controlling the spreading of this infectious disease including announcing of the phase-wise lockdown, announcing of contentment zone where the number of COVID patients was high, Closing down pilgrimage centers, banning/putting restriction on the international travel to prevent the entry of the virus over the national boundaries, banning/putting restriction on social, political, religious, cultural event, encouraging work from home for the people wherever possible. Launching of ArogyaSetu App for con-

tact tracing and connecting them regarding the COVID related health services etc and so on ...

Since the higher educational institutions were fully closed from 16th March 2020 to prevent the spread of infection in the initial days. The Government of India through Ministry of Education and University Grant Commission(UGC) had taken various steps & decisions to ensure the continuity of education during this pandemic period which includes:-

Issue of directives/guidelines in respect of imparting the education through online mode.

Encouraging the use of SWAYAM platform, National Digital Library, SWAYAM PRABHA etc to make available various additional learning resources to the faculty as well as to the students.

Revising of Academic calendar and Conduct of UG, PG exams through online mode. Various Faculty Induction Programs, Faculty Development Programs, Refresher Courses etc were also allowed through online mode through the HRDC's all over the country.

Challenges before higher education post pandemic period:-

Presently according to the Government sources the vaccination drive have crossed the total of 185 cr in India and because of it the corona cases are also started decreasing day by day and the daily cases in India it has come down to 1260 on 2nd April 2, 2022 and registered a highest recovery rate of 98.76% Which is a very good sign for almost all sectors including the Higher education institutions. In many states the restrictions were also lifted and all activities were allowed to conduct with full strength. Now the big challenge is that, once again shifting of online mode of education to towards offline mode. Various mental issues and social issues required to be tackled before normalizing the activities and making the teaching and learning impactful.

This requires arrangement of some Sessions by psychological experts, Yoga sessions

not only for the student's community but for the teaching community as well who have suffered a lot during the pandemic period. This will really help them to get mentally stabilize and they can focus and concentrate on future activities.

Universities, Academicians should design the content of the syllabus in such a way so that there will be proper blending of theory and practical based approach which requires industry-academia collaboration which will lead to reduce the gap between current education system and employment generation.

Conclusion -

Right to education is a fundamental right of every citizen of India but due to online mode of teaching it has separated the students in two classes, the one who are accessible to education due to availability of internet and another facilities and the other one's who are beyond the internet access as well as having insufficient infrastructure facilities. Though the use of internet technology in teaching learning and evaluation process is need of modern times but due to the lack of infrastructure facilities in interior parts of the country it cannot fully replace the traditional way of teaching.

However due to this dark COVID experience the Government, Universities and colleges are now well aware of the importance of building of infrastructure facilities even in the remote area of the country so that no student remain deprived due to lack of infrastructure facilities. Government also should increase the expenditure on education which is still just 3% of the GDP of India and which is very less compared to the developed countries, actually expert suggests that it must at least 6% of GDP. This require rethinking, reframing and rebuilding of the whole educational infrastructure throughout the nation for bringing the shift and coming back to the new normal conditions.

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7. Green Marketing: An Initiative by Indian Automobile Sector towards Sustainable Development

Mahadeo Keshav Kelkar

Department of Accountancy, I.C.S. College, Khed (Ratnagiri).

Abstract

Green Marketing is relatively newer concept but fast growing in today's fast changing business environment. Green marketing refers to marketing of those products or services which are environment friendly and ensures sustainable development. Green product is either produced by taking care of biodiversity or its uses may be environmentally safe i.e. creating less harm to environment or creating minimum amount of waste. Green Marketing involves wide range of activities and includes activities like designing or redesigning the product, making modification in the existing product, using environment friendly process and even promoting the product in creative but nature friendly manner. The present study is an attempt to review the green marketing practices by selected top five automobile companies in India. In this study the concept of Green Marketing & Sustainable development, need for green marketing, Green Marketing Practices of Selected Indian Auto Companies, Government initiatives, Problems of Green Marketing are broadly discussed. Secondary sources are used to meet the data required for the study.

Keywords: - Green Marketing, Eco friendly product, Sustainable Development, Automobile Sector, Bio-diversity.

Introduction

Green Marketing is not a new concept to developing country like India as well as to the whole world. This concept was introduced in the late 80's and early 90's. Green Marketing concept was discussed in a seminar in the year 1975 organized by American Marketing Association. Green Marketing also recognized as Environmental Marketing. According to this concept Company which adopt Green Marketing Practices must introduce the product which will produce less harm to the environment.

According to the American Marketing Association "Green marketing is marketing of the product which are presumed to be environmentally safe"

Sustainable Development : - The term sustainable development is like a password to the success in today's fast changing business environment. Sustainable development means meeting the human needs by maintaining proper ecological balance.

In the era of globalization, privatization and innovations, one cannot separate itself from making the use of technology in their respective businesses. On one hand with the use of modern techniques and technology in production, the cost of production has come down to considerable extent as well as it has also facilitated the mass productions, but on the other hand excessive use of technology has created serious problems to the biodiversity.

However due to growing awareness among the consumers all over the world in respect of the environmental imbalance, degradation of biodiversity and other related environmental issue they are now becoming more and more cautious and protective regarding the environmental issue as a result of this they have started demanding those product and services which are environmental friendly or less harmful to the environment.

Profile of Global and Indian Automobile Sector

Currently India stands fifth in automobile industry in terms of production however our neighbor china has secured first position in this respect. China manufactures nearly 48.9 vehicles per minute however our production at present is 8.6 vehicle per minute. Indian Automobile Sector is expected to be the third largest sector in the world in term of volume by 2026 after China and United States of America. The Indian Automobile industry produced for more than 26 million vehicles including passenger vehicles, commercial vehicles during in FY 2020. The current annual sale of vehicles is about 26 million and expected to grow up to 85 million by 2030. According to the estimates Indian Automobile sector will contribute nearly 12% of GDP and will provide 65 million jobs by 2026 currently its contribution to GDP is 6.4%.

Significance of the study

This study is undertaken to study the importance and relevance of green marketing practices/activities undertaken by Indian Automobile sector .This study wants to focus on various Green Marketing practices and strategies undertaken by top five companies in Indian Automobile sector.

Research Methodology

This research is mainly conducted with the help of secondary data which is gathered from various sources like e-journals, research papers, research articles, Newspapers, books and various websites related to the topic under study.

Objective of the Study

- To study the concept of Green Marketing and sustainable development.
- To study the need of Green Marketing practices.
- To study the impact of Green Marketing practices on environment.
- To study various Green marketing activities undertaken by selected automobile companies in India.
- To study the Challenges faced by auto sector in while adopting Green Marketing
- To Study the various government initiative to boost up the Green Marketing.

Need for implementation of Green Marketing Practices

Green marketing though a new concept to the business world but its application is more difficult because it puts many restrictions on the functioning of the organization. In spite of all such limitations Automobile sector in India as well as in the whole world is adopting this these practices to gain more benefits to their organization like increase in publicity to their product, increase turnover, customer satisfaction, building of brand image etc.

In India Tata Motors, Maruti Suzuki India, Mahindra & Mahindra Ltd, Hero Moto Corp Ltd, Bajaj Auto Ltd, are top five leading Indian Automobile companies on the basis of market share which act as a major contributor to Indian Economy. Other Manufacturing industries like Steel, Tyre, Glass, Plastic, Metal, Rubber, Petro-Chemicals etc are directly or indirectly connected to the automobile sector. Which provides employment opportunities to thousands of peoples in the country thereby boosting the pace of economic development of India on one side however on the other side the negative impact of the automobile sector which includes release of poisonous gases like Nitrogen Oxide, Sulfur Dioxide, Carbon Monoxide resulting in air pollution to the serious level, increase in noise pollution, increase in water pollution etc resulting in serious threat to the bio diversity and climate change. This cannot be overlooked and it demands for use of green practices by these companies as well as launching of eco-friendly products.

Findings

Green Practices by Top Five Automobile Companies in India

1. Green Marketing Practices by Tata Motors

- Tata Motors along with One NGO decided to plant a sapling for sale of every commercial vehicle as well for every new customer who will service his vehicle at Companies Dealer workshop or at authorized service station and company will take care of such plant and will provide a Geo-tagged location to its customer who can monitor the plant status. This will help in increase in green cover.
- As Environment sustainability is the core of Tata Motors it has already B6 product range in the market which will help in reducing tailpipe emission.
- Tata motors also plans to source 100% renewable electricity by the year 2030.
- Tata Motors plans to bring 10 EV cars by 2026.

2. Green Marketing Practices by Maruti Suzuki India

- Maruti Suzuki India is committed to the environment protection and sustainable development. Company has brought various products in Hybrid range as well as in CNG range.
- CNG technology is a bench mark towards the green fuel mobility. ALTO, WAGON-R, CELERIO, EECO, ERTIGA are available in CNG category.
- The luxury cars like XL 6, THE NEW CIAZ, VITARA BREZZA, S-CROSS are available in Hybrid range. This hybrid technology is fuel efficient as well it enhances driving performance.
- At all the manufacturing sites of the company have zero waste water discharge facility and the company does not discharge any amount of waste water outside the factory premises. The Water is recycled in the plant and reused in other processes, irrigation and cleaning.

3. Green Marketing Practices by Mahindra and Mahindra

This group's environmental responsibility always remains on top priority basis. They are engaged in making the world Greener, Cleaner and Safer place to live in.

- According to Mahindra and Mahindra Sustainability Report 2019-20 Carbon emission leads to climate changes results in serious impact on Bio Diversity. Mahindra & Mahindra is committed towards Carbon Neutral by the year 2040.

- In Mahindra and Mahindra Group more attention is given on adopting cleaner and greener processes to reduce carbon emission as well as helps in reducing cost of fuel and electricity.
- Mahindra is expecting to sell half of its vehicles by 2030 which will be in the EV segment. They have put a goal of selling 5 lakhs electric vehicles by 2025.
- In E-Car segment Mahindra has launched E-Varito model. They are planning to launch another 16 models in Electric segment by the year 2027.

4. Green Marketing Practices by Bajaj Auto India

Bajaj Group is one of the leading manufacturer in the auto segment in India selling two wheeler and three wheeler vehicles. As like the other environmental conscious auto manufacturer this group is also eco sensitive group and adopted various green practices.

- Bajaj Auto have adopted Robotic and Automated Technology in manufacture of Electric vehicles plant in Pune, the total manufacturing process is fully automated resulting in cost cutting and waste minimization to the greater extent.
- To reduce emission and increasing the fuel efficiency Bajaj Auto encourages use of alternate energy like LPG and CNG in their two and three wheeler auto segment.
- Their manufacturing units at Walunj and Pantnagar follows green practices like Tree plantation in the factory area, recycling of water used in the plant and use of wind power technology to meet upto 90% energy requirement in their factories located in Maharashtra state.
- The CSR expenditure of Bajaj Auto was Rs 112.32 cr in 2019 and it rose to 119.44 cr.in the year 2020.

5. Green marketing practices by Hero Motor corp.

This organization is a leader in the two wheeler segment in India. Hero Motor Corp has a mission of maintaining high ecological standards. They always believe in adopting Eco-friendly practices. They adhere following environment friendly practices in their organization.

- As a care for environment they are the first to launch four stroke motor cycles in the era of two stroke two wheelers.
- Hero motor corp. has planned to launch their first EV bike in the month march 2022.
- They have taken various efforts in their factories to reduce energy consumption like use of 100% LED lights in the new plant and changing nearly 40% of the conventional

lights into LED in old plants, use of occupation sensors in toilets, use of solar energy in plants, trip circuits for ideal running machines etc.

- They have adopted Robotic Painting Technology in the process to reduce the air pollution.
- In Vadodara plant they adopted Green Roof Technology to reduce energy consumption and maintaining moderate temperature on the roof and surrounding area. They have built Eco Friendly garden factory in Rajasthan.

Challenges / Problems in implementing Green Marketing Practices

- Consumer are still not aware about green products, they must be made aware by educating them about the benefits of green product.
- Electric vehicles are costly compared to the vehicles using traditional fuels like petrol and diesel.
- Problem of frequent battery charging is one of the important issue which requires sufficient number of charging stations which requires setting up of additional infrastructure.
- Change in the consumer preference in respect of switching from traditional fuel based vehicles to EV vehicles will be very gradual due to various limitations.
- Problem of setting up of infrastructure for charging station is important as it requires more space for EV charging and the availability of space for parking EV cannot be easily available in the city or metro city area.
- Adoption of Robotic technology in manufacturing activity requires huge investment as well as expenses on R & D will be increased.
- Increasing government pressure to control over pollution and adopting green marketing practices are forcing the automobile sector gradually to shift from manufacturing of traditional vehicles to eco-friendly vehicles.
- The Green practices adopted by the competitors are forcing the auto companies to use green marketing practices.

Government Initiative towards Green Practices

- In the Budget 21-22 The Government of India Introduced voluntary scrapping policy to remove the unfit vehicles from the market which will helps in reducing the air pollution

to greater extent. This step will also provide boosting for the auto sector as the demand for the new vehicles will get increased.

- Government of India is also planning to make mandatory to the car manufacturers to introduce Flex-Fuel or dual fuel engines.
- State governments are also taking initiative in setting up EV charging stations in their states to encourage use of Electric vehicles.eg. Delhi government in the month Feb 2021 has started the setting up of 100 charging stations across the states.
- Maharashtra Govt. has revised its policy in 2021 in respect of EV to provide total benefit of Rs 2.75 lakh to the EV four wheeler buyer.
- Ministry of Heavy Industry of GOI has identified 100 cities in the country to introduce EV in public transportation system.
- In the Budget 2022 our Finance Minister announced Battery Swapping Policy to give boosting to adoption of Electric Vehicles.

Conclusion

Green marketing is a future for not only to the Indian Automobile sector but also for the rest of the world. Gradual but growing awareness among the consumers as well as increasing pressure from the government is forcing adoption of green marketing practices to automobile sector. Leading Auto companies in India are started using various green practices like use of Robotic technology in manufacturing process, Use of solar energy, Waste minimization and Recycling of waste, Water recycling, Plantation, Production of CNG vehicles and EV vehicles etc. Adoption of these practices by Auto Sector is really proving a positive step towards sustainable development as it helps in reducing the carbon footprints on greater extent, reducing the power consumption, Waste minimization from factory and increase in green cover due of adoption of plantation program by responsible automobile companies.

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Study the effect of Covid-19 in Indian Banking Sector

Asma Saif Pangarkar

Assistant Professor: ICS College of Arts, Commerce and Science, Khed

Abstract

The havoc created with the aid of using the sector-huge pandemic COVID-19 toppled the whole financial popularity of the sector. Perhaps the maximum tragic length of records humans have ever visible. Everybody is aware of defeating a plague-like covid-19, the Indian authorities introduced a whole lockout to save the lives of human beings, from 24 March 2020 and changed into then prolonged to a 3 May also 2020 with the aid of using the Indian government. The financial system has been extraordinarily affected because of the COVID-19 Pandemic. All sectors were badly affected due to it including banking. Banking is the spine of the Indian financial system. Reserve Bank of India, the apex financial institution of India made essential adjustments with the assistance of professionals of their coverage for dealing with the COVID- 19 pandemic. Banks face many situations, challenges with liquidity problems. Reserve Bank of India decreased the rate of REPO. Since human beings are suffering to get hold of profits and incomes, the Reserve Bank of India determined to offer concession for paying EMI from the client with the aid of using extending the length for installment period. The objective of the studies paper is to examine how COVID-19 has impacted the Indian Banking Sector. Further, the suggestion is proposed for Indian Banking Sector to grapple with the losses due to the Pandemic. Studies observe that Indian Banks have adopted various facilities and working styles for the effective and smooth function to serve customers. Most of the Indian Banks had been dealing with the hassle of NPA, Online Frauds, Non-recovery of funds, Bad debts, etc. and this directly impact on Banking Business. But Covid-19 has modified the structure of Indian bank customers. Due to the closedown of business activities source of income and supply of the human beings got here to halt. So, people were unable to utilize loans and repay with bank interest. Due to this situation, our Indian banks are dealing with in cutting-edge pandemic scenario.

Keywords: COVID-19, Indian Banks, Covid-19 and Indian Banks, Lockdown

Introduction

Indian Banks trying to improve services to limit the impact of COVID-19. The whole world is facing the Covid-19 pandemic situation. It has changed the working style of the world. It creates super depression. The Coronavirus disorder was first time recognized in Wuhan, the capital of Hubei China in December 2019 and spread worldwide. After the resultant spread and boom in the death rate, WHO declared the pandemic on 11 March 2020. In the current scenario in India Corona Virus is widely affected. The government of India announced a lockdown on 24 March 2020 and it extended up to 3rd May 2020. Many actions were taken worldwide, WHO praised the timely action taken by Prime Minister of India Mr. Narendra Modi. Lots of human lives were saved because of lockdown and helped to prevent the spread of the virus in absence of a vaccine. The establishments like IMF and World Bank, Central Banks economists, fund managers and consulting corporations from distinct nations have expressed their fears about the devastating impact of lockdown in GDP internationally, especially in developed and developing economies like India. Its consequences on Continuous upward push in unemployment, High pressure incurred on delivery chain control. It reduces the revenue of Government and consumer buying activities. Also, decrease in fuel consumption activity. Banks get outbreak because of novel Corona Virus. Borrowers and Industries suffer losses of jobs, a slowdown in trade due to the spread of viruses all over India. Bank customers desired financial relief and the Reserve Bank of India encouraged national banks to offer comfort with the aid of using framing properly banking schemes and policies for customers. For safety issues among employees, it was decided to offer facility work from home to employees. WHO has suggested people apply contactless financial transactions and avoid handling currency notes. As it was found Covid-19 virus live on currency notes for days and can widely spread Corona. So Indian Bank shifted towards Digital transactions. Now Indians are more dependent on online transactions, Mobile Banking, Net Banking, etc. At Banks hassle of Non-Performing Asset has increased. From the studies, it was known that asset quality constantly is going down from companies Small and Medium Enterprises, and the retail sector for lending to stress on profitability and capital for lenders. Reduced productiveness and lockdowns have already begun to take a toll on the financials of the business sector. The overall operating environment is unpredictable because of uncertainty surrounding the severity and pandemic period and the related consequences on Indian banks of restrictions on economic activities. Indian banks already suffered due to tragic business and customer confidence. Global hazard aversion has hit the Indian Financial Market. RBI prepares the monetary policy and a guideline to all private sector and public sector banks. RBI issues banknotes and retaining of reserves to be able to secure economic

balance in India and operate credit and currency system in India. RBI maintains economic stability in India with consistent development. In India, COVID-19 has created crises about 1.5 trillion revenue loss and a 20 to 25% decline in refinery utilization. Fall in production because of the shutdown, import limitations and shortage of workforce. Fall in the pharmaceutical sector because of import restrictions. Close down the small and medium scale businesses. Indian government tries to emphasize on a sector like hospitals, schools, and service sectors that borrowed loans from banks and they want support for their survival.

Temporary disruption in Indian Banking due to Covid-19 Pandemic.

1. Reduce serviceability due to inability to access the data
2. Temporary correction in the valuation of FIs, with an expected reduction in returns
3. Difficulty in getting access to branches for daily operations
4. Default in loan installments
5. Scaling down of vital operations
6. Significant fall in domestic and international trade

Long term crisis in In Indian Banking due to Covid-19 Pandemic

1. Increasing preference for workforce distribution and shared services
2. Raising preferences and need for digital transactions
3. Increasing preference for life and health insurance cover
4. Accumulation of surplus capital because of constrained deployment possibilities
5. Increase loan defaulters because of reduce revenue and margin

Review of Literature

Covid-19 Virus begins to spread internationally from 1st December 2019, Many of the researchers starts writing articles associated with Covid-19, Their Effect on the global economy, Covid-19 impact on the Indian economic system, How the people mentally become weak because of the Pandemic.

A Research paper is published in June 2020 “Literature Review of the Economics of COVID-19”, by Abel Brodeur, David Gray, Anik Islam, Suraiya Jabeen. The study focuses on the survey of the emerging & swiftly developing literature on the economic problems due to COVID-19 & Government’s role. How many fatalities have occurred as a result of COVID-19? How many people comply with social distancing as preventive measures? How are the

world scenarios changing because of a pandemic? What is the impact of the COVID-19 pandemic on the service sector?

A Research paper is published in June 2020 at the name of “Covid-19 Pandemic And Lockdown Impact On India's Banking Sector: A Systemic Literature Review”, What are the powerful effects of COVID-19 on the economic system? discussed in the paper.

A Research paper is published by the name “Analysis of Banking Sector in India: Post Covid-19” dated September 2020 by Ashish Bagewadi & Dewang Dhingra, this paper emphasizes on pre & post impact of COVID-19 in the Banking sector alongside that what are the impact of COVID-19 on surroundings? is published in study paper.

Research Paper publishes in June 2020 as the name of “A study on impact of COVID-19 on banking sector: An Indian Perspective.” A Research paper emphasizes on low productivity of the company, poor Supply chain, Manufacturing Hindrances & crippled health systems. Banking & Financial institutions suffer from losses. Increased Bad loans, reduced income in the entertainment and tourism industry, etc.

Research Methodology

Research is based upon the impact of COVID-19 in the Indian Banking Sector. As the world is suffering from the worst scenario. It also affects Indian Banking. People repaying potential of loan get decreased. GDP of India falls. The economic development of India slows down. Indian Government along with RBI is constantly in the process to develop new policies, which assist to reduce the effect of COVID-19.

The COVID-19 scenario not only adopted technology but also, focuses on the following 4 key areas of banking:

Embracing Neo Technologies – with inside the publish epidemic and financial disaster, rising technology will play a key position in rushing up transactions and lowering prices for banks. The Indian banking area has already found out the position of an era in attaining get entry to and scale. These technologies will play a key position inside the virtual transformation of banks and economic establishments and re-consider the virtual transport of offerings.

Channels of Digitization - According to the sector 2017 international search report, India is the sector’s 2nd biggest non-populous family with a hundred ninety million adults without getting access to a financial institution account with the aid of using going to financial

institution branches to apply virtual channels, desire banks will permit their clients to barter a couple of computerized and virtual channels to provide this column channel mix. Banks will recall such critical elements as demographic, net get entry to, lat mile, connectivity, client banking, behaviour patterns, etc. To efficiently followed with the aid of using Indian banking consumers.

Security, Privacy and Customer Trust - According to the RBI for the economic year 2017, India's banking area noticed a boom in Cyber fraud and a lack of thirteen factors 7 million dollars. With the growing use of cashless and virtual financial systems, it is going to be obligatory for banks to put in force steady systems and systems.

Policy and Compliance - Focus ought to be on virtual bills and infrastructure, especially in rural India. India is already on its direction to introduce the private information safety invoice at the traces of GDPR inside the EU.

Objectives of Research Paper

1. To study the impact of COVID-19 on the Indian Banking Sector.
2. Finding a solution for the Indian Banking system to tackle with COVID-19 Pandemic.

The Research is primarily based on secondary information. For data collection referred the to Reserve Bank of India Website, RBI Manual, Manuscript of RBI, Books, research papers, Newspapers and Magazines.

Findings

1. Government take initiative with the aid of using pronouncing Rs. 1.7 trillion funds for poor people which includes cash transfer and food security.
2. Financial Institutions claim large company bail-out applications.
3. Government introduces emergency / drastic measures for economic survival ⁽⁴⁾.
4. Indian authorities strengthen administrative employees for local bodies for efficient crisis management.
5. The Government of India imposes empowerment for local bodies for productive crisis management.
6. Government pushes the private sector with the aid of using supplying lending from banks.
7. RBI offers three month moratorium period for loan installments.

8. Reserve Bank of India offers relaxation in Asset Classification Norms to the private and public sector Banks.
9. RBI provides guidelines for institutions for their structural strengthening operating limits of customers.
10. Reserve Bank of India decreased REPO Rate by 90 BPS.
11. RBI works with 25 thousand crores for Long Term Repo Operation (LTRO)

Conclusion

Financial Institution facilitates healthy work environment for the employees and re-skilling of the personnel to approach new working methods. They improve customer-centric approaches via virtual channels. The effect of the Covid-19 like an epidemic on banks in India has left a few banks to suffer due to deposits, as loans are secured by deposits. The circumstance of private sector banks may enforce customers to lend less, which may also result in poor liquidity. The RBI has given a three month grace length to all banks because of corona which has brought some relief from rules and regulations governing bad credit score recognition however bank's NPA has increased. It is widely recognized to the bankers that for the reason that implementation of the lockdown by Indian Government on 25 March 2020. RBI has taken lots of effort for doing business in the banking sector. RBI has also relaxed the time limit for bad credit rules because of corona and barred welsher from paying dividends for the year ended on 31 March 2019. The scenario of Banks has deteriorated because of the lockdown. But now after opening up, it will take some more time period to be normal.

Suggestions

1. The forces of RBI should be on the financial system and its context to maintain liquidity in COvid-19 period.
2. After open up it is required to provide loan facilities to small and medium enterprises to be normal.
3. Government of India should reduce the uncertainty in the economy and financial stress ⁽⁴⁾.
4. Money and capital market both must be operated properly.
5. The Government of India should make provision for strong economy to avoid coming crises

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Research Paper titled Eco Tourism: Need for Eco Tourism in Dapoli - Murud Harney
during One Day Multidisciplinary International Conference on Recent Trends in Commerce,
Management & Social Sciences in the Era of Post COVID-19 held on 22nd March 2022.

Dr. Subhash D'Souza
I/C PRINCIPAL

ECO TOURISM: NEED FOR ECO TOURISM IN DAPOLI – MURUD HARNEY**Leena R. Chikhale**

Assistant Professor, I.C.S. College of Arts, Commerce & Science, Khed, Ratnagiri

ABSTRACT

Tourism is an important source of revenue-generation for any destination. It is a source of earning valuable foreign-exchange for the country. It supports the local economy directly as well as indirectly. A form of tourism that has been around for some time is eco-tourism. It is also known as sustainable tourism. It is a kind of tourism which leaves minimum impact on the environment. However, at the same time, it also helps in conservation of the environment. This tourism is for the travellers who are interested in the flora, fauna and natural attractions of a particular destination, rather than man-made attractions and shopping. It is a responsible type of tourism, one that promotes the well-being of the indigenous population, by encouraging financial benefits for the locals. The Konkan region of Maharashtra stretches from Mumbai to Sindhudurg. Its beaches are very popular amongst tourists, and there are a lot of domestic and international visitors or most of the year, except during heavy monsoon. To cater to this demand, there is a lot of development that has taken place over the past few years, ranging from infrastructure and roads, to accommodation facilities, local transport & recreational activities. All this growth and expansion has had an impact on the environment. Encouraging eco-tourism will be instrumental in ensuring sustainable development of the Konkan region.

INTRODUCTION

Eco-tourism is a form of tourism that involves travelling with a focus to destinations that are rich in culture as well as natural attractions. It is of interest to those kinds of travellers who would like to reduce the negative effects arising from their visits on the environment. Such travellers are also fascinated by the indigenous culture and landscape. Tourism in any form has impacts on the environment to a lesser or greater degree. Every organism in the eco- system has its own role to play. Numerous organisms co-exist in harmony in nature. However, if this synchronization is disturbed in any way, it disrupts the natural balance. The World Tourism Organisation (UNWTO), which is the top-most body for the development of tourism in the world, defines Tourism Carrying Capacity as "the maximum number of people that may visit a tourist destination at the same time, without causing destruction of the physical, economic, socio-cultural environment and an unacceptable decrease in the quality of visitors' satisfaction"

ECO TOURISM

What is Eco Tourism?

Eco Tourism is sustainable that focuses on minimal impact/less impact on environment and local culture.

It may be defines as:

"it deals with interaction with biotic components of natural environment"

"Travels to the destination where flora, fauna and cultural heritage are the primary attractions"

OBJECTIVES OF RESEARCH

As we know Eco Tourism is the most important part of economy. Its provides income to the government as well as society.

- Eco tourism is intended to offer tourists an insight into the impact of human beings on environment.
- To encourage people for a greater appreciation of our natural habitats.
- I would like to minimize the negative impacts on environment like pollution and enhance the cultural integrity of local people.
- Promotion of energy efficiency, recycling, water conservation and wild life conservation.
- Maximizing the use of renewable resources.
- Increase awareness about recent climatic and social conditions in between tourists and local people and aware the about 'Why they have to support ECO TOURISM' Motivating tourist about the recently launched mission "Swachh Bharat Abhiyan"

OBSERVATIONS AND DISCUSSION

- The „Bed and Breakfast scheme“ of the Maharashtra Tourism Development Corporation of the State Government has been instrumental in promoting the concept of eco-tourism, offering clean and maintained rooms to the tourists.
- Hotel rooms and home stays are often built using locally found material such as the jambha stone“ and other things such as betel nut tree trunks. This has helped in sustainable development and to minimize the carbon footprint, as fuel required for bringing building material from far off places has reduced.

BENEFITS OF ECO TOURISM

- Ø It brings a huge a sustained economic gain to the local community
- Ø It provides great job opportunities to local peoples as per their skills and affection towards environment.
- Ø First benefit is to creation of jobs like hotel workers, conservation staff, local guides and retail workers
- Ø Tourist and local peoples begins to realize the true value of culture, traditional knowledge and natural resources.
- Ø The increased pride in the community and society leads them to seek out further education and training.
- Ø Profit from tourism funds social development programs and projects. Ø Increases the standard of living.

It develops the water supplies, health clinics, roads, and many other public facilities.

RESEARCH METHODOLOGY

This research article is based on secondary as well as primary data sourced from research articles and papers, internet websites and magazine articles as well as Maharashtra Tourism Development Corporation website.

The survey of Murud and Harnai beach has taken to know the recent developments and to see the positive and negative impacts of tourism.

DISADVANTAGES OF ECO TOURISM

- Ø It disturbed the local residences
- Ø It causes a huge cultural insensitivity
- Ø There is no awareness of resources is being maintained
- Ø The society is not being particularly guided about rules and regulations regarding the Ecotourism
- Ø Wild life is disturbed
- Ø it is very hard for the local people to afford their daily needs.
- Ø Ecotourism always causes huge destruction environmental damages such as erosion, pollution, cultural clashes, and imbalance economy and tourism dependence.

Last but not the least; the greatest concern is uncleanliness and disposal of waste anywhere which directly harms to environment.

ECO TOURISM IN DAPOLI (Murud-Harney beach)

Dapoli is a small city in Ratnagiri district, Maharashtra. It is beautifully situated with a green blanket of nature. it is commercially strong city due to Tourism and its natural resources. Dapoli is mostly famous for its beaches like Murud, Harney, Kelshi, karde beach, ladghar beach and keshavraj beach.

Murud is situated 11kms from dapoli. It is a long flat beach and vast expanse of sandy beach. There are thousands of tourist visits to the murud beach daily and also peoples from neighbor cities spent their holidays and weekends at this beach.

Somehow there is large number of negative impacts on that place that's why there is need for practices of Eco tourism.

NEED FOR ECO TOURISM IN DAPOLI (Murud)

- Ø There is no any particular rules and regulation regarding conservation of natural resources.
- Ø There is need to awareness in between peoples about preservation and conservation about the Gods gifted beauty.

- Ø Peoples have to use public vehicles instead of private vehicle to go there. So it may be a less pollution practice.
 - Ø Shops hotels and retailers are very close to the place of beach area so that it creates lots of garbage, food waste, and decreases the purity of water so it has to maintain distance between sea area and shops.
 - Ø There is adventure activities like boating, speed boats, horse cart riding Camel
 - Ø There is adventure activities like boating, speed boats, horse cart riding. Camel riding, banana boating, paragliding which introduces many expanses and endangers animals and human beings
 - Ø Consumption of resources and energy in a huge amount causes destruction of ecosystem.
 - Ø The prices of articles rise in a surplus amount which is not nearly affordable for each and every individual.
 - Ø There is a less amount of Eco friendly hotels present over here. Ø There is no proper sewage treatment in Dapoli.
- Marine life is disturbed and harmed due to water pollution.



HARNAI BEACH

Harnai beach is famous for their fishing and fish auction. it contains rich variety of marine life which provides a huge opportunities of business for fishermen , boat sailors, traders, transporters and local peoples.

NEED FOR ECO TOURISM

- Ø There is a high need for conservation of marine life. Ø Proper waste management should be provided.
- Ø There is a need for Eco friendly hotels.



CONCLUSION

- § Effective policy must be implemented to curb consumption by affluent.
- § We need morale education to instill genuinely environment respecting modern values in young student society.
- § Eco tourism is responsible form of tourism and tourism development, which encourages going back to natural products in every aspect of life. It is also the key to sustainable ecological development
- § Younger generation needs for Eco tourism and implementation of it for a better future. If not so within a decade the beauty and purity of these places will be on the pages on history.

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"I DON'T WANT TO PROTECT THE ENVIRONMENT,

I WANT TO CREATE A WORLD WHERE THE ENVIRONMENT DOESN'T NEED PROTECTION"

GAS SENSING PROPERTIES OF ZnO SCREEN-PRINTED THICK FILMS

Mr. Sudhakar V. Maske I.C.S. College of Arts, Commerce and Science, Khed,
Dist. Ratnagiri (M.S.)

Abstract: The Zinc oxide nanostructures have been synthesized and studied as the sensing element for the detection of various hazardous gases such as H₂S, NH₃, CO, H₂, Cl₂ and LPG etc. by using screen printing method, thick films of synthesized ZnO nanostructure were deposited on glass substrate. Gas sensing properties of ZnO nanostructure thick films were studied. The x-ray diffraction studies show that the nanostructures are crystallized in the form of hexagonal wurtzite crystalline phase. The Zinc Oxide thick films are used as a promising material for semiconductor gas sensor to detect poisonous gases at room temperature with high sensitivity and selectivity. Some new routes to gas selectivity are investigated with the help of thick film screen-printing technology.

Key Words: Zinc Oxide Nanostructures, Gas sensor, XRD.

1. Introduction

The need for a novel gas sensor material capable of providing reliable operation in harsh environments is now greater than ever. Such sensors find a range of applications, including the monitoring of traffic pollutants or food quality in specially designed electronic noses [1,2]. Gas sensors based on metal-oxides are commonly used in the monitoring of toxic pollutants and can provide the necessary sensitivity, selectivity and stability required by such systems [3]. Commonly

used oxides include, zinc oxide, titanium dioxide, iron oxide, tungsten oxide and tin oxide. These materials have successfully been employed to detect a range of gas vapors, particularly ethanol, methanol and propanol [4–9]. Thick film technology is often used to fabricate such sensors and possesses many advantages, for example, low cost, simple construction, small size and good sensing properties [10]. In addition, this approach provides reproducible films consisting of a well-defined microstructure with grains and grain boundaries that can be studied easily [11]. In this paper, ZnO thick films were prepared and deposited by screen-printing onto glass substrates. The sensor was then interfaced with bridge circuitry. The change in output voltage upon exposure to the gas vapors was then recorded in order to investigate the sensitivity of the printed films to propanol, methanol, ethanol, H₂S, NH₃, etc.

2. Experimental:

The thick film paste was prepared by mixing iron oxide (Fe₂O₃) and zinc oxide (ZnO) powders in the ratio, 60/40 mol.%. The results of a previous study carried out using 60/40 mol.% Fe₂O₃ / ZnO have been recorded elsewhere [16]. The results of this study will be used throughout this paper as a comparison. The composition used in this study was mixed and wet-ball milled in alcohol for 24 h and then dried at 120 °C. The pressing was done under a vacuum of 6×10^{-3} mbar for 5 h and followed by cooling at a rate 3 °C/min. The resulting solid lump was broken up and ground down to a powder using a Gy-RO Mill machine for 10 min. The powders were mixed with 7 wt. % of polyvinyl butyl (PVB), which was used as a binder, while ethylene glycol mono butyl ether served as a solvent to make the paste.

To improve the conductivity of the film, carbon black (1.5 wt. %) was added to the thick film paste. In this study, glass substrates, prepared with silver inter digital electrodes were used. The sensing layer was then screen-printed onto its surface and dried at 120 °C for three hours using an oven. Silver paste was used to fix two contact wires.



Fig. 1. The sensor configuration.

3. Results and discussions:

3.1. Material properties

3.1.1. X-ray diffraction analysis

Following the screen-printing process, the composition of the sensing layer was determined using X-Ray diffraction (XRD). This was necessary as the high temperatures reached during the fabrication process may cause the composition to change. Such changes result from chemical reactions between the raw materials. Fig. 2 shows the results from XRD analysis of a sample from 0° to 70° , 2θ . The XRD data shows that the final composition consists of two phases, namely zinc ferrite (ZnFe_2O_4) and zinc oxide (ZnO).

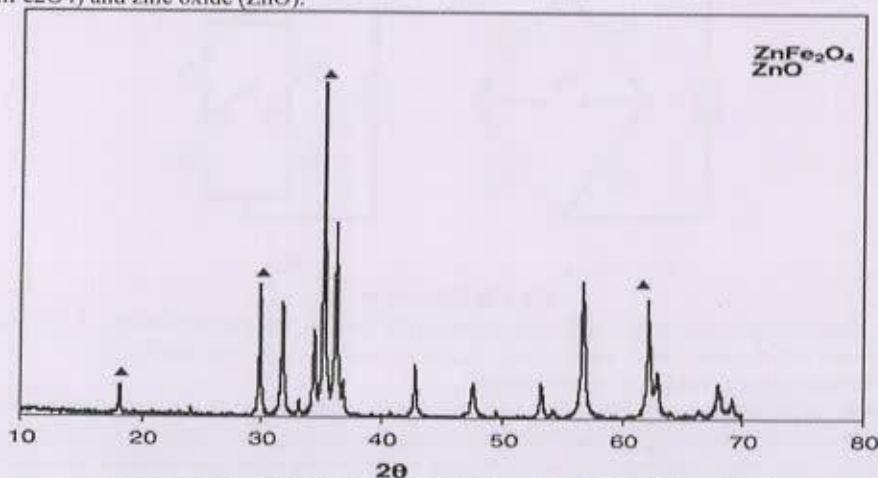


Fig. 2. X-ray diffraction pattern of the mixture ratio 60/40 mol. % of $\text{Fe}_2\text{O}_3/\text{ZnO}$ powder fired at 1250°C for 5 h under vacuum in the tube furnace

3.1.2. Scanning electron microscope

Fig.3(A) and(B) show the results of using scanning electron microscopy (SEM) to view the $\text{ZnFe}_2\text{O}_4/\text{ZnO}$ powder and the $\text{ZnFe}_2\text{O}_4/\text{ZnO}$ sensing layer, respectively. From the SEM pictures.

It can be concluded that the average grain size of sensing layer is less than $5\ \mu\text{m}$. This is very advantageous for gas sensing applications as smaller grain sizes have a larger specific area and as result, a higher sensitivity to vapors.

Previous work using $\text{Fe}_2\text{O}_3/\text{ZnO}$ compositions produced sensing layers with a larger particle size [16]. The reduction in particle size achieved in this study has been made possible by increasing the ZnO content and decreasing the amount Fe_2O_3 . Such a strategy leads to a higher concentration of ZnO in the final composition. Zinc compounds have a brittle property and as a result, break easily when placed under a mechanical mill while iron compounds are more difficult to fracture.

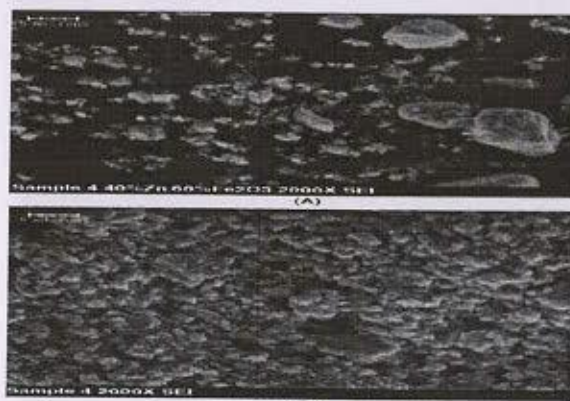


Fig. 3. (A) Scanning electron microscope for the $\text{ZnFe}_2\text{O}_4/\text{ZnO}$ powder. (B) Scanning electron microscope for the $\text{ZnFe}_2\text{O}_4/\text{ZnO}$ film surface deposited on the glass substrate by a screen-printer.

3.2 Details of the gas sensing system:

The sensing performance of the sensors was examined using a "static gas-sensing system." There were electrical feeds through the base plate. The heat was fixed on the base plate to heat the sample under test up to required operating temperatures. The current passing through the heating element was monitored using a relay with adjustable ON and OFF time intervals. A Cr-Al thermocouple was used to sense the operating temperature of the sensors. The output of the thermocouple was connected to digital temperature indicators. A gas inlet valve was fitted at one port of the base plate. The required gas concentration inside the static system was achieved by injecting a known volume of test gas

using a gas-injecting syringe. A constant voltage was applied to the sensors, and current was measured by a digital Pico-ammeter. Air was allowed to pass into the glass dome after every Gases exposure cycle.

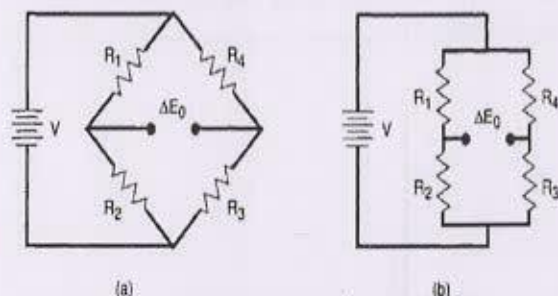
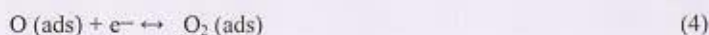
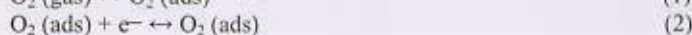


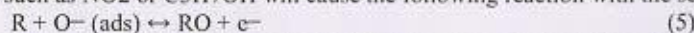
Fig.4 Bridge circuit.

Fig. 4 shows the bridge circuit used as part of the gas sensing mechanism. The circuit consists of, four resistances, R_1 , R_2 , R_3 and R_4 sensor, which should have equal values. A 5V dc power supply was used to apply a voltage across the circuit. To assist in balancing the bridge, a 1 potentiometer

was used and works to adjust the small offset in the base-line resistance of the sensor. The arrangement was used to detect methanol, ethanol and propanol gas vapors within a concentration range of 0–3000 ppm. For each concentration, readings were taken 5 min after equilibrium conditions were reached within the gas chamber. In order to explain the response of an oxide film to gas vapors, the films conductivity type must first be determined. This has been achieved by using a hot point probe and a p type semiconductor behavior was observed. When a p-type sensor is exposed to an oxidizing gas such as O_2 , NO_2 or Cl_2 the process can be explained by the following equations. (1)– (4) [17]:



Reducing gases such as NO_2 or C_3H_7OH will cause the following reaction with the sensing layer



Where R is the reducing gas, O^- the oxygen ion adsorption and e^- are electrons. The change in electron concentration explained by these equations will causes an increase in oxide resistance for a p-type material.

The theoretically predicted increase in resistance of the oxide layer upon exposure to gas vapours has also been experimentally observed and the results are shown in Fig. 5.

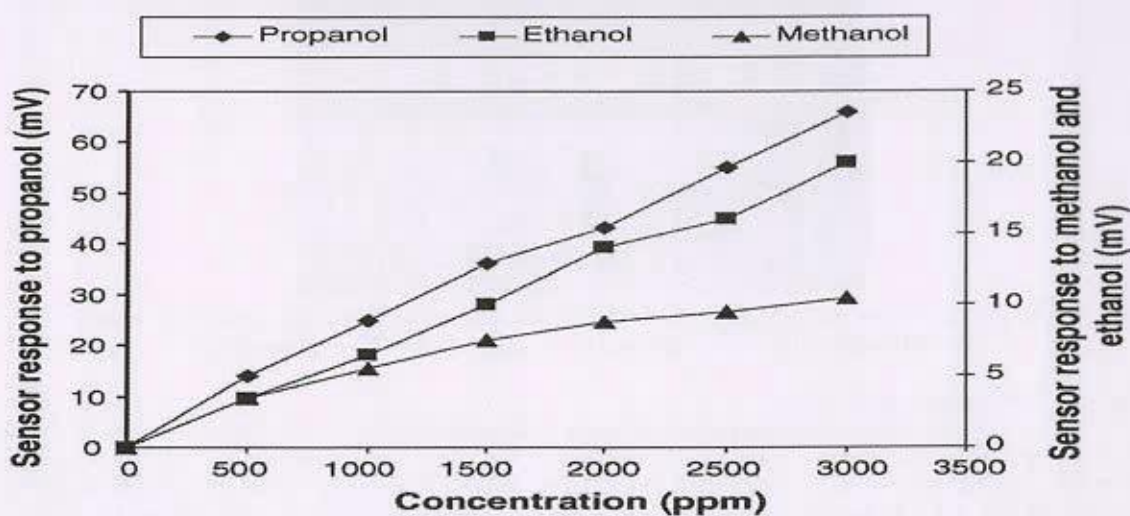


Fig. 5. ZnO/ZnFe₂O₄ sensor response (mV) to propanol on left x-axis and to methanol and ethanol on right x-axis versus the gas concentration in ppm.

It shows the response of the sensor (bridge output (mV)) on the y-axis and the gas concentration in ppm of propanol, methanol and ethanol on the x-axis. It can be seen that the ZnFe₂O₄/ZnO polymer oxide sensor exhibited a higher response to propanol than to ethanol and finally the lowest response was measured for methanol. This behavior can be explained by the decomposition and reduction of alcohols with increased (-CH₂-) groups. As a result, propanol is the most easily adsorbed into the sensor, followed by ethanol and methanol, respectively. This explains the high response of the sensor to the presence of propanol gas vapors. The sensitivity of the sensor is defined as the change in bridge output voltage (mV) per change in gas concentration (ppm). The sensitivity of the sensor to 3000 ppm methanol, ethanol and propanol at room temperature was 3.5, 6.6 and 22 V/ppm while the relative resistance change of the sensor was calculated as $(R/R_0) \times 100$ and was 0.84, 2.5 and 5.2, respectively. However, the sensitivity of this sensor to ethanol is higher than that reported in refs. [16, 17], being around 1.8 and 3.5 V/ppm at 2634 and 3732 ppm, respectively. Although the sensors were tested under different conditions, the sensitivity of the devices tested as part of this work was found to be better to those reported in ref. [18]. Different metal oxides were used as raw materials for such gas sensors. For example, Salehi [19] used SnO₂ thin films to detect different gases; among the gases used was methanol at a concentration range of 500–3000 ppm and at operating temperatures of 50–250 °C. Salehi reported that a heater is required and this is operated at elevated temperatures—typically 200–500 °C. This not only increases the power consumption of the device.

4. Conclusions:

This paper investigated the development and manufacture of thick film gas sensors, based on zinc ferrite and zinc oxide. The sensor showed a higher sensitivity to propanol than to ethanol and methanol vapor. The effect of temperature on the sensing layer has also been investigated. It has been shown that sensitivity to propanol is adversely affected by increasing temperature. Finally, the response and recovery times of ZnFe₂O₄/ZnO thick film gas sensors has been investigated. It was found that the response/recovery times to 1000 ppm decrease with increasing temperature.

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SURFACEWATER CONTAMINATION ASSESSMENT IN INDUSTRIAL PARK MAHAD M.I.D.C. RAIGAD, MAHARASHTRA

*¹SRIKANT KEKANE AND ²R.P. CHAVAN

¹Department of Chemistry, I.C.S. College, Khed (Maharashtra) India

²Department of Chemistry Dnyanasadhana College, Thane West (Maharashtra) India

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ABSTRACT

The surface water quality in Mahad M.I.D.C.'s industrial area was analyzed; water from study area is used for domestic purposes, so the quality of surface water must be assessed. A few industries discharge their wastewaters into a nearby nalas and river. Throughout the year, water samples were obtained from nalas and river located across the industrial area at one-month interval. To determine the effect of industrial wastes on surface water, the following parameters were estimated: pH, EC, Na⁺, K⁺, Cl⁻, Ca²⁺, Mg²⁺, HCO₃⁻, TH, TA, PO₄³⁻, SO₄²⁻, and NH₃-N. The findings indicate that in the current analysis, the majority of the physicochemical parameters of water samples were below the permissible level of drinking water quality.

KEY WORDS : Surface water, Factory wastes, Pollution.

INTRODUCTION

The Environmental pollution has also been a cause of worry in India on a lot of different levels (Paul *et al.*, 2012). Sewage or contaminants from factories can percolate through the soil layer and enter the water resources, creating a polluted layer that disrupts natural ground water quality by altering its chemical properties. If waste water is used for irrigation, it has an effect on soil fertility and crop health. The physico-chemical analysis of groundwater and soil every where reveal the effect of toxic chemicals on soil health and ground water contamination.

MATERIALS AND METHODS

The research area Mahad is located on the Arabian Sea, south of Mumbai, in Maharashtra's coastal Kokan area. The selected area's geographical coordinates are Latitude 18°6'12"N and Longitude 73°28'40"E, with an elevation above mean sea level (metres) of approximately 177.5m. Water samples were collected in MIDC (Maharashtra Industrial Development Corporation) sites in the Mahad, district of Raigad. A variety of factories such as fertilizer, agrochemicals, acid, dyes, paints, machine

tools materials, and resins are located in the area of study. Fifteen water samples were obtained using the methodology of APHA (1998). Trivedy and Goel (1986), and physico-chemical parameters were analysed using the appropriate standards. Chemicals and reagents of AR grade are used. The solutions are made with doubled distilled purified water.

RESULTS AND DISCUSSION

The physicochemical characteristics of ground water in the industrial area Mahad MIDC, Maharashtra, varied throughout the year (August-2018 to July-2019). Tables 1 show the outcome of the water quality status.

pH

The pH is an acidity or water alkalinity indicator. The available macro and micronutrients for plants are considered to be linked to pH (Ladwani *et al.*, 2012). The water pH ranged from 6.66 to 8.20, with an average of 7.16 during the period of one year. Laterite soil, however, is acidic in nature and so it is acidic in nature. During the monsoon season, some chemicals and metals percolate through rain water

and settle in ground water, resulting in water with a low pH value (Walakira, 2011), which may be attributed to the discharge of acidic industrial effluents into the well water (Sunil *et al.*, 2011). In same way the pH values reported by I. Touzani (2020) are ranged from 7 to 7.87 with an average value of 7.42. Ramprasad (2020) found that the pH value of the river sample on the upstream side was 7.97 ± 0.23 and on the downstream side was 8.16 ± 0.38 .

Electrical conductivity (EC)

The capacity of a material to conduct electricity is referred as its electrical conductivity. Water conductivity is a more or less linear property of dissolved ion concentration (Kumar *et al.*, 2012). During the study period electrical conductivity of water ranged from 0.04 to 0.52 dSm⁻¹ with a mean value of 0.16 dSm⁻¹. As a result, during the year, all samples obtained were in the excellent and decent water grades. The electrical conductivity increases during the monsoon and winter seasons due to an increasing number of ions, which is confirmed by the salinity value (Ramesh *et al.*, 2014), and decreased during the summer due to a rise in the rate of precipitation (Kataria *et al.*, 1994). Similarly, Yasin *et al.* (2020) found that all surface waters do not surpass the norms, although the threshold value for spring waters has been increased. Few samples have been surpassed the limit and the electrical conductivity value observed was 619.8 mS.cm⁻¹

Total hardness (TH)

Hardness is generally caused by the calcium and magnesium ion present in the water. Polyvalent ions of some other metal like strontium, iron, aluminium, zinc and manganese, etc. can cause the hardness. Total hardness observed during the period of one year was minimum of 24.55 ppm to 64.74 ppm with mean 43.64 ppm but Subhash Prasad Singh *et al.* (2020) observed that the 2.38 % of pre- and post-monsoon water samples were found to have Concentration of total hardness greater than the BIS permissible limit of 300 ppm to 600 ppm. TH levels were calculated in the range of 55 ppm to 635 ppm with a median of 137.5 ppm during pre-monsoon and 105 ppm to 1290 ppm with a median of 215 ppm during post-monsoon.

Total alkalinity (TA)

It is a measure of the capacity of water to neutralise a strong acid. In the study area the Total alkalinity

ranged from 21.90 to 139.8 ppm having average value of 71.11ppm unlike Subhash Prasad Singh *et al.* (2020) noted that the Total Alkalinity (TA) levels higher than the BIS permissible limit of 200 ppm to 600 ppm were found in 2.38 % of pre- and post-monsoon water samples, respectively. The concentrations of TA were measured. Measured between 45 ppm and 980 ppm with a 65 ppm to 955 ppm and a median value of 122.5 ppm during the pre- and post-monsoon periods, with a median of 155 ppm.

Bicarbonates (HCO₃²⁻)

During the study period, very little carbonate concentrations were found in some water samples. The bicarbonate concentration in surface water ranged from 23.51 to 160.4 mg l⁻¹, with an average value of 67.30 mg l⁻¹. Because of the dilution effect of rain water, the concentration of bicarbonate is lower during the monsoon season (Prasath *et al.*, 2013). The data showed that the concentration of bicarbonate in groundwater samples was less than the maximum permissible limit.

Phosphate (PO₄³⁻)

Phosphorous remains in the form of phosphates. The released phosphate after treatment with the acid can be determined by colorimetrically (Trivedy *et al.*, 1986). In the MIDC area the phosphate concentration was ranged from 0.02 ppm to 0.21 ppm having average value 0.10ppm during year. Similarly, the Daya river water quality evaluation indicated the range of phosphate from 0.2ppm to 3.9 ppm with an average 1.06ppm (Agrawal, 2020)

Chloride (Cl)

Chlorides enter ground water from both natural and anthropogenic causes, such as weathering processes and inorganic fertilizer leaching, dumps or landfills, liquid wastes, and so on (Yadav *et al.*, 2014). The variation of chloride concentration in surface water sources ranged from 112.5 to 299.30 mg l⁻¹, with an average value of 181.95 mg l⁻¹, the values are found below the allowable level for drinking water. Similarly, Anuradha Gogi *et al.*, (2020) found that the chloride ion concentration in Dikowa river water ranged from 49 to 62 mg/l and average value of 54.6 mg/l.

Sulphate (SO₄²⁻)

Sewage treatment plants and industrial discharges from tanneries, pulp mills, and textile mills are

Table 1. Variation in the physicochemical properties of water during the period of August-2018 to July-2019

Parameters	Statistical data											
	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July
pH	Mean	7.16	7.29	7.17	7.15	7.17	7.11	7.13	7.01	7.03	7.07	7.25
	Min.	6.66	7.08	7	7.01	7.07	7	6.66	6.79	6.75	6.7	7.1
	Max.	8.20	7.5	7.33	7.25	7.24	7.22	7.54	7.35	7.3	8.2	8
EC (dSm ⁻¹)	Mean	0.16	0.187	0.143	0.162	0.168	0.181	0.167	0.145	0.123	0.149	0.177
	Min.	0.04	0.039	0.041	0.041	0.041	0.061	0.055	0.054	0.042	0.047	0.071
	Max.	0.52	0.399	0.342	0.472	0.462	0.451	0.515	0.354	0.274	0.443	0.512
TH (ppm)	Mean	43.64	28.16	32.74	34.26	41.03	46	51.1	52	56.84	60.84	33.35
	Min.	24.55	24.55	30.51	32.64	36.4	43.24	47.9	48.93	51.54	52.58	29.84
	Max.	64.74	32.05	34.75	36.94	45.61	49.86	54.83	55.51	60.1	58.85	38.41
TA (ppm)	Mean	71.11	34.66	42.63	57.59	61.61	72.35	59.61	90.91	98.41	108.96	41.12
	Min.	21.90	21.9	32.64	44.73	51.32	55.64	49.86	72.85	83.51	87.49	24.1
	Max.	139.80	47.34	50.67	70.17	75.46	89.98	89.62	109.9	128.4	128.5	54.82
Bicarbonate (ppm)	Mean	67.30	55.71	55.93	59.17	69.02	72.5	75.28	93.86	73.89	76.08	48.17
	Min.	23.51	34.15	38.15	34.15	37.42	49.83	44.96	47.42	42.51	47.15	23.51
	Max.	160.40	90.51	78.15	90.19	109.8	122.4	101	144.2	160.4	150.2	83.13
Phosphate (ppm)	Mean	0.02	0.01	0.02	0.02	0.02	0.02	0.02	0.03	0.06	0.04	0.01
	Min.	0.01	0.01	0.012	0.013	0.013	0.013	0.019	0.023	0.026	0.031	0.008
	Max.	0.13	0.019	0.13	0.017	0.018	0.021	0.027	0.032	0.036	0.048	0.015
Chloride (ppm)	Mean	181.95	172.02	180.5	199.00	196.30	196.40	182.40	179.03	185.40	182.90	157.5
	Min.	112.50	122.30	156.3	125.20	152.80	162.30	135.40	145.61	125.50	119.90	112.5
	Max.	299.30	250.60	225.1	290.20	290.30	254.20	299.30	290.51	295.80	280.60	261.1
Sulphate (ppm)	Mean	18.29	1.04	4.03	9.37	15.64	19.89	25.53	30.04	32.72	38.23	0.63
	Min.	0.24	0.56	2.89	6.74	10.12	18.51	22.14	23.51	28.61	33.42	0.24
	Max.	44.22	1.52	5.40	11.24	19.05	23.46	31.23	33.51	36.65	42.08	1.21
Ammonia (Nitrogen) (ppm)	Mean	0.10	0.06	0.12	0.14	0.16	0.17	0.17	0.12	0.09	0.05	0.03
	Min.	0.02	0.05	0.08	0.10	0.14	0.14	0.16	0.10	0.07	0.03	0.03
	Max.	0.21	0.08	0.16	0.17	0.20	0.19	0.19	0.17	0.10	0.21	0.04
Sodium (ppm)	Mean	8.33	6.68	6.95	8.31	8.30	7.07	7.15	6.99	11.53	13.03	7.91
	Min.	2.10	2.20	4.10	5.10	5.30	4.50	3.20	3.00	8.80	9.10	2.60
	Max.	29.20	18.50	15.90	17.90	17.90	15.00	14.30	12.00	21.40	29.20	18.50
Potassium (ppm)	Mean	0.42	0.50	0.40	0.50	0.40	0.50	0.40	0.40	0.40	0.30	0.40
	Min.	0.00	0.20	0.10	0.20	0.10	0.20	0.10	0.20	0.00	0.00	0.20
	Max.	0.90	0.80	0.70	0.90	0.70	0.90	0.80	0.70	0.80	0.80	0.70
Calcium (ppm)	Mean	26.41	28.69	24.51	22.45	20.96	22.27	23.59	27.44	29.39	33.30	33.70
	Min.	9.54	16.10	13.40	10.60	13.20	9.70	11.30	13.40	14.20	23.54	25.90
	Max.	73.41	66.00	42.60	61.42	45.29	50.27	70.64	73.41	53.10	52.00	55.40
Magnesium (ppm)	Mean	3.08	3.12	2.89	2.24	2.37	2.60	3.44	3.43	3.62	3.50	3.59
	Min.	0.15	1.20	0.65	0.42	0.15	0.52	1.72	1.43	0.37	0.40	1.03
	Max.	9.99	8.00	7.44	7.14	9.99	9.07	8.04	8.11	7.84	6.76	7.86

examples of point sources. Sulphates are often carried into water bodies through runoff from fertilized agricultural lands. The range observed during the one year in the industrial areas surface water for sulphate concentration was 0.24 ppm to 44.02 ppm having average 18.29 ppm. Previous study done by Subhash Prasad Singh *et al.* (2020) indicates that the sulphate concentration in surface water ranged from 0.8 ppm to 261.56 ppm. Similarly, the Ramprasad (2020) observed the sulphate content of the river water samples 394 ± 17.5 ppm in the upstream side and 512.8 ± 11.2 ppm in the downstream side.

Ammonia (Nitrogen)

Ammonia levels that exceed the recommended limits can be harmful to aquatic life. Although the ammonia molecule is a necessary nutrient for life, excess ammonia can accumulate in the organism and cause metabolic changes or increases in body pH. It is a sign of pollution caused by the overuse of ammonia-rich fertilisers. The ammonia concentration in the study area was observed in the range of 0.02 ppm to 0.21 ppm with an average of 0.10 ppm. Similarly, Ajit Kumar Vidyarthi *et al.* (2020) observed variation in Ammonia-Nitrogen values was ranged from BDL to 0.838 ppm with an average of 0.220 ppm.

Sodium (Na⁺)

Sodium is a highly soluble chemical element that can be found in natural surface water. Sodium concentrations in surface water ranged from 2.10 to 29.20 ppm, with a mean value of 8.33 ppm. Owing to low water levels and high evaporation, there is a peak in sodium concentration in water during the summer (Yadav *et al.*, 2014). The sodium concentration in the ground water samples in this analysis is below the maximum allowable limit.

Potassium (K⁺)

During the period of one year the potassium concentration was ranged from 0.0 ppm to 0.90 ppm with mean value of 0.42 ppm. Similarly, Ramprasad *et al.* (2020) reported the potassium concentration in river Cauvery was 4.24 ± 2.88 and 8.12 ± 5.2 in upstream and downstream respectively. Likewise, the potassium observed in water at Jaipur district with mean value was 242.64 ppm before monsoon and 6.73 ppm after monsoon (Subhash Chand Jat, 2020).

Calcium (Ca⁺)

During the study period the calcium concentration in surface water ranged from 9.54 to 73.41 mg l⁻¹, with a mean value of 26.41 mg l⁻¹. The data revealed that the calcium content in water samples was below the maximum allowable level. Due to industry runoff, low water levels, and high evaporation, higher calcium concentrations in water were observed during the summer season (Deshmukh, 2014). Similarly, the calcium concentration reported by Kulkarni (2020) was ranged from 10 ppm to 57.71 ppm in Panchaganga river of Maharashtra.

Magnesium (Mg⁺)

Magnesium concentrations in water ranged from 0.15 to 9.99 mg l⁻¹ with an average value of 3.08 mg l⁻¹. The calcium content in the water samples used in this analysis was below the legal tolerance level for drinking water. Higher magnesium concentrations in ground water during the summer season may be attributed to polluting factories located near water sources, low water levels, and high evaporation (Deshmukh, 2014). Similarly, Magnesium concentration observed at Cauvery river by Ramprasad *et al.* (2020) ranged from 179.2 ± 12.8 to 188.7 ± 15 in upstream water and downstream water.

CONCLUSION

An environmental risk assessment of water contamination, in particular industrial areas is extremely significant for agricultural and non-agricultural purpose because it is seriously influenced by industries and anthropogenic activities, that further influence on soil and human health. In this investigation it is found that the no physicochemical parameter exceeds the permissible limits of WHO and BIS hence the water from water bodies selected to the study purpose is safe for irrigation. Yet long-term research on surface water pollution needs to be monitored in the study area.

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Heavy Metal Concentration in Surface Water around the Industrial Area M.I.D.C. Mahad, Maharashtra, India

Srikant Kekane*¹ and R.P. Chavan²

¹*Department of Chemistry, I.C.S. College, Khed (Maharashtra) India*

²*Department of Chemistry, Dnyanasadhana College, Thane West (Maharashtra) India*

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ABSTRACT

The surface water quality in Mahad M.I.D.C.'s industrial area was analysed; it is used for irrigation and domestic purposes, so the quality of water must be assessed. Rapid industrialization and growing urbanization are the predominant factors responsible for the progressive stress on the area's water. As a result, in light of this serious issue, the current study was undertaken to assess surface water pollution caused by heavy metals. Throughout the year, water samples were obtained from Nalas and river located across the industrial area at one-month intervals. Using an Atomic Absorption Spectrophotometer, the heavy metals iron, copper, zinc, manganese, nickel, chromium and cobalt were determined (Perkin Elmer make model No. Aanalyst 200). A comparison of surface water with WHO (1993) and BIS (1991) recommendations reveals that the majority of water samples contain heavy metal concentrations below the maximum permissible level.

Key words: Surface water, Heavy metal, Industrial waste

Introduction

Water is an essential component of life and is needed by all biotic populations. Water is never completely clean in a chemical sense (Agale *et al.*, 2013). Water contains very few impurities, but rapid industrialization, overpopulation, uncontrolled use of chemicals resulting in water contamination, and contamination of water disrupt the aquifer's equilibrium (Ramesh *et al.*, 2014). Drinking water should be free of radioactive elements, living and non-living organisms and excessive amounts of minerals that may be harmful to one's health. Some metals are present in the body naturally and are essential for human health. Iron, for example, prevents anaemia, and zinc is a cofactor in more than 100 enzyme reactions. They are known as trace metals because they are found in low concentrations (Harte *et al.*, 1991).

In certain cases, industrial effluents or waste percolate through the subsoil and enter the water table, creating a polluted pool that degrades the natural water quality by altering its chemical composition. When contaminated water is used for irrigation, the soil quality and crop health suffer.

Materials and Methods

The Mahad M.I.D.C. research area is situated on the Arabian Sea, south of Mumbai, in the coastal Kokan area of Maharashtra. The geographical coordinates of the chosen region are Latitude 18°6'12"N and Longitude 73°28'40"E, with an elevation above mean sea level (metres) of approximately 177.5 m. Water samples were collected at M.I.D.C. (Maharashtra Industrial Development Corporation) sites in Mahad, Raigad district. The study area contains a

number of factories producing fertiliser, agrochemicals, acid, dyes, paints, machine tools materials, and resins. Fifteen water samples were collected and metals were determined using the required standards as per APHA (1998), Trivedy and Goel (1986) methodologies. AR grade chemicals and reagents are used. Double distilled water is used for the preparation of the reagents.

Results and Discussion

The physicochemical characteristics of water in Mahad MIDC, Maharashtra, varied over the course of the year (August-2018 to July-2019). Table 1 demonstrate the results of the water quality assessment.

Iron

During the study period the iron concentration in surface water ranged from 0.027 to 0.65, with a mean value of 0.083 mg l⁻¹. Similarly, the Al-Khuzai *et al.* (2020) observed that the iron concentration ranged from 0.271-0.603 mg l⁻¹ likewise the Iron concentration in Mula-Mutha river at Pune observed was 1.57 to 11.49 mg l⁻¹ (Dnyandeo Gorakhe, 2020). Owing to leaching of industrial wastes during the rainy season and the natural occurrence of iron oxides in laterite soil, higher concentrations of iron in water were observed during the monsoon and winter (Thomas *et al.*, 2011).

Copper

Copper toxicity to marine life is determined by the alkalinity of the water, with lower alkalinities being more toxic to aquatic fauna (Train, 1979). The copper concentration in surface water ranged from BDL to 0.071 mg l⁻¹, with a mean of 0.059 mg l⁻¹, according to the report. Likewise, the copper was ranged from 0.0088ppm to 0.0716ppm in Almathana Province, Iraq (Hussain Ali Shaheed, 2019), In addition to this the Matta Gagan (2020) reported the Copper concentration at all the study stations BDL in Bijnor District, Uttar Pradesh, India

Zinc

During the summer, the concentration of zinc in surface water ranged from 0.024 to 0.091 mg l⁻¹, with a mean value of 0.05 mg l⁻¹, likewise the concentration of Zn in Mahi Estury in Gujarat India was ranged from 0.02 mg l⁻¹ to 0.63mg L⁻¹ with mean value of 0.170 mg l⁻¹. Similarly, Pallavi Sharma (2020) found that the Zinc in water of Brahmaputra Asam was

ranged from 2 ppb to 270 ppb with an average of 46.91ppb. The zinc concentration was lower during the monsoon season due to the dilution effect of rain water and higher during the summer and winter due to water depletion leading to higher metal concentrations and concentration effect (Thomas *et al.*, 2011).

Manganese

Manganese concentrations in surface water ranged from 0.012mg l⁻¹ to 0.091 mg l⁻¹, with a mean value of 0.042 mg l⁻¹, recently the Mn concentration analysed by the Mohana *et al.* (2020) found to have average values 0.605 mg/l and 0.526 mg/l during pre-monsoon and post-monsoon periods. Manganese concentrations in water are higher in the summer and gradually decrease before the winter season, according to the current analysis. Manganese compounds can be found in nature as a solid in the soil and as small particles in the water. These are normally deposited in the form of dust particles on the ground. Industrial practises and fossil fuel combustion increase manganese concentrations in the air Owing to anthropogenic activities such as industrial effluents, old plumbing, and household waste (Warmate, 2011), as well as discharge of adjacent industries such as tanneries, chemical processing, and a considerable volume of specific matter in the river, chromium was stored as adsorbed ions (Mandol *et al.*, 2011).

Nickel

Nickel is primarily used in the manufacture of stainless steel, nonferrous alloys, and super alloys, which are all directly emitted from the steel industry. Nickel concentration in surface water ranged from BDL to 0.35 mg l⁻¹ with a mean value of 0.042 mg l⁻¹. Dnyandeo Gorakhe (2020) observed the Ni concentration in the range of 0.009 ppm to 0.59 ppm. Owing to the presence of water-soluble salts (Kumar *et al.*, 2001) and the leaching effect of heavy metals, the majority of water samples contain nickel concentrations in water above the allowable level for drinking (BIS, 1991; WHO, 1984). (Bharti *et al.*, 2013). In general, a low pH favours the concentration of exchangeable and soluble nickel (Parth *et al.*, 2011).

Chromium

The variation of chromium in water ranged from BDL to 0.051 mg l⁻¹ with a mean value of 0.034 mg l⁻¹. Similarly, the Dnyandeo Gorakhe (2020) analysed

Table 1. Month-wise metals concentration of surface water around Mahad MIDC, Maharashtra

Metal	Statistical Data	August	Sept	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	
Fe(ppm)	Mean	0.083	0.118	0.069	0.071	0.065	0.0762	0.079	0.091	0.104	0.072	0.059	0.112	0.076
	Min.	0.027	0.056	0.046	0.042	0.034	0.046	0.051	0.061	0.046	0.027	0.036	0.042	0.055
	Max.	0.65	0.65	0.083	0.083	0.111	0.121	0.124	0.134	0.164	0.105	0.112	0.4	0.091
Cu(ppm)	Mean	0.059	0.05647	0.103	0.073	0.064	0.066	0.069	0.08	0.079	0.016	0.035	0.03	0.035
	Min.	BDL	BDL	BDL	0.034	BDL	0.034	0.034	0.034	0.03	BDL	BDL	BDL	BDL
	Max.	0.71	0.52	0.71	0.104	0.11	0.097	0.094	0.104	0.094	0.05	0.096	0.051	0.22
Zn(ppm)	Mean	0.050	0.047	0.048	0.053	0.057	0.051	0.05	0.05	0.048	0.051	0.047	0.046	0.05
	Min.	0.024	0.03	0.034	0.041	0.041	0.034	0.029	0.034	0.024	0.041	0.04	0.034	0.037
	Max.	0.091	0.075	0.06	0.063	0.085	0.079	0.091	0.074	0.085	0.062	0.079	0.063	0.071
Mn(ppm)	Mean	0.042	0.035	0.027	0.046	0.019	0.031	0.032	0.034	0.037	0.075	0.086	0.048	0.036
	Min.	0.012	0.023	0.019	0.013	0.012	0.015	0.017	0.019	0.023	0.062	0.081	0.021	0.024
	Max.	0.091	0.061	0.042	0.081	0.027	0.061	0.058	0.061	0.055	0.084	0.091	0.089	0.061
Ni(ppm)	Mean	0.040	0.034	0.035	0.032	0.036	0.03	0.028	0.035	0.053	0.052	0.049	0.054	0.041
	Min.	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
	Max.	0.35	0.075	0.061	0.061	0.056	0.051	0.051	0.051	0.35	0.082	0.084	0.088	0.072
Cr(ppm)	Mean	0.034	0.026	0.023	0.061	0.026	0.028	0.028	0.031	0.031	0.043	0.041	0.036	0.029
	Min.	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.021	0.022	BDL	BDL
	Max.	0.51	0.05	0.046	0.51	0.052	0.055	0.044	0.06	0.061	0.084	0.081	0.061	0.054
Co(ppm)	Mean	0.010	0.004	0.007	0.006	0.005	0.009	0.012	0.013	0.011	0.013	0.028	0.007	0.003
	Min.	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
	Max.	0.074	0.005	0.015	0.009	0.008	0.051	0.051	0.042	0.016	0.04	0.074	0.021	0.006

the metal concentration From Mula-Mutha River, Pune and reported that the concentration ranged from 0.096 mg l⁻¹ to 0.762 mg l⁻¹.

Cobalt

During the period of one year the concentration of cobalt in surface water ranged from BDL to 0.074 mg l⁻¹ with a mean value of 0.010 mg l⁻¹. Likewise, the study conducted by P. Mohana (2020) indicates average value of Cobalt concentration 0.011ppm in pre-monsoon and 0.088 ppm in post-monsoon similarly the Akansha Patel (2021) reported the range of Cobalt in ganga river from 10.50 µg l⁻¹ to 20.77 µgl⁻¹.

Conclusion

According to the analytical results, the majority of the water samples contained heavy metal concentrations below the permissible limit, whereas nickel concentrations were above the permissible limit in water, as per BIS and WHO guidelines. However, this study stresses the importance of routine water quality monitoring to determine pollution activity on a regular basis such that effective management measures can be implemented in time to reduce pollution intensity.

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Seasonal Changes in Some Micronutrients and Heavy Metals from Soil Near Lote Industrial Sector, District Ratnagiri, Maharashtra

Srikant Kekane¹ and Ganesh Bhagure²

I. C. S. College of Arts, Commerce and Science, Khed, Ratnagiri, Maharashtra, India¹

Satish Pradhan Dnyanasadhana College of Arts Science and Commerce, Thane West, Maharashtra, India²

Corresponding Author: Srikant Kekane

Abstract: *A thorough understanding of the soil temporal variability of micronutrients and how this variation impacts the environment is critical for optimum crop productivity and eco system preservation in a variety of disciplines within agricultural science. An attempt was made to investigate the soil temporal variability of micronutrients such as cadmium, cobalt, chromium, copper, mercury, nickel, lead, zinc, and SAR from March to September 2017 in the Lote industrial area. During the post-monsoon season, the concentration of several micronutrients is often high. Nutrient imbalance is caused by the rate of fertiliser input and the continual discharge of industrial waste water on the soil surface.*

Keywords: Soil micronutrients, Lote industrial area, Seasonal variation, SAR.

I. INTRODUCTION

In agricultural research and production, a thorough understanding of the temporal variability of soil fertility characteristics and their consequences on the environment is becoming increasingly important. The goal of specific nutrient recommendations and large-scale environmental monitoring is to increase crop yield while limiting negative environmental effects. Excess nitrogen (N), phosphorus (P), and potassium (K) shortage in soil is caused by incorrect fertiliser and manure application recommendations. However, a thorough understanding of how fertiliser and management processes affect long-term soil fertility in traditional agricultural systems across wide regions remains a mystery [1]. Residual water in coarse-textured soil occurs in intragranular pores and accounts for around 10% of total soil porosity, while it is practically hieratically immobile in fine-textured soil [2]. Sixteen elements are required for plant growth. These elements are classified as macronutrients and micronutrients. Micronutrient deficiencies or excesses, such as iron, zinc, and copper, can have both synergistic and antagonistic effects in plants [3]. Dynamic soil quality indicators are soil qualities that can be modified quickly due to land use [4]. Soil contamination has been linked to the presence of heavy metals and residues from municipal and industrial trash. Soil is a natural dynamic entity formed by natural forces operating on natural stuff. At varying depths, it is frequently divided into horizons from mineral and organic elements. These differ from the parent materials in morphological, physical, and component chemical attributes, composition, and biological features. Because industries are voracious users of natural resources, they pollute the air, water, and soil. Soil contamination is typically caused by factories, fertilizers, swage, sludge, city compost, other industrial waste, industrial effluents, and water drainage. Once pollutants penetrate and are incorporated into the soil, their concentration in the soil continues to rise, becoming harmful to all kinds of life such as plants, microorganisms, and humans [5,6]. The current study aims to assess the association between various soil micronutrients in the Lote industrial region during the pre- and post-monsoon seasons.

II. EXPERIMENTAL SECTION

The study area is located in the Ratnagiri district Lote MIDC. Soil samples were taken from eight different sites. A soil pit was drilled at each sample location to assess the depth of the soil horizons and to conduct discrete depth sampling by natural horizons. Soil samples were air dried, broken if bulk, and sieved using a 2 mm screen. All samples were kept in polythene receptacles [7]. The analytical properties of the soil samples were determined as follows. Cadmium, cobalt, chromium, mercury, lead, and zinc were measured spectrophotometrically, whereas copper and nickel were determined

using an atomic absorption spectrophotometer. All of the chemicals utilized were of the AR grade. Standard procedures were used for the analysis [8,9]. The sodium adsorption ratio (SAR) was estimated using the equation below.

$$\text{SAR} = \text{Na}^+ / [(\text{Ca}^{++} + \text{Mg}^{++}) / 2]^{0.5}$$

Where, Na^+ , Ca^{++} and Mg^{++} in (mg/kg)

III. RESULTS AND DISCUSSION

Table 1 summarises the findings of the analysis. From March 2017 to September 2017 (mg/kg); for pre monsoon and post monsoon; During the research period "T," the temperature in the entire region ranged from 37.7°C (post-monsoon) to 32.7°C. (pre-monsoon). The content of cadmium in soil ranged from 6.4 mg/kg to 74.0 mg/kg. Cadmium concentrations were lowest in the pre-monsoon season and highest in the post-monsoon season. Excessive concentrations over the limit were detected as a result of industrial waste water discharge on the soil surface. The cobalt content ranged from 0.1 mg/kg to 169 mg/kg and was highest in the post-monsoon season, while it was lowest in the pre-monsoon season. The readings exceeded the essential limitations set by higher plants. Nitrogen fixing microorganisms require just trace quantities. As a result, the cobalt content in soil appears to be totally enough for nitrogen fixation [10].

During the research period, chromium concentrations ranged from 11.6mg/kg to 27.2mg/kg. The concentration was found to be lowest in the post-monsoon season and highest in the pre-monsoon season. Copper and mercury levels varied greatly throughout the pre- and post-monsoon seasons. The content of nickel ranged from 77.7 mg/kg to 169.0 mg/kg. The concentration of nickel was lowest during the pre-monsoon season and highest during the post-monsoon season. The concentration of lead ranged from 29.0 mg/kg to 89.0 mg/kg during the pre-monsoon season, with the highest concentration occurring during the post-monsoon season. It is caused by industrial effluent percolation. The seasonal fluctuation of copper, mercury, nickel, lead, and zinc was seen in the pre-monsoon and post-monsoon seasons due to farmers' usage of a large amount of inorganic fertilizer and continuous discharge of industrial waste, effluents on soil surface and which was percolated in soil generates an imbalance in micronutrient content [11]. SAR (sodium adsorption ratio) varies from 1.17 mg/kg to 84.09 mg/kg. SAR was found to be lowest in the pre-monsoon season and highest in the post-monsoon season. A greater SAR value suggests loamy sand, clay loam, or clay soil.

Table 1: Various Elements Concentration in Soil Samples from the Lote Industrial Area

Location	Season	SAR	Pb	Zn	Cd	Co	Cr	Cu	Hg	Ni
S-1	Pre. M.	3.99	29	102.4	9.7	55.2	24.5	141.1	BDL	119.7
	Post.M.	17.44	82	86.1	24.6	105	24.4	120.2	BDL	159
S-2	Pre. M.	3.21	41	92.7	7.7	53.3	22.2	135.9	1099	92.5
	Post.M.	10.28	89	759	23.9	106.5	21.6	144.9	189	145.3
S-3	Pre. M.	1.29	43	128.3	8	78.6	25.5	173	2199	115.2
	Post.M.	17.44	88	104	20	112.8	20	158.7	209	143.8
S-4	Pre. M.	14.1	34	109.6	8.4	50.6	1.1	96.4	BDL	77.7
	Post.M.	14.84	79	329	9.3	94.1	20.8	26.4	269	151.7
S-5	Pre. M.	3.49	38	89.7	10.4	63.2	23.8	119.8	2099	91.6
	Post.M.	6.12	83	579	21.3	8.5	23.9	141.3	BDL	156.9
S-6	Pre. M.	19.42	43	106.9	10.7	0.1	26.2	123.5	199	81.2
	Post.M.	52.56	82	89	6.4	116.5	17.8	13.5	69	159
S-7	Pre. M.	13.25	34	91.6	8.4	51.6	11.9	144.7	499	68.8
	Post.M.	84.09	81	68.5	29.1	99	10.6	82.6	19	117.8
S-8	Pre. M.	1.17	44	9	14	52	26	144	BDL	91.5
	Post.M.	7.94	89	74	74	169	10.9	72.5	BDL	169
Max		84.09	89	759	74	169	26.2	173	2199	169



Min		1.17	29	9	6.4	0.1	1.1	13.5	19	68.8
Average		16.91	61.19	176.18	17.87	75.99	19.45	114.91	685.00	121.29

IV. CONCLUSION

Industrial pollution has a negative impact on soil quality. The primary impact on biomass was the excessive use of fertiliser and irrigation water. To achieve long-term agricultural success, good management is required.

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RESEARCH ARTICLE

Synthesis and Biological Evaluation, Structural Elucidation, Thermogravimetric Analysis, X-Ray Diffraction Studies of a Schiff Base Derived from 3-formylchromone and 3-aminoquinoline and their Cu(II) and Co(II) Complexes



**BENTHAM
SCIENCE**



Sushil K. Ghumbre^{1,*}, Amol V. Patil², Atul S. Renge³, Satish A. Dake⁴, and Bhimrao C. Khade^{5,*}

¹Department of Chemistry, I.C.S College of Arts, Commerce and Science, Khed, Dist. Ratnagiri-41570 MS., India; ²Department of Physics, I.C.S College of Arts, Commerce and Science, Khed, Dist. Ratnagiri-41570 MS., India; ³Department of Chemistry, K.G.K. College of Arts, Science and Commerce, Karjat, Dist. Raigad-410201, MS., India; ⁴Department of Chemistry, Sunderrao Solanke Mahavidyalaya Majalgaon, Dist. Beed-431131, MS., India; ⁵Department of Chemistry, Dnyanopasak College of Arts, Commerce, and Science, Parbhani-431401, MS., India

Abstract: Introduction: The study of novel Schiff bases and their metal complexes has achieved enormous attention of inorganic as well as medicinal chemists.

Objective: The objective of this study is to study the structural elucidation and antimicrobial screening of 3-formylchromone and 3-aminoquinoline-based Schiff base and their metal complexes.

Methods: Cu(II) and Co(II) complexes of 3-((quinolino-3-ylimino) methyl)-4H-chromen-4-one ligand were synthesized and characterized by elemental analysis, molar conductivity measurement, infrared, UV-Visible, ¹H NMR spectral studies, thermogravimetric analysis, and powder X-ray diffraction studies.

Results: Antibacterial activity of synthesized compounds were screened against *Klebsiella pneumoniae*, *Staphylococcus aureus*, and *Proteus vulgaris*, and antifungal activity was screened against fungi *Candida albicans* and *Aspergillus niger*. Schiff base ligand and their Cu(II) and Co(II) complexes revealed significant antibacterial and antifungal activity against tested strains. Octahedral geometry of metal complexes was proven by analytical, physical, and spectral data.

Conclusion: In this present work, novel Schiff base 3-((quinolino-3-ylimino) methyl)-4H-chromen-4-one and its Cu(II) and Co(II) complexes revealed promising antibacterial and antifungal activities.

Keywords: Antibacterial activity, Antifungal Activity, 3-aminoquinoline, 3-formylchromone, Powder X-ray Diffraction, Thermogravimetric studies.

1. INTRODUCTION

Inorganic chemists from the nineteenth century have been perusing the depth of coordination compounds. Schiff bases

and their metal complexes have acquired a unique position due to enormous applications in various fields of science, *i.e.*, Medicinal Chemistry, catalysis, pharmacology, analytical chemistry, biology, food, and dye industries.

This class of aromatic compounds in analogy to other heteroaromatic moieties-containing molecules is of potential biomedical importance [1-4]. Coordination compounds have performed ample vital role in human physiology and have contributed to their enhancing prevalence in biology and chemistry. Alfred Werner received a Noble prize in 1913 for

*Address correspondence to this author at the Department of Chemistry, Faculty of Science, I.C.S College of Arts, Commerce and Science, Khed, Dist. Ratnagiri-415709 MS, India and Department of Chemistry, Dnyanopasak College of Arts, Commerce, and Science, Parbhani-431401, MS., India; Tel: +91-8379960325; E-mails: sghumbre6680@gmail.com, avpatil333@gmail.com, asrenge@rediffmail.com, satish_dake57@yahoo.com, bckhade@yahoo.com

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his precious contribution to the field of coordination chemistry [5]. To sustain the normal functioning of the living body, biologically active molecules such as coordination compounds play a key role in the biological process, including the DNA-driven ones [6]. Thus, due to the various applications of such metal complexes, coordination confirms its scientific importance in recent years. On the other hand, there is growing attention toward Schiff bases and their metal complexes for their synthetic and effective biological role [7].

The attention on Schiff bases and their metal complexes justifies their biological activities, including anti-tumor, antibacterial, fungicidal, and anti-carcinogenic properties and catalytic activity [8, 9]. Huge numbers of Schiff bases are biologically active, and they show their importance in the medicinal field in the development of clinically significant molecules [10]. Chelation affects the biological role of Schiff bases. Naturally, occurring chromones have a cytotoxic effect on different types of cells [11]. The 3-formylchromone nucleus has a unique identity for two reasons; its derivatives show significant biological activity, and they are attractive synthetic intermediates [12]. In fact, 3-formylchromone and its derivatives were found to inhibit the thymidine phosphorylase IC_{50} values in the range of 19–480 μM [13]. Formylchromone inhibits a human protein tyrosine phosphatase PTP1B with an IC_{50} value of 73 μM [14]. The 3-formylchromone and its derivatives underwent *in vitro* and *in vivo* tests and showed remarkable anticancer, anti-inflammatory, anti-oxidant, antiproliferative, anti-HIV activities [15–17]. The various substitutions on formylchromone structure change modify its characteristics potentially leading to desirable chemical reactivities. Furthermore, 3-formylchromone and its metal complexes revealed significant fluorescent properties. The design and synthesis of molecules containing heterocyclic nuclei showing alteration in emission spectra is a subject of current research in view of their potential applications such as chemosensors and optoelectronic devices [18, 19]. From a therapeutic perspective, 3-formylchromone and its derivatives may act as good pharmaceuticals due to their potency and selectivity providing novel pharmacophores for novel drugs for the treatment of type II diabetes and obesity. Also these derivatives act as efficient intermediates in heterocyclic synthesis [20–22]. Fe(III) complex containing 8-aminoquinoline was used in the catalytic oxidation of alkanes and alkenes [23]. 3-aminoquinoline-based Nickel complexes are involved in urease inhibition with low inhibition of the chymotrypsin [24]. Schiff bases derived from 3-formyl-6-methylchromone and their Ni(II), Cu(II), Co(II) and Fe(III) complexes showed remarkable antibacterial and antifungal activity [25, 26].

Overall, according to a literature survey, metal complexes of 3-formylchromone and their derivatives are endowed to a vast pharmacological activity. Hence, there is a clear interest in discovering novel and more potent compounds which could show significant antibacterial and antifungal activities, to cite a few. Keeping this view into consideration, we decided to synthesize new Schiff bases from 3-formylchromone and 3-aminoquinoline and their Cu(II) and Co(II) complexes. The synthesized Schiff bases and their Cu(II) and Co(II) complexes were screened for antibacterial and antifungal activities. In the current research work, the Schiff bases and their

Cu(II) and Co(II) complexes were characterized by various analytical tools such as UV-visible, infrared, ^1H NMR spectra, molar conductance, magnetic susceptibility, powder X-ray diffraction studies and Thermogravimetric analysis.

2. MATERIALS AND METHODS

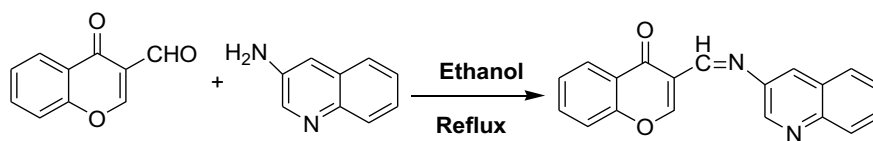
3-formylchromone, 3-aminoquinoline, $\text{CuCl}_2 \cdot 2\text{H}_2\text{O}$, $\text{CoCl}_2 \cdot 6\text{H}_2\text{O}$ and solvents used were of AR grade. The bacterial strain and fungi species were obtained from National Facility of Biopharmaceuticals, G. N. Khalasa College, Matunga, Mumbai.

The X-ray powder diffraction of representative metal complexes was scanned on a Miniflex II Desktop X-ray Diffractometer coupled to a digital computer at the Department of Physics, Savitribai Phule University, Pune. The X-ray diffractograms of studied metal complexes were scanned in the range $2\theta=20\text{--}80^\circ$ at $\lambda=1.543\text{\AA}$. The diffractograms and associated data depict the 2θ value for each peak, relative intensity and observed inter planer spacing (d-values). The diffractograms and associated data provided information helpful for indexing the pattern to determine the unit dimensions and space group. The position of each reflection was recorded with intensity. Inter planer spacing d_{hkl} was calculated from 2θ values using the relation $d=n\lambda/\sin\theta$. The pcpdfwin programme was used for indexing the data. The programming contains ICDD (International Centre of Diffraction Data) data, where the observed peaks of complexes were compared with ICDD data and then possible lattice parameters were chosen. The selected data of lattice parameters were fed into the crystallography open database where the possible value of lattice parameters was obtained. Then preliminary data in the form of 2θ and intensities were fed to the computer and all differences (d- observed) were calculated. All the possible combinations of h. k. l. plane and d-observed values were arranged in the decreasing order.

The programme pcpdfwin contains all the crucial attributes of X-ray programme. When the system of compound is unknown, the observed data are first treated with the isomeric chart and Hul-Devy's curve for tetragonal and hexagonal systems. If these tests are proved to be negative then the data is subjected to programme bar and attempt is made for the existence of lower symmetry and then data can be indexed in an orthorhombic system. The failure of all these tests is an indication for the existence of lower symmetry and then the data can be indexed on either monoclinic or triclinic system. The precise lattice parameters and the deviation are obtained from pcpdfwin programme.

2.1. SYNTHESIS OF SCHIFF BASE LIGAND (L)

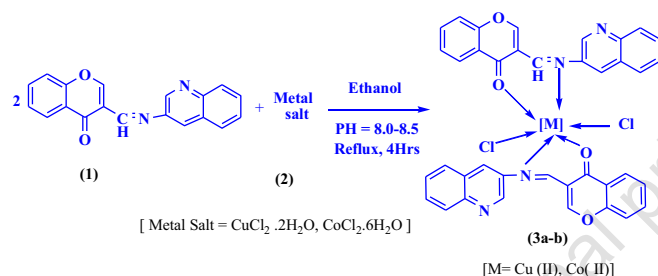
The synthesis of the Schiff base ligand (L) was accomplished by refluxing 3-formylchromone (0.87 gm, 5 mmol) and 3-aminoquinoline (0.72 gm, 10 mmol) in 5 ml of ethanol for 2 hours. The progress of the reaction was monitored by using Thin Layer Chromatography. The resulting yellow coloured product precipitated, filtered off and washed with ether and stored in vacuum desiccators over anhydrous calcium chloride. The product was purified and recrystallized with hot ethanol. Yield obtained was 76% (Scheme 1).



Scheme 1. Synthesis of the Schiff base ligand 3-((quinolino-3-ylimino)methyl)-4H-chromen-4-one.

2.2. SYNTHESIS OF METAL COMPLEXES

A hot ethanolic solution of ligand (1) (3.00 gm, 10 mmol) was added separately to the ethanolic solution of $\text{CuCl}_2 \cdot 2\text{H}_2\text{O}$ (0.85 gm, 5 mmol) and $\text{CoCl}_2 \cdot 6\text{H}_2\text{O}$ (1.18 gm, 5 mmol) (2), respectively. The reaction mixture was refluxed for 4 hours. When the metal complexes did not precipitate at the end of the refluxed time, a 50% ethanolic solution of ammonia was added to raise the P^{H} of the reaction mixture until the metal complexes (3a-b) precipitated entirely. The formed precipitate was digested for one additional hour. Any subsequently detected change in the P^{H} (8.0 to 8.5) was readjusted and the content was digested again for one hour. After cooling, the coloured precipitate obtained was collected, filtered, washed with hot ethanol, followed by petroleum ether (40–60°C) and dried in a vacuum desiccator over anhydrous granular calcium chloride (Scheme 2).



Scheme 2. Synthesis of metal complexes of ligand 3-((quinolino-3-ylimino)methyl)-4H-chromen-4-one.

3. BIOLOGICAL ACTIVITY OF SYNTHESIZED SCHIFF BASE AND ITS COMPLEXES

3.1. Preparation of Bacterial Pathogens

Bacteria stock cultures (*Klebsiella pneumoniae*, *Staphylococcus aureus*, and *Proteus vulgaris*) were sub-cultured into nutrient agar plates and incubated overnight at 37 °C. The next day, three to four discrete bacterial colonies with similar morphology were inoculated into 10 ml sterile Mueller Hinton broth (MHB) and incubated overnight at 37 °C. The overnight bacterial suspensions were adjusted to 0.5 McFarland Standard with sterile MHB broth. To aid comparison, the adjustment of bacterial suspensions to the density of the 0.5 McFarland Standard was performed against a white background with contrasting black lines.

3.2. Preparation of Resazurin Solution

Resazurin [*i.e.* (7-Hydroxy-3H-phenoxazin-3-one 10-oxide)] solution was prepared by dissolving 337.5 mg of resazurin powder in 50 ml sterile distilled water in a disinfected beaker. A sterile vortex mixer was used to mix the solution for 1 h to ensure homogeneity. The preparation procedures were performed in the dark and the resazurin solution was

then kept in a brown bottle to prevent exposure to light since this compound is sensitive to light.

3.3. Resazurin-Based Assay and Minimum Inhibitory Concentration (MIC) Determination

The assay was performed in a flat bottom 96 well plate. First column was used as negative control, while from the second column onward the test drugs were added. Initially, in the second column 2X MHB (100 μl) was added, while 3rd column onwards 1X MHB (100 μl) was added. Subsequently, the tested compound at a 4000 ppm (100 μl) concentration was added to the second column, after stirring the compound solution properly in order to achieve a final concentration of 2000ppm. Later 100 μl of solution from 2nd column was taken out and added into 3rd column in order to achieve the 2 fold dilution. Finally 100 μl of culture was added to achieve 1.5 x 10⁶ cell/ml in each well. Similarly, in first row the culture along with diluent and 1 X MHB was added. After 24 hours, 5 μl resazurin (6.75 mg ml⁻¹) was added to all wells and incubated at 37 °C for another 4 h. Changes in color were observed and recorded. The lowest concentration prior to colour change was considered the Minimum Inhibitory Concentration (MIC) [25].

3.4. Procedure for Antibacterial Activity

Schiff base and their Cu(II) and Co(II) complexes were studied for antibacterial activity against *Klebsiella pneumoniae*, *Staphylococcus aureus* and *Proteus vulgaris*. In a conical flask, 50 ml volume of nutrient agar medium was prepared and then plugged with cotton and paper. The conical flask was subjected to sterilization by keeping it in an autoclave for 15 minutes at 121°C temperature and 15 lbs pressure. Sterilized nutrient agar medium was poured into sterile Petri-dishes and allowed to solidify. The sterile wire loop was used to spread the bacterial culture over petri-dishes. The dishes were labeled. The metallic bore was used to make wells in the nutrient medium.

3.5. Procedure for Antifungal Activity

3.5.1. Preparation of Potato Dextrose Agar (Pda) Medium

The Potato dextrose Agar (PDA) medium required for the growth of fungi was prepared by dissolving 200 gm of Potato, 6 gm of dextrose, 15 gm of agar and 0.5 gm of $\text{MgSO}_4 \cdot \text{H}_2\text{O}$ in one liter of sterile distilled water. The Potato dextrose Agar medium is a source of carbohydrate and nitrogen, which are both activators for growth.

3.5.2. Preparation of Spores Suspension of Fungi Used

Seventy-two hours old cultures of *C. albicans* and *A. niger* were used. The spores of each fungus were scraped with a sterilized nichrome wire loop and inoculated into 10 ml sterile distilled water tubes to make pure suspension of both fungi.

3.5.3. Spreading of Spore Suspension of Fungi

Solidified PDA plates were labeled according to fungi, *i.e.* *C. albicans* and *A. niger* and 0.1 ml spore suspension of respective fungi was poured with a sterile spreader to form uniform layers of spores on the surface of the agar. Plates were then labeled according to the compounds *i.e.* ligands and complexes. Then sterile Whatmann filter paper discs were dipped into the respective compounds and placed aseptically on respective labels. Plates were kept for diffusion in the refrigerator for 30 minutes and then incubated at room temperature for 48 hours. After incubation, zone of inhibition was measured and observations were recorded in mm.

4. RESULTS AND DISCUSSION

4.1. Elemental Analysis

The analytical, physical and molar conductance data values are given in Table 1. The elemental analysis of ligand and their metal complexes was carried out by Thermo Finnigan, Italy CHN analyzer at SAIF, IIT, Bombay. The analytical data predicted that the metal to ligand ratio is 1:2 in all the complexes. The molar conductance value of complexes was measured in DMF at 1×10^{-3} M using "ELICO" digital conductivity meter CM 180 with a range $20\mu\Omega$ to 20 m Ω at 298 K temperature indicating their non-electrolytic nature. The measurement of magnetic susceptibility was carried out at room temperature by Gouy balance consisting of an electromagnet with a suitable power supply and a single pan-semi microbalance, E-Mettler-Zurich, Swiss-make-H-1640 with a maximum capacity of 80 mg and a precision ± 0.01 mg.

All the complexes were coloured, non-hygroscopic and stable in air. The ligand was dissolved in chloroform, while the metal complexes were dissolved in DMF and DMSO but are insoluble in many organic solvents.

4.2. Electronic Spectral Analysis

UV-Vis spectra were recorded on SHIMADZU-UV-160A UV/Visible double beam spectrophotometer in the region 190-1100 nm using quartz optic tubes of 2 cm path length

using pure solvent as reference. The absorption spectra of the Schiff base and its Cu(II) and Co(II) complexes were measured in DMSO solution in wavelength range of 200-1000 nm. The electronic spectra of the ligand show two bands, one band at 23201 cm^{-1} attributing to the $\eta \rightarrow \pi^*$ transition. Another band at 32786 cm^{-1} is due to the $\pi \rightarrow \pi^*$ transition [27, 28]. The electronic spectra of Cu(II) exhibit three bands at $12048\text{ cm}^{-1}(\nu_1)$, $14903\text{ cm}^{-1}(\nu_2)$ and $24330\text{ cm}^{-1}(\nu_3)$ that are assigned to ${}^2B_{1g} \rightarrow {}^2B_{2g}$, ${}^2B_{1g} \rightarrow {}^2E_g$ and LMCT transitions, respectively. These bands are characteristic of distorted octahedral geometry. The observed magnetic moment 1.81 B.M. is also in support of the proposed octahedral geometry of Cu(II) complex [28-29]. The Co(II) complex has shown three characteristic absorption bands at $9213\text{ cm}^{-1}(\nu_1)$, $15015\text{ cm}^{-1}(\nu_2)$ and $24213(\nu_3)\text{ cm}^{-1}$ which may be assigned to ${}^4T_{1g}(F) \rightarrow {}^4T_{2g}(F)$ (ν_1), ${}^4T_{1g}(F) \rightarrow {}^4A_{2g}(F)$ (ν_2), and ${}^4T_{1g}(F) \rightarrow {}^4T_{1g}(P)$ (ν_3) transitions, respectively, all characteristic of octahedral geometry. The magnetic moment of the Co(II) complexes observed at 3.79 B.M. is consistent with the literature values in the range of 3.72 - 3.92 B.M. reported for the octahedral geometry of the Co(II) complex [28]. The observed magnetic moment and electronic absorption data of Cu(II) and Co(II) complexes are given in Table 2. The positions of complexes in electronic absorption spectra are given in Fig. 1 to 3.

4.3. Infrared Spectral Analysis

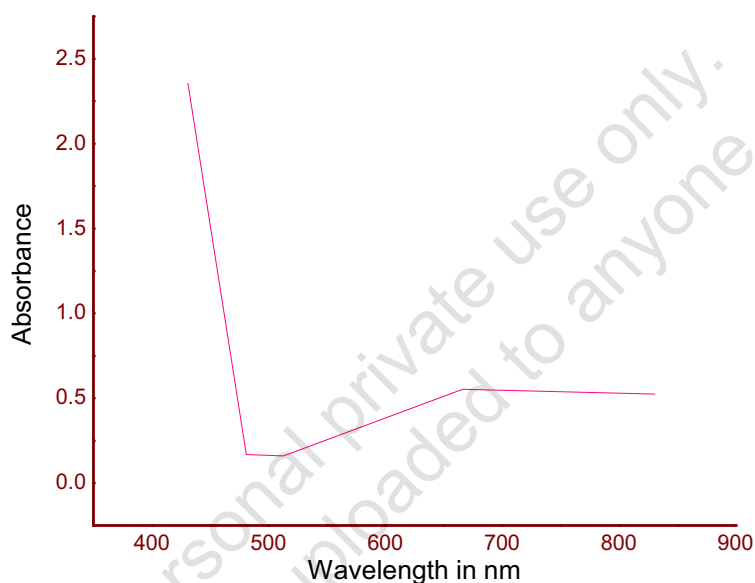
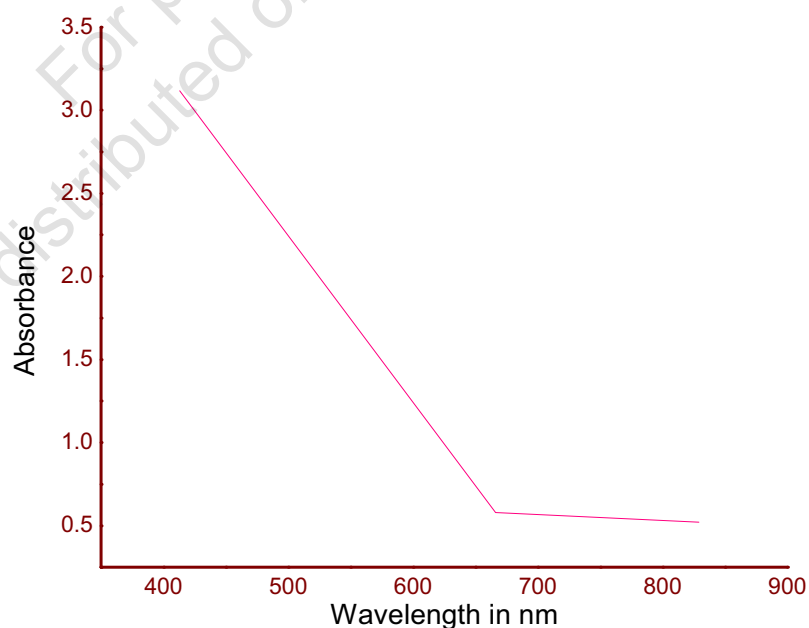
IR spectra were recorded on a Bruker spectrophotometer over the range of 4000 cm^{-1} to 450 cm^{-1} using the KBr pellet technique. Infrared spectral data of the ligand and its metal complexes are listed in Table 3 and IR graphs are shown in Figs. 4 to 6. In the IR spectra of Schiff base the ligand showed most characteristic band of azomethine group in the IR region of 1596 cm^{-1} [28-30]. The vibrational stretching of $\nu(\text{C}=\text{O})$ carbonyl group for the ligand emerged in the region near 1650 cm^{-1} . Interestingly, P. Kavitha *et al.* described $\nu(\text{C}=\text{O})$ carbonyl group stretching in the range of $1650\text{-}1620\text{ cm}^{-1}$ [31], while B. Wang *et al.* assigned the band at 1649 cm^{-1} for $\nu(\text{C}=\text{O})$ carbonyl group of ligand [32].

Table 1. Physical, analytical and molar conductivity data of ligand and complexes.

Compounds	Molecular Formula	Mol. Wt.	Colour	M.P. (°C)	Molar Cond. ($\text{mho}^{-1}\text{mol}^{-1}\text{cm}^2$)	% Found (Calculated)			
						C	H	N	M
Ligand	$\text{C}_{19}\text{H}_{12}\text{O}_2\text{N}_2$	300.32	Yellow (76)	240	7	76.19 (75.91)	3.9 (3.99)	9.58 (9.32)	-
$[\text{Cu}(\text{L}_2)\text{Cl}_2]$	$\text{C}_{38}\text{H}_{24}\text{N}_4\text{O}_4\text{Cl}_2\text{Cu}$	735.09	Brown (82)	290	12	62.37 (62.03)	3.22 (3.26)	8.01 (7.61)	8.2 (8.64)
$[\text{Co}(\text{L}_2)\text{Cl}_2]$	$\text{C}_{38}\text{H}_{24}\text{N}_4\text{O}_4\text{Cl}_2\text{Co}$	730.48	Green (80)	278	10	62.73 (62.42)	3.66 (3.28)	7.73 (7.66)	8.45 (8.06)

Table 2. Electronic absorption spectra of complexes.

Compounds	Band Position (cm ⁻¹)	Assignments	μ_{eff} (B.M.)
[Cu(L ₂)Cl ₂]	12048	${}^2B_{1g} \rightarrow {}^2B_{2g}$	1.81
	14903	${}^2B_{1g} \rightarrow {}^2E_g$	
	24330	LMCT transition	
[Co(L ₂)Cl ₂]	9213	${}^4T_{1g}(\text{F}) \rightarrow {}^4T_{2g}(\text{F}) (\nu_1)$	3.79
	15015	${}^4T_{1g}(\text{F}) \rightarrow {}^4A_{2g}(\text{F}) (\nu_2)$	
	24213	${}^4T_{1g}(\text{F}) \rightarrow {}^4T_{1g}(\text{P}) (\nu_3)$	

**Fig. (1).** Electronic absorption spectra of Schiff Base Ligand. (A higher resolution/colour version of this figure is available in the electronic copy of the article).**Fig. (2).** Electronic absorption spectra of Cu(II) complex. (A higher resolution/colour version of this figure is available in the electronic copy of the article).

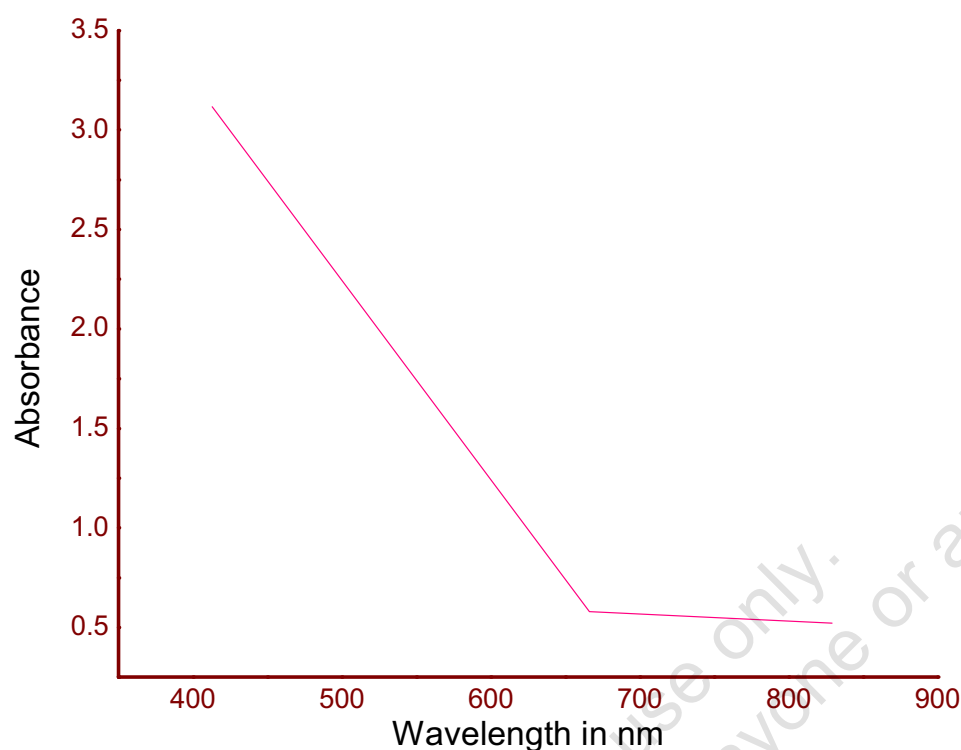


Fig. (3). Electronic absorption spectra of Co(II) complex. (A higher resolution/colour version of this figure is available in the electronic copy of the article).

Table 3. IR absorption spectra of schiff base ligand and its complexes.

Compounds	Bond Vibrational Modes (stretching- ν). Band Position (cm^{-1})				
	$\nu(\text{C}=\text{N})$	$\nu(\text{C}=\text{O})$	$\nu(\text{C}=\text{C})$	$\nu(\text{M}-\text{O})$	$\nu(\text{M}-\text{N})$
Ligand	1596	1650	1491	-	-
$[\text{Cu}(\text{L}_2)\text{Cl}_2]$	1582	1650	1465	433	526
$[\text{Co}(\text{L}_2)\text{Cl}_2]$	1580	1647	1489	464	528

The IR spectra of Cu(II) complexes have shown a strong band at about 1582 cm^{-1} assigned to C=N stretching frequency. Compared to their free ligand, it is shifted to a lower wavenumber by 14 to 38 cm^{-1} . This gave the evidence for involving the azomethine nitrogen bonding with central Cu(II) ion [28, 33]. The band in the region of 1649 cm^{-1} corresponds to carbonyl C=O stretching in the complexes, while in their free ligands, this band is found at 1650 cm^{-1} . In the complex formation, this band is shifted to lower wavenumber by 4 to 40 cm^{-1} . This indicates the carbonyl oxygen engaged in the coordination with central Cu(II) ion [34]. The IR stretching frequency of $\nu(\text{M}-\text{O})$ and $\nu(\text{M}-\text{N})$ bonds appeared in the IR range 433 cm^{-1} and 526 cm^{-1} attributed to the coordination of oxygen and nitrogen with Cu(II) ion, respectively [25]. In the IR spectra of Co(II) complexes, the strongest bands ap

peared at 1580 cm^{-1} and were assigned to C=N azomethine stretching frequency. During complex formation, the band was shifted to lower wavenumber compared to their free ligand and at 1596 cm^{-1} . This lowering of frequency indicates that the azomethine nitrogen coordinates to central Co(II) ion. The carbonyl frequency C=O of Co(II) complexes appeared in the IR region of 1647 cm^{-1} . In the free ligand carbonyl stretching frequency is found at 1650 cm^{-1} . In the complex formation, IR frequency shifted towards the lower wave by 2 to 46 cm^{-1} compared to their free ligands. This clearly indicates that the carbonyl oxygen is involved in the coordination with central Co(II) ion [35-37]. The IR stretching frequency of $\nu(\text{M}-\text{O})$ and $\nu(\text{M}-\text{N})$ bonds appeared in the IR range 464 cm^{-1} and 528 cm^{-1} and these signals are attributed to the coordination of oxygen and nitrogen with Co(II) ion, respectively.

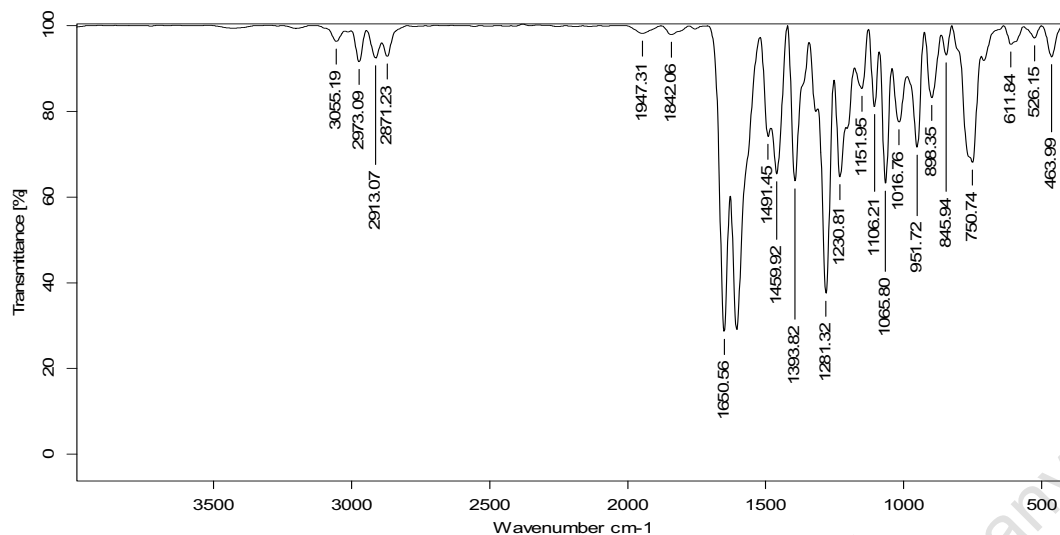


Fig. (4). IR spectrum of Schiff base ligand. (A higher resolution/colour version of this figure is available in the electronic copy of the article).

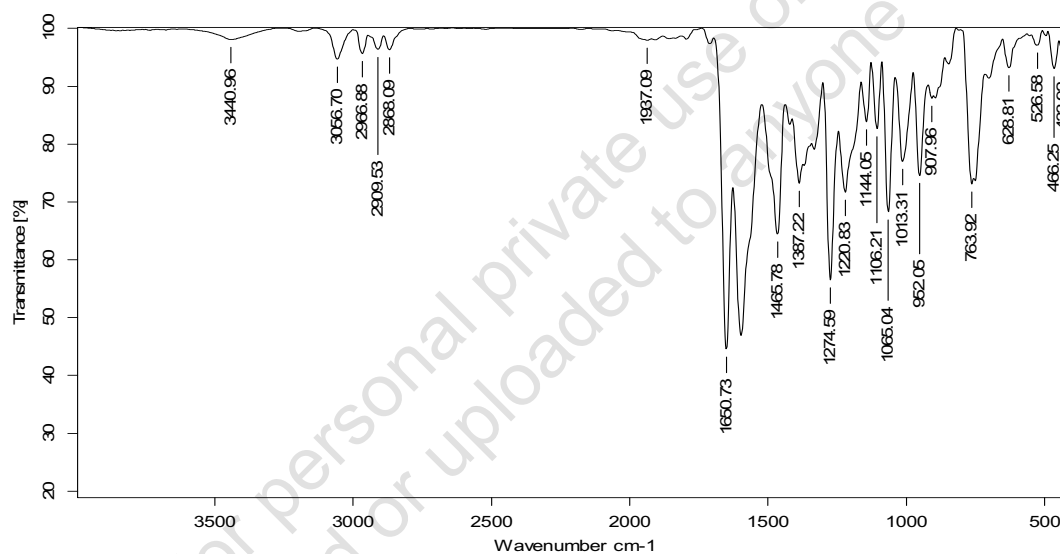


Fig. (5). IR spectrum of Cu(II) complex. (A higher resolution/colour version of this figure is available in the electronic copy of the article).

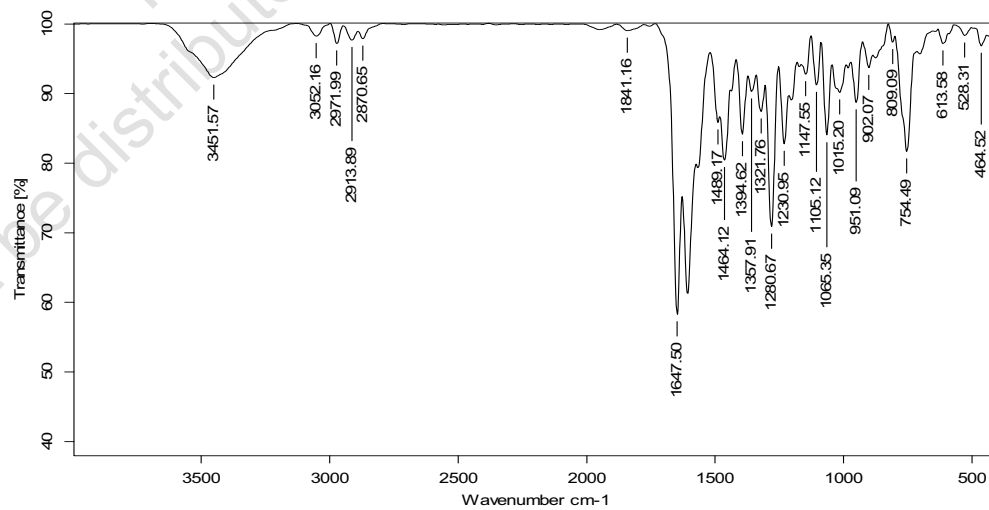


Fig. (6). IR spectrum of Co(II) complex. (A higher resolution/colour version of this figure is available in the electronic copy of the article).

4.4. ¹H NMR SPECTRAL ANALYSIS

The ¹H NMR Spectra of Schiff bases and their metal complexes were recorded on a Bruker 300 MHz spectrometer in deuterated organic solvent DMSO with tetramethylsilane (TMS) as the internal standard. The ligand has shown a signal at 8.02 ppm, which confirmed the formation of azomethine (CH=N-) group [29, 38]. The multiplet signals in the range of 6.1 ppm to 7.9 ppm revealed the protons of aromatic ring of chromone nucleus [39]. The protons of quinoline nucleus led to multiplet signals in the range of 7.6 to 9.02 ppm [40]. The water impurity of the deuterated DMSO caused a singlet at 3.7 ppm [41].

During complex formation, the signal of the azomethine proton is shifted downfield at 8.27 ppm, which revealed the involvement of coordination between Cu(II) ion and azomethine nitrogen. The azomethine signal of the Co(II) complex of ligands falls at 8.23 ppm. This NMR signal is downfield compared to their free parent ligand, which revealed the complex formation between Co(II) ion and the azomethine nitrogen of the ligand. The chemical shift of protons of chromone nucleus and quinoline nucleus are reported in Table 4. There is a slight difference in the chemical shift positions of proton signals of chromone nucleus and quinoline nucleus of ligand and their metal complexes [42]. The broad signals in the NMR spectra of metal complexes at 2 to 3.5 ppm are due to the DMSO solvent, which was used during NMR analysis (Table 4).

4.5. Thermogravimetric Analysis

Thermogravimetric analysis was performed on a PERKIN ELMER instrument (USA, Diamond TG/DTA Instruments) in an inert atmosphere of inert gas and the heating rate was 10 °C min⁻¹ over a temperature range of 10 °C to 1000 °C. The thermal decomposition data are mentioned in Table 5 and TGA curve is reported in Figs. 7 and 8. The complexes are stable up to 150-170 °C. Thermal decomposition of Cu(II) complex is achieved in two steps. The weight loss of 9.83 % (Calc. 9.64 %) revealed the presence of coordinated chloride ions. In a second step, the temperature range 180 – 940°C caused a weight loss of 78.60 % (Calc. 79.44 %) indicating an organic moiety. A CuO residue was left with constant weight 11.23 % (Calc. 10.80 %) [43, 44].

Table 4. NMR data of Schiff Base ligand and their complexes.

Compounds	Chemical Shift (ppm)	Assignment
Ligand	8.02	(H, S, -HC=N- azomethine proton)
	7.04-7.8	(m, aromatic protons of chromone nucleus)
	7.4-9.02	(m, aromatic protons of quinoline nucleus)
[Cu(L) ₂ Cl ₂]	8.27	(H, S, -HC=N- azomethine proton)
	6.2-7.7	(m, aromatic protons of chromone nucleus)
	7.8-8.8	(m, aromatic protons of quinoline nucleus)
[Co(L) ₂ Cl ₂]	8.23	(H, S, -HC=N- azomethine proton)
	6.2-7.6	(m, aromatic protons of chromone nucleus)
	7.9-8.8	(m, aromatic protons of quinoline nucleus)

Thermal behavior of Co(II) complex showed a two steps degradation. The weight loss of 9.65 % (Calc. 9.65 %) in the first step was attributed to the presence of two coordinated or lattice chloride ions. The weight loss of 78.80 % (Calc. 79.94 %) revealed the lost mass of organic ligand moiety. CoO residue was left with constant weight 11.50 % (Calc. 10.93 %) [45] (Table 5 and Figs. 7 and 8).

Table 5. Thermal analysis data of Cu(II) and Co(II) complexes.

Complex	Temperature	Weight Loss		Inference
		Observed	Calculated	
[Cu(L) ₂ Cl ₂]	90 – 170	9.83	9.64	Loss of two coordinated chloride ions
	180 – 940	78.60	79.44	Loss of organic ligand molecule
	>940	11.23	10.80	CuO residue remain left
[Co(L) ₂ Cl ₂]	90 – 150	9.65	9.7	Loss of two coordinated chloride ions
	200 - 960°C	78.8	79.94	Loss of organic ligand molecule
	>960°C	11.5	10.93	CoO residue remain left

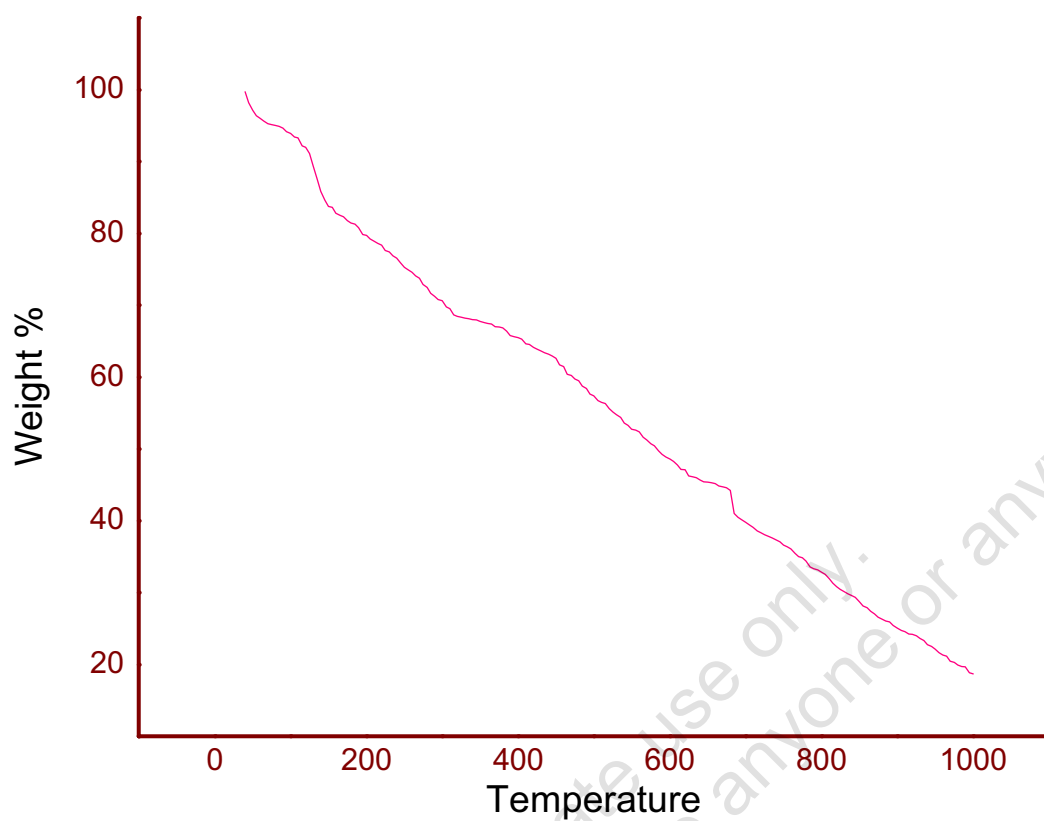


Fig. (7). TGA curve of Cu(II) complex. (A higher resolution/colour version of this figure is available in the electronic copy of the article).

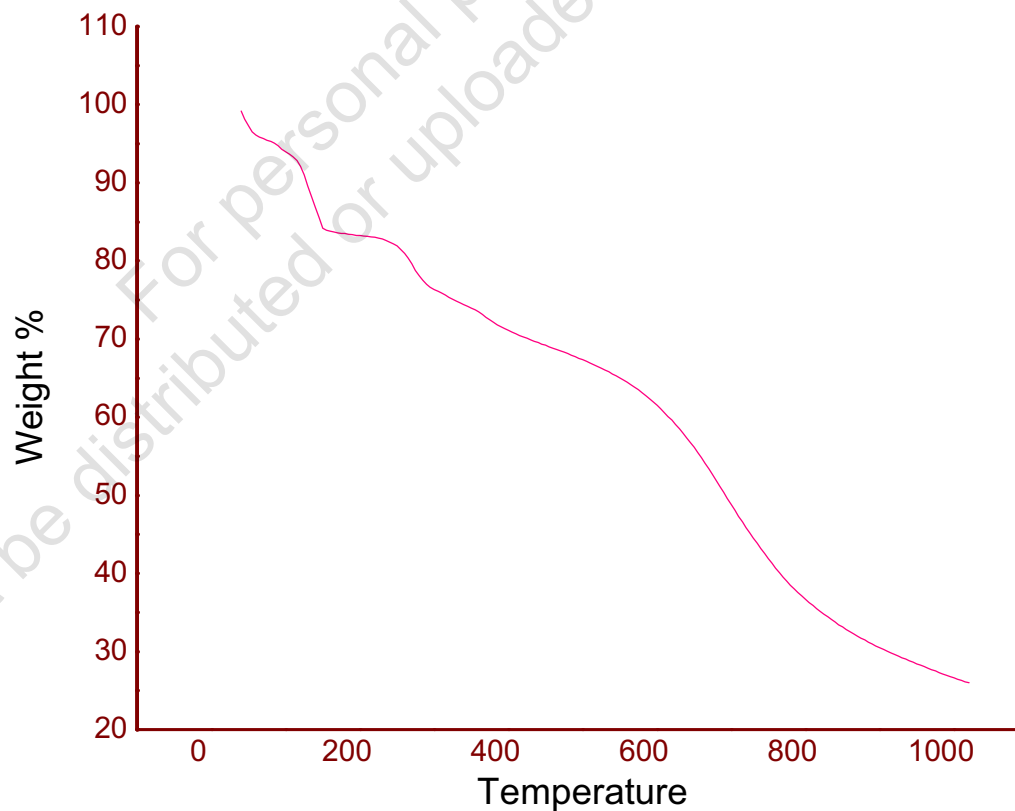


Fig. (8). TGA curve of Co(II) complex. (A higher resolution/colour version of this figure is available in the electronic copy of the article).

4.6. Powder X-Ray Diffraction Studies

X-ray powder diffraction studies of Cu(II) and Co(II) complexes were carried out (Figs. 9 and 10). The trial and error method was used for indexing the main peaks of X-ray powder data [46]. Data were indexed in such a way that the standard deviation for their lattice parameters was kept to minimum.

The standard deviation in lattice constant parameter was found in the permissible limit. The volume of the crystal was derived from indexing of the diffraction pattern. The Z value was calculated and rounded up to the nearest whole number. The observed and calculated densities were used to find the porosity percentage.

4.6.1. The Calculated Density and Observed Density

The fact that the calculated and actual densities were so near has demonstrated the accuracy of indexing.

Both the complexes are monoclinic with unit cell parameters are as follows: for Cu(II) complex: $a = 8.43$ $b = 10.61$ $c = 7.34$, $\alpha = 90$ $\beta = 101.67$ $\gamma = 90$, Density (d_{obs}) = 2.9172, Density (d_{cal}) = 2.8047, $V = 823 \text{ \AA}^3$, Porosity % = 2.47, Particle size = 353.34 \AA and Space Group = P21/c and $Z = 2$, Crystal system – Monoclinic; for Co(II) complex: $a = 11.42$ $b = 6.14$ $c = 8.23$, $\alpha = 90$ $\beta = 112.53$ $\gamma = 90$, Density (d_{obs}) = 2.471, Density (d_{cal}) = 2.504, Porosity % = 2.617 and $V = 1073 \text{ \AA}^3$, Particle size = 321.43 \AA and Space Group = P21/c and $Z = 4$, Crystal system- Monoclinic (Tables 6 and 7)

4.7. Minimum Inhibitory Concentration (MIC)

The growth of microbes and fungal spores are checked in the form of turbidity by using different concentrations of metal complexes in broth test-tube, which help us in the identification of minimum inhibitory concentration. The higher the concentration of metal complexes lesser the turbidity observed *i.e.* turbidity directly depends on concentrations of metal complexes.

4.8. Antibacterial Activity

Antibacterial activity was determined by measuring the diameter of zones showing complete inhibition in (mm) at 250 ppm, 500 ppm, 1000 ppm & 2000 ppm. The Cu(II) and Co(II) complexes were significantly more potent than their parent free ligand (L). The Co(II) complexes of ligand (L) are moderately active against *Klebsiella pneumoniae*, *Staphylococcus aureus* and *Proteus vulgaris* at 500 ppm with a zone of inhibition 7-11 mm. Schiff base and metal complexes are less active compared to standard tetracycline (Table 8 and Fig. 11).

4.9. Antifungal Activity

The results of our antifungal activity assays revealed that both the ligand and the metal complexes inhibited the growth of *Candida albicans* and *Aspergillus niger*. However, both the metal complexes showed higher antifungal activities than their parent free ligand. The Schiff base and their Cu(II) complex are significantly active against *Candida albicans* at 500 ppm concentration and the zone of inhibition was found to be 14 mm. The Schiff Base and their metal complexes have shown comparable antifungal activity to the standard tetracycline used as a reference drug (Table 9 and Fig. 12).

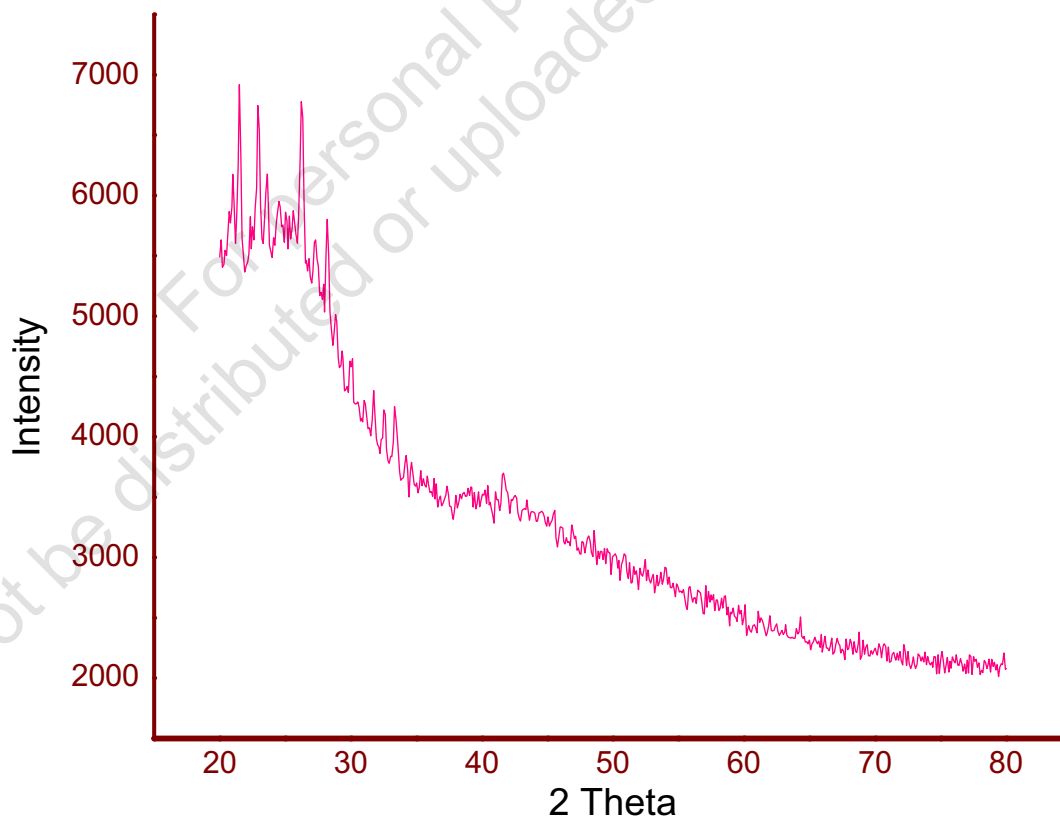


Fig. (9). X-ray diffractogram of Cu(II) complex. (A higher resolution/colour version of this figure is available in the electronic copy of the article).

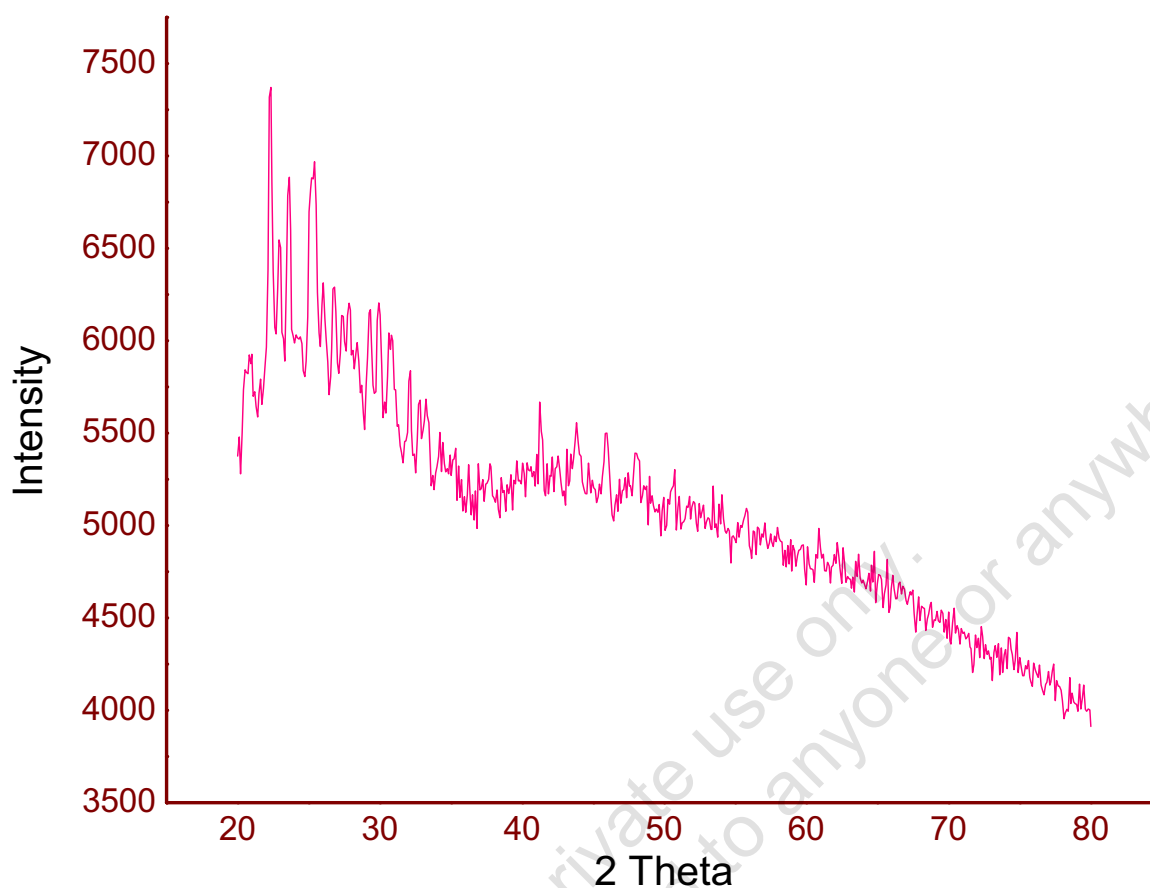


Fig. (10). X-ray diffractogram of Co(II) complex. (A higher resolution/colour version of this figure is available in the electronic copy of the article).

Table 6. Indexed X-ray diffraction data of Cu(II) complex of ligand L.

Miller Indices h k l	2θ Obs.	2θ Calc.	d Obs.	d Calc.	Intensity
0 2 0	20.7	19.15	4.63	4.6725	52
1 1 1	21.5	21.861	4.0623	4.087	100
1 2 0	22.9	22.645	3.9234	3.9073	84
0 1 2	23	23.307	3.8135	3.8627	68
2 0 0	24.5	24.068	3.6946	3.6462	57
2 1 0	25.6	25.944	3.4315	3.4194	54
-1 0 2	26.6	26.726	3.3329	3.3491	80
1 2 1	27.3	27.555	3.2345	3.2571	44
0 1 2	28.2	28.214	3.1604	3.1864	48
1 0 2	30.1	31.449	2.8423	2.8671	29

Table 7. Indexed X-ray diffraction data of Co(II) complex of ligand L.

Miller Indices h k l	2θ Obs.	2θ Calc.	d Obs.	d Calc.	Intensity
1 0 2	20.8	20.130	4.4168	4.4113	66
1 1 1	21.0	21.50	4.1162	4.1175	68
2 1 0	22.1	21.88	4.0676	4.0608	88
3 0 0	24.4	24.365	3.6528	3.6533	47
3 0 2	25.4	25.849	3.4492	3.4468	100
0 1 2	26.0	26.313	3.3816	3.3871	80
2 1 1	27.8	27.115	3.2856	3.2887	54
3 1 0	28.4	28.555	3.1243	3.1260	34
0 2 0	29.3	29.517	3.0242	3.0263	43
1 1 2	29.9	29.965	2.9816	2.9821	56
1 2 0	30.8	30.649	2.9149	2.9171	38
0 2 1	31.2	31.531	2.8316	2.8374	30
4 0 0	32.8	32.667	2.7461	2.7413	30
1 2 1	33.4	33.691	2.6615	2.6603	25

Table 8. Antibacterial activity of schiff base and their metal complexes.

Compounds	<i>K. pneumoniae</i>				<i>S. aureus</i>				<i>P. vulgaris</i>			
	250 ppm	500 ppm	1000 ppm	2000 ppm	250 ppm	500 ppm	1000 ppm	2000 ppm	250 ppm	500 ppm	1000 ppm	2000 ppm
Ligand	3	5	8	11	2	5	9	12	4	7	11	14
[Cu(L) ₂ Cl ₂]	4	7	9	13	3	7	11	15	6	9	11	14
[Co(L) ₂ Cl ₂]	6	9	13	16	6	8	12	15	7	11	14	18
Tetracycline	15	17	18	20	14	16	16	17	17	19	20	20

Table 9. Antifungal activity of Schiff Base and their metal complexes.

Compounds	<i>Candida albicans</i>				<i>Aspergillusniger</i>			
	250 ppm	500 ppm	1000 ppm	2000 ppm	250 ppm	500 ppm	1000 ppm	2000 ppm
Ligand	8	14	17	20	2	4	7	9
[Cu(L) ₂ Cl ₂]	8	14	15	18	4	7	11	15
[Co(L) ₂ Cl ₂]	5	9	14	19	2	4	9	11
Tetracycline	14	14	17	19	11	12	14	16

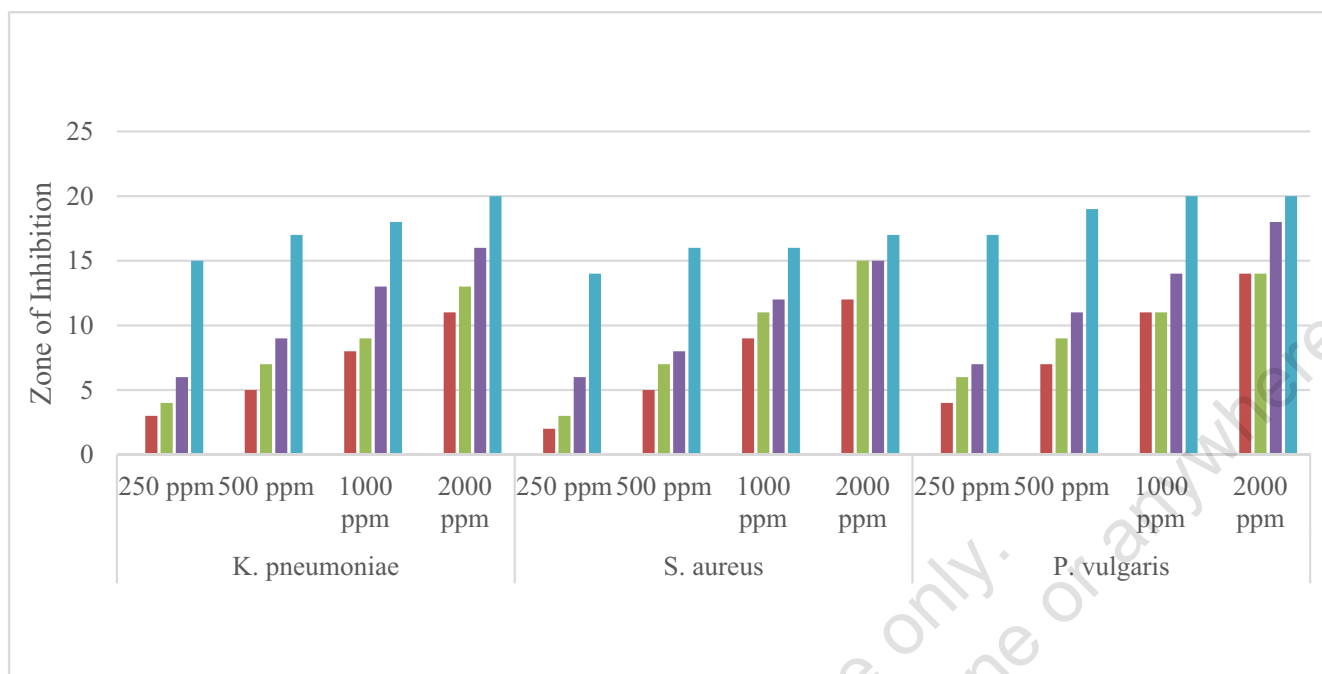


Fig. (11). Antibacterial activity of Schiff Base and their metal complexes. (A higher resolution/colour version of this figure is available in the electronic copy of the article).

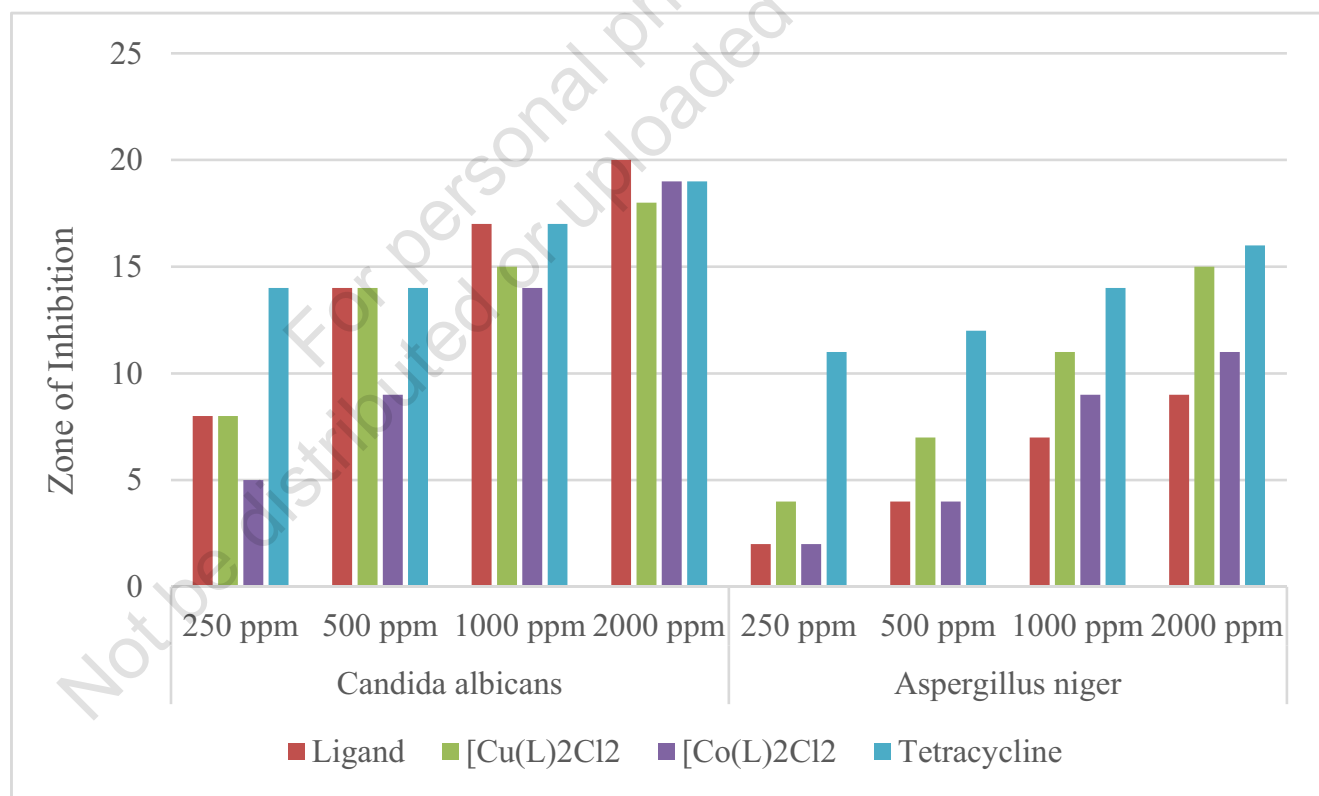


Fig. (12). Antifungal activity of Schiff Base and their metal complexes. (A higher resolution/colour version of this figure is available in the electronic copy of the article).

CONCLUSION

Cu(II) and Co(II) complexes with a bidentate Schiff base ligand derived from 3-formylchromone and 3-aminoquinoline were synthesized. Schiff base and their metal complexes were characterized by physical and analytical parameters. Electronic data and magnetic susceptibility measurements proved the octahedral geometry of both the metal complexes. Thermogravimetric analysis revealed the thermodynamic stability of the complexes, as well as two chloride ions of Cu(II) and Co(II) complexes, which were found to be part of the coordination sphere. Powder XRD data provided structural characterization and determination of lattice dimensions and demonstrated monoclinic crystal system for both the complexes. Our antibacterial and antifungal activity studies suggest that the metal complexes are more potent than the Schiff base. All these findings let us hypothesize that both the complexes are interesting lead compounds worthy of further structural optimization and development as potential antimicrobials.

LIST OF ABBREVIATIONS

°C	=	Degree Celsius
CDCl ₃	=	Deuterated Chloroform
cm ⁻¹	=	Per centimeter
DMSO	=	Dimethyl Sulfoxide
EtOH	=	Ethanol
FTIR	=	Fourier Transform Infrared Spectroscopy
M	=	Molar
MeOH	=	Methanol
Mg	=	Miligram
MHz	=	Mega Hertz
Mol	=	Molar
Nm	=	Nanometer
pH	=	Potence Hydrogen
ppm	=	Parts per million
RT	=	Room temperature
TG/DTA	=	Thermogravimetric/ Differential Thermogravimetric Analysis
TLC	=	Thin Layer Chromatography
TMS	=	Tetramethyl Silane
M. P.	=	Melting Point
B. P.	=	Boiling Point
Mmol	=	Milimole

AUTHOR'S CONTRIBUTION

Sushil Keshvrao Ghumbre has made the reference, synthesis, elemental analysis and physical properties of Schiff Base and their metal complexes.

Amol Vishnudas Patil has worked on X-ray diffraction studies.

Atul Sarngrao Renge has studied the IR spectra of synthesized molecules.

Satish Ashruba Dake has worked on UV-visible spectra.

Bhimrao Chintamanrao Khade has worked on the Antibacterial and antifungal studies

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

HUMAN AND ANIMAL RIGHTS

Not applicable.

CONSENT FOR PUBLICATION

Not applicable.

AVAILABILITY OF DATA AND MATERIALS

Not applicable.

FUNDING

None.

CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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Synthesis of 2, 3- Dihydroquinazolin-4(1H)-Ones Derivatives

Atul S. Renge¹, Kisan K. Gadge¹, Sushil K. Ghumbre², Manisha S. Barahte³

Department of Chemistry

Konkan Gyanpeeth Karjat College of ASC, Karjat, Raigad, Maharashtra, India¹

I.C.S. College of Art's, Commerce and Science, Khed, Ratnagiri, Maharashtra, India²

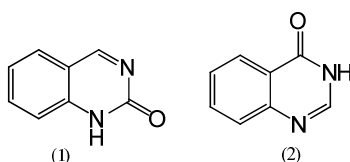
K.M.C. College, Khopoli, Raigad, Maharashtra, India³

Abstract: 2,3-Dihydroquinazolin-4(1H)-one possess a wide range of pharmacological and biological activities and have important applications in the fields of synthesis and research & development of drugs. Therefore, its synthetic methods have also attracted considerable attention. In this paper, some synthetic methods in the synthesis of 2,3-dihydroquinazolin-4(1H)-ones were reviewed.

Keywords: Quinazolinone derivatives; o-aminobenzamides; isatoic anhydrides; N-alkyl anilines; C—H activation & functionalization.

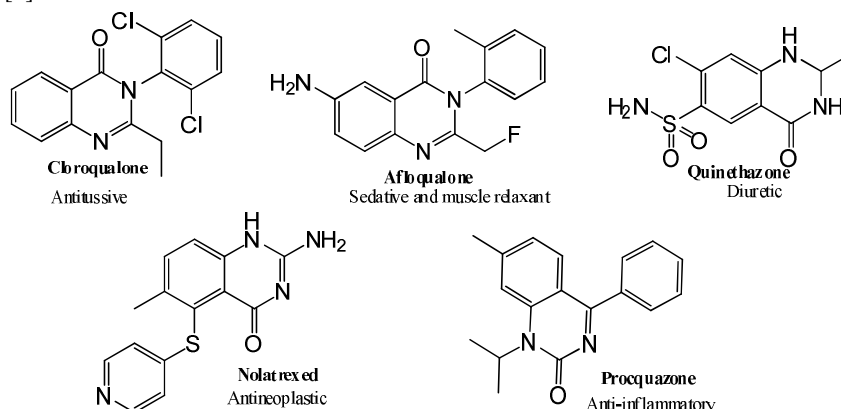
I. INTRODUCTION

Quinazolinone is a heterocyclic compound with two conjoined aromatic rings incorporating two nitrogen atoms and one carbon oxidized with keto oxygen. It is present in two structural isomeric forms namely 2-quinazolinone (1) and 4-quinazolinone (2).



2,3-Dihydroquinazolin-4(1H)-one possess a wide range of pharmacological and biological activities and have important applications in the fields of synthesis and research & development of drugs.

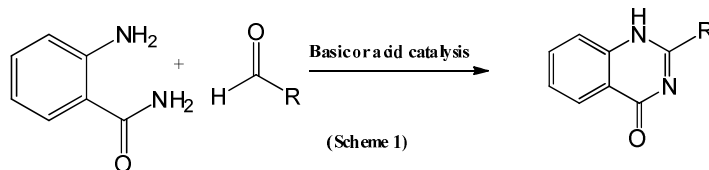
Quinazolinones constitute a class of sedative drugs that contain a 4-quinazolinone core. These compounds acquire a unique place in pharmaceutical and medicinal chemistry [1]. Quinazolinone and related compounds are the building blocks of more than 150 natural products [2]. Afloqualone (3) is a quinazolinone derivative commonly functioning as sedative and muscle relaxant [3]. Cloroqualone (4) is a sedative and has antitussive (against cough) properties resulting from its agonist activity [4]. Quinethazone (5); commonly known as hydromox is a diuretic used in the treatment of hypertension [5]. Halogenated derivative of fuginone is used in veterinary medicine as a coccidiostat (an antiprotozoal agent that acts upon Coccidia parasites [6]).



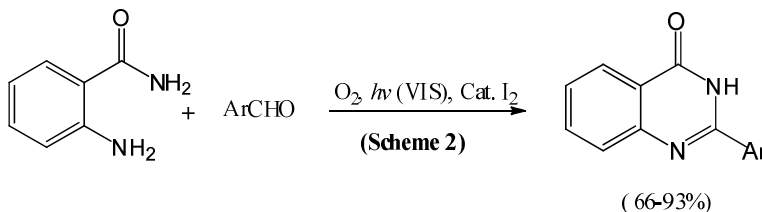


Considering the therapeutic potential and wide range of biological activities associated with quinazolinones; there has been an enormous increase in the attention of medicinal and synthetic organic chemists towards this class of heterocyclic compounds. Consequently search for the development of new synthetic strategies for the synthesis of quinazolinone derivatives becomes essential.

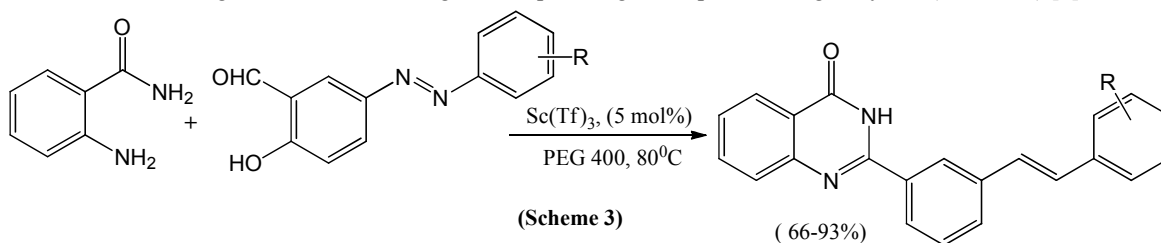
Although numerous strategies have been developed for the construction of the DHQ core, the most common and simple synthetic route for the preparation of DHQs is the direct cyclocondensation of anthranilamide and an aldehyde (Scheme 1).



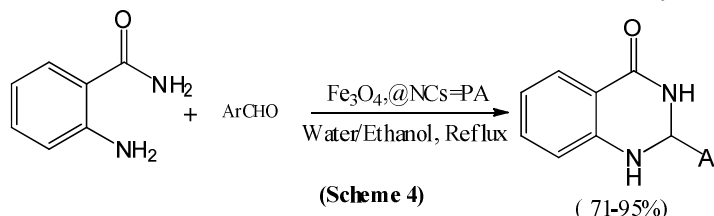
Y. Nagasawa studied the synthesis of 2-aryl-4-quinazolinones from aromatic aldehydes and aminobenzamides through a cyclization-oxidation sequence using iodine as catalyst, visible light irradiation, and molecular oxygen with moderate to good yield. (Scheme 2) [7]



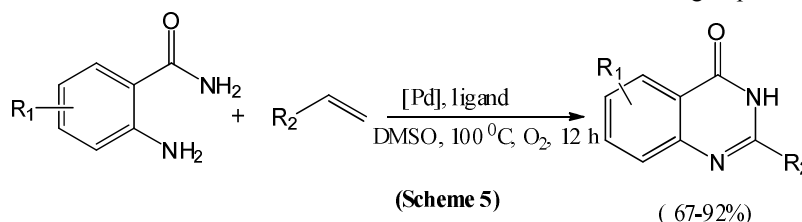
Scandium triflate was reported as reusable catalyst for 80 °C temperature synthesis of novel dibenzo[*b,f*][1,5]oxazocin-6-ones in PEG-400 as a greener medium. Using this simple and greener protocol in good yields (Scheme 3) [8]



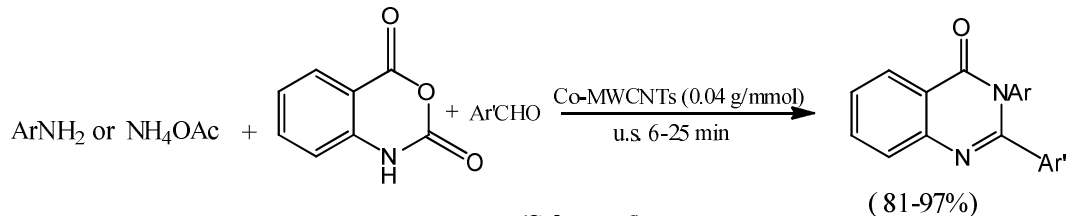
Fe₃O₄@nano-cellulose-OPO₃H was documented as magnetic bio-based nanocatalyst for the synthesis of 2,3-dihydroquinazolin-4(1*H*)-ones via condensation of 2-aminobenzamide and different aldehyde. (Scheme 4) [9]



W. Liu studied Palladium-catalyzed oxidative cleavage/cyclization for the synthesis of various quinazolinone derivatives from readily available 2-aminobenzamides and terminal alkenes with excellent functional group tolerance. (Scheme 5) [10]

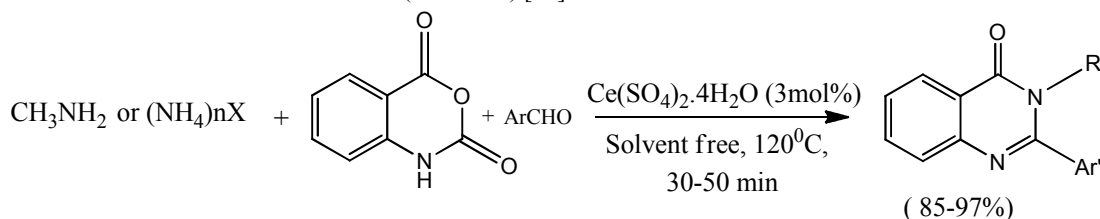


J. Safari reported Multi-walled carbon nanotubes (MWCNTs) as the heterogeneous heterogeneous catalyst under ultrasound irradiation for the synthesis of mono and di-substituted dihydroquinazolinones by three-component condensation of isatoic anhydride, ammonium acetate or primary amines and aromatic in excellent yield (Scheme 6) [11].



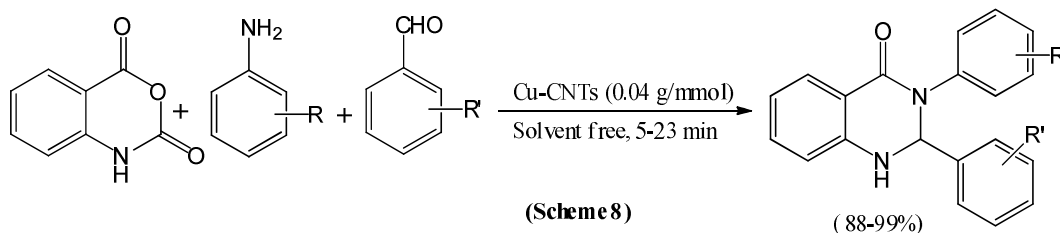
(Scheme 6)

Cerium (IV) sulfate tetrahydrate was used as a reusable inorganic solid acid catalyst for the synthesis of 2,3-dihydroquinazolin-4(1H)-ones by one-pot three-component reaction of isatoic anhydride, aromatic aldehydes and a nitrogen source under solvent-free condition (Scheme 7) [12].



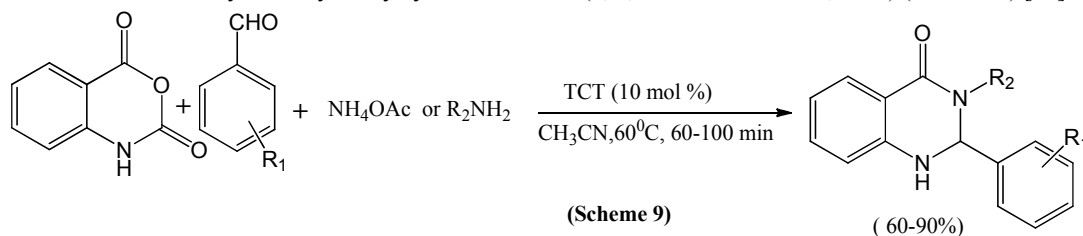
(Scheme 7)

An environmentally benign copper carbon nanotubes catalyzed employed in the synthesis of 2,3-dihydroquinazolin-4(1H)-one derivatives via the reaction of isatoic anhydride, ammonium acetate or primary amines and aldehydes in high yield by J. Safari (Scheme 8) [13].



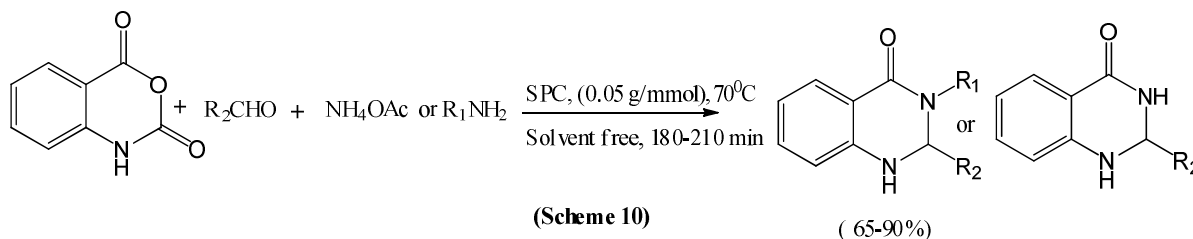
(Scheme 8)

M. Sharma reported synthesis of 2, 3-dihydroquinazolin-4(1H)-ones by the reaction of isatoic anhydride, amine or ammonium acetate and aldehyde catalyzed by cyanuric chloride (1, 3, 5 trichloro triazine; TCT) (Scheme 9) [14].



(Scheme 9)

Synthesis of 2, 3-dihydroquinazolin-4(1H)-ones were synthesized by using a catalytic amount of sulfonated porous carbon (SPC) as a reusable catalyst under solvent-free condition by A. Shokrolahi [15]. The catalyst was reused for several times and was found to work efficiently (Scheme 10).



II. CONCLUSION

In this review we have discussed about different biological activity of 2,3-Dihydroquinazolin-4(1H)-one and their synthetic methods. It is clear from above discussion that 2, 3-Dihydroquinazolin-4(1H)-one is a precursor of different heterocyclic moiety of valuable medicinal compounds.

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A Short Review on Biological Importance of Schiff Base and their Transition Metal Complexes Derived from 3-formylchromone and its Derivatives

S. K. Ghumbre¹, A. S. Renge²

Department of Chemistry, I.C.S. College of Arts, Commerce and Science, Khed, Ratnagiri, Maharashtra, India¹

Department of Chemistry, K.G.K. of Arts, Commerce and Science, Karjat, Raigad, Maharashtra, India²

Email: sghumbre6680@gmail.com¹

Abstract: Coordination compounds contributed their enhancing prevalence in biology and chemistry. To sustain normal functioning of living body biologically active molecules such as coordination compounds play a key role in investigating the bodily process. Due to various applications of such metal complexes, coordination becomes emerging field in recent years. Chemists have remarkable attention towards Schiff base and their metal complexes for their synthetic and effective biological role. Metal complexes have biological origin to perform various metabolic processes.

Keywords: Schiff Bases, Ligand, Antibacterial activity, Metal complexes

I. INTRODUCTION

The chemistry of coordination compounds is an intrinsic field and foundation of modern inorganic chemistry. Accretion of coordination chemistry revealed new way regarding the concept of chemical bonding. Coordination chemistry has variety of applications in many branches of sciences. The study of schiff bases and metal complexes is most focused and interested research area of inorganic chemistry. Schiff bases employed by coordination compounds acquired prime importance in this era. Coordination compounds carried out ample of vital role in human physiology. Alfred Werner got Noble prize in 1913 for his precious contribution in the field of coordination chemistry. Werner theory of coordination compound depends on stereochemistry and mechanism of isomerism etc. The emphasis to know geometry of the complexes through metal ligand bonding. Research and development in the area of coordination chemistry has been came from time of Werner is the milestone in the progress of modern inorganic chemistry. Coordination chemistry carried a leading role in distinct fields as bioinorganic chemistry, dyes metallurgy, nuclear fuel, material science, electronics, catalysis, toxicology, medicine etc. The Schiff bases contain imine or azomethine functional moiety. Their existence may be natural or synthetic. Schiff Bases named after Hugo Schiff in 1864, in which the carbonyl group is replaced by an imine and azomethine group¹.

II. RESULT AND DISCUSSION

In modern coordination chemistry, the Schiff base and its metal complexes deal a vital role. The ability of Schiff base to link by coordinate bond with many metal ions through both azomethine group and phenolic group²⁻⁵. Chemists have attention for Schiff base and its metal complexes due to biological vitality including anti-tumor, antibacterial, fungicidal, and anti-carcinogenic properties⁶⁻¹¹ and catalytic activity¹²⁻¹⁷.

P. Kavitha and K. Laxma Reddy¹⁸ synthesized Pd(II) complexes from 3-formylchromone and 2-aminophenol, 2-amino benzoic acid, 2-amino-3-hydroxy pyridine, 2-amino thiol and 2-amino pyridine Figure 1 and 2. All Pd(II) complexes are coloured, non-hygroscopic, stable in air, insoluble in water and many common organic solvents but soluble in DMF and DMSO. Complexes were characterized by physico analytical techniques. Electronic and magnetic data suggest the square-planar geometry for all Pd(II) complexes. Powder XRD data revealed the crystalline nature of the complexes. Pd(II) complexes exhibit less to moderate antimicrobial activity.

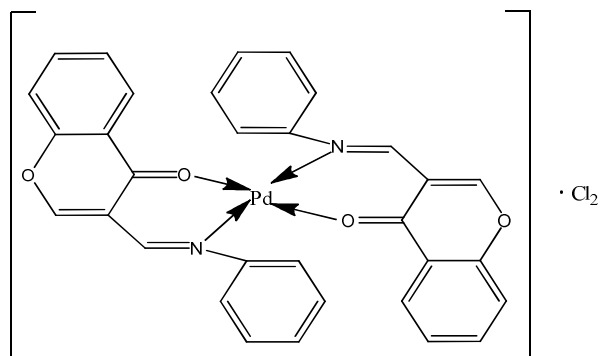


Figure: 1

Figure: 2

P. Kavitha et.al.¹⁹ synthesized Cu(II), Co(II), Ni(II) and Zn(II) complexes obtained from 3-formylchromone and 2-amino pyridine Figure 3. All the complexes were characterized by analytical, conductivity, IR, electronic, magnetic, ESR, thermal, powder XRD and SEM studies. The proposed octahedral structure of the complexes have revealed on the basis of magnetic and electronic spectral data. The X-ray diffraction studies indicate triclinic system for all the complexes. Thermal studies of the complexes shown the existence of coordinated and lattice water molecules. The homogeneous nature of the complexes has shown by the SEM studies. The metal complexes have superior antimicrobial and nematocidal activities than the Schiff bases. The DNA cleavage activity of ligand and its complexes has shown in the presence of H₂O₂.

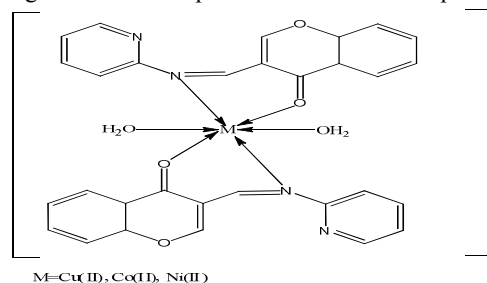


Figure: 3

C. Anitha et.al.²⁰ synthesized azo complexes of VO(II), Co(ii), Ni(II), Cu(II) and Zn(II) of Schiff base derived from 5-(4-chloro-phenylazo)-2-hydroxy benzaldehyde, 3-formylchromone and p-phenylenediamine. The structural elucidation of the complexes were carried by the elemental analysis, IR, UV-Vis, ¹H NMR and mas spectra and further studied by molar conductance, magnetic susceptibility, electron spin resonance, cyclic voltammetry, nonlinear optical properties of ligand, fluorescence and SEM. The spectral data suggested octahedral geometry of the complexes. The Schiff base and its complexes were shown excellent antibacterial and antifungal activities. The proposed structure as shown in figure 4.

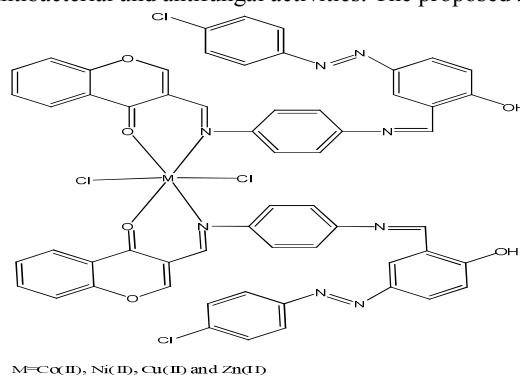


Figure: 4

T. Rosu et.al.²¹ reported Cu(II), VO(II), Ni(II) and Mn(II) complexes of Schiff base derived from 4-amino-2,3-dimethyl-1-phenyl-3-pyrazolin-5-one with 3-formyl-6-methyl-chromone. The complexes were characterized by ¹H NMR, UV-Vis,

IR, ESR spectroscopy, elemental analysis and molar conductivity. The single crystal X-ray structure of Schiff base was studied for its various weak H-bonding and dimeric association. The antibacterial studies shown that complexes have a better activity than the free ligand. The structure of Schiff base as shown in figure 5.

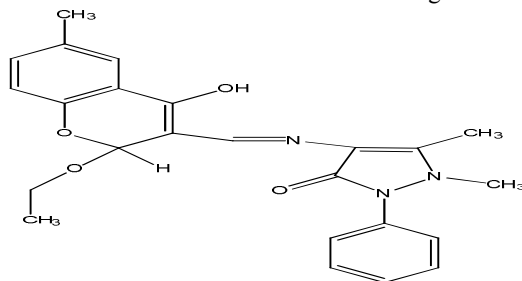


Figure: 5

III. CONCLUSION

The Schiff base metal complexes derived from oxygen heterocyclic compound 3-formylchromones and its derivatives have been center of attraction for many researchers in recent years. The chromone moiety form the vital role of the pharmacophores of a number of biologically active molecules of synthetic as well as natural origin and many of them have useful medicinal applications. 3-formylchromone occupies a unique position for two reasons. They are carrying a significant biological activity and they are attractive synthetic intermediates.

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Preparation and Characterization of Fe^{+3} , Co^{+2} First Transition Metal Ions Chelates with Heterocyclic Molecules

Bhagat S. M.

Department of Chemistry

I. C. S. College of Art's, Commerce and Science, Khed, Ratnagiri, Maharashtra, India

Abstract: The transition Metal ion chelates of Fe^{+3} , Co^{+2} is synthesized by using 2-(4'-dimethylamion phenyl)-4-bromo-6-ethoxy benzothiazolyl hydrazones and characterized by different analytical procedure and spectral study. These metal ion chelates are insoluble in common organic solvents. Infrared spectrum showed the bonding through azomethazine N and ring N.

Keywords: Benzothiazolyl Hydrazones, Metal Ion Chelates.

I. INTRODUCTION

1.1 Chemistry of Ligands

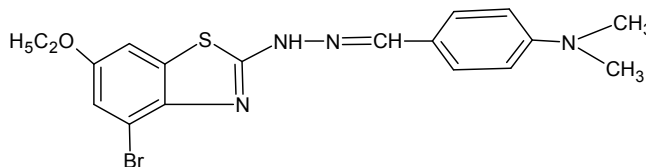
The coordination chemistry of hydrazones is an intensive area of study and numerous metal complexes of these ligand have been investigated¹. The development of the field of bioinorganic chemistry has increased the interest in Schiff base complexes, since it has been recognized that many of these complexes may serve as models for biologically important species²⁻⁴. The hydrazones metal complexes have found application in various process like sensor, medicine, nonlinear optics etc. they are well known for their metal binding ability and exhibit interesting coordinating behavior with transition metal ion^{5,6}. Coordination compound derived form aryl hydrazones have been reported because of their anti-tuberculosis, antimicrobial and corrosion inhibitor⁷⁻⁹. Hydrazones have been drawing much attention from coordination chemistry to transition metal¹⁰. In the context of the above application we have tried to the synthesis and characterization of transition metal complexes of 2-(4'-dimethyl amino phenyl)-4-bromo-6-ethoxy benzothiazolyl hydrazones. Prepared complexes were dried and the physical and chemical properties were recorded. analysis of the complexes and different spectral studies like I.R., Electronic spectra of the complex were used for find out the donor site of the ligand.

1.2 Synthesis of Ligand

Preparation of 2-(4'-dimethylamion phenyl)-4-bromo-6-ethoxy benzothiazolyl hydrazones from 4-bromo-6-ethoxy benzothiazolyl hydrazones.

To the ethanolic solution of 4-bromo-6-ethoxy benzothiazol was added in ethanolic solution of 4-dimethylamino benzaldehyde. The mixture was refluxed on water bath for two hours. Obtained solid is cooled filtered, washed with ethanol and recrystlised from hot benzene.

A. Structure of ligand



2-(4'-dimethylamion phenyl)-4-bromo-6-ethoxy benzothiazolyl hydrazones

1.3 Physical Parameter**A. Synthesis of Complexes****i) Synthesis of 2-(4'-dimethylamion phenyl)-4-bromo-6-ethoxy benzothiazolyl hydrazones Fe^{III} chloride complex**

100 ml 0.1 M FeCl₃.4H₂O were prepared in alcohol and 2-(4'-dimethylamion phenyl)-4-bromo-6-ethoxy benzothiazolyl hydrazones 0.2 M solution were prepared in ethyl alcohol. These two solutions were mixed and transfer into 500 ml round bottom flask attached water condenser, the pH is of the reaction mixture were adjusted by adding basic buffer solution pH-10. Reaction mixture were reflused for one hour in water bath. The precipitate was obtained. it is digested, after cooling it is filtered through buckner funnel, the precipitate of complex were purified by washing with ethyl alcohol, the complex were dried by keeping it in oven. The product was packed into sample bottle.

ii) Synthesis of Cobalt Complex

Cobalt chloride and ligand 2-(4'-dimethylamion phenyl)-4-bromo-6-ethoxy benzothiazolyl hydrazones were dissolved separately in ethanol so as to prepare 0.1 molar solution with constant stering . A clear solution of cobalt chloride was mixed in ligand solution in 1:2 proportion and pH is adjusted to 6.5 with buffer solution and refluxed on water bath for one hour and allowed to cool. the contents were digested for one hour and filtered. Pale pink colored solid is obtained it washed with ethanol and dried and stored in bottle.

1.4 Physical Parameter and Elemental Analysis.

Decomposition point was determined with the help of melting point apparatus by open capillary methos. M:L ratio was determined by heating known weight of complex in platinum crucible .Metal ion percentage in a complex is determined by E.D.T.A. titration method. Chloride is estimated by Mohr's method.

Physical parameter and analytical data of the Fe(II), Co(II), complexes and ligand 2-(4'-dimethylamion phenyl)-4-bromo-6-ethoxy benzothiazolyl hydrazones (MAPBEBTH). Are given in table no. 5.1. metal ligand ratio and empirical formula were assigned on the basis of T.G.A. measurement and elemental analysis is given in table no.5.2.

1.5 Characterization of Complexes

U.V. and visible spectra of complexes and ligand recorded on U.V. SHIMADZU UV3600 spectrophotometer at range 200-800 nm by using D.M.S.O. solvent at P.G. department of chemistry Shivaji University Kolhapur. I.R. spectra of ligand were recorded at Yeshwant Mahavidyala Nanded and I.R. spectra of complexes are recorded at PERKIN ELMER spectrum-100/79720 by KBr platelate method at Shivaji University Kolhapur. Thermo gravimetric analysis (T.G./D.T.A.) measurement are recorded on thermo gravimetric analyzer on TA model S.T.D-2960 at Shivaji University Kolhapur in Nitrogen atmosphere .XRD pattern of the complexes recorded on PW-3719/1710 Philips –Holland spectrometer at Shivaji University Kolhapur and E.S.R. is recorded at IIT, pawai, Mumbai.

II. RESULT AND DISCUSSION

The complexes of Fe(III), Co(II), are prepared with the ligand 2-(4'-dimethylamion phenyl)-4-bromo-6-ethoxy benzothiazolyl hydrazones (MAPBEBTH). This complexes are coloured. These complexes are soluble in D.M.S.O. but insoluble in water, alcohol, chloroform, and D.M.F. Decomposition point of complexes are in the range of 240-300°C . It suggest that they have good thermal stability at room temperature

Table 1: physical property of (MAPBEBTH) metal complexes.

Complex	color	D.P.	Yield%	%Cl
[Fe(MAPBEBTH) ₂ Cl ₂] Cl H ₂ O	Faint brown	272-280	59	10.453
[Co(MAPBEBTH) ₂ (H ₂ O) ₂]Cl ₂ .	Pale pink	284-289	64	7.069

Table 2: Percent C, H, N and metal ion in HMPBMBTH metal complex

Compound	M. wt	Empirical formula	%C	%H	%N	%M
MAPBEBTH	419.20	C ₁₈ H ₁₉ N ₄ BrSO	51.576	4.532	13.365	-
[Fe(MAPBEBTH) ₂ Cl ₂] Cl H ₂ O	1018.75	C ₃₆ H ₄₀ Cl ₃ FeN ₈ S ₂ Br ₂ O ₃	42.445	3.926	10.993	5.482
[Co(MAPBEBTH) ₂ (H ₂ O) ₂]Cl ₂ .	1004.34	C ₃₆ H ₄₂ Cl ₂ CoN ₈ S ₂ Br ₂ O ₄	43.054	4.181	11.156	5.868

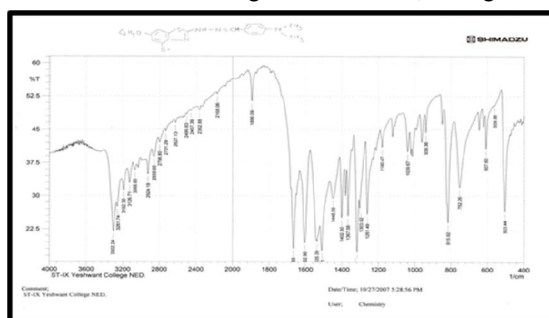
2.1 U.V.

U.V. and visible spectra of complexes and ligand recorded on U.V. SHIMADZU UV3600 spectrophotometer at range 200-800 nm by using D.M.S.O. solvent at P.G. department of chemistry Shivaji University Kolhapur.

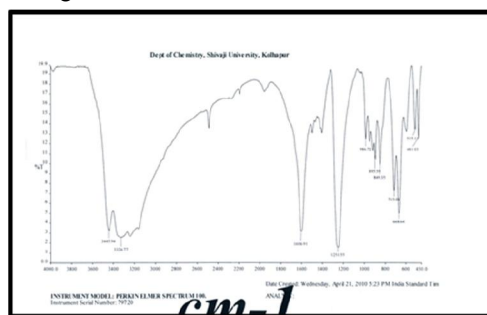
The ligand 2-(4'-dimethylamion phenyl)-4-bromo-6-ethoxy benzothiazolyl hydrazones has exhibited one characteristic maxima in U.V. region at 246 nm where in $[\text{Fe}(\text{MAPBEBTH})_2\text{Cl}_2] \text{Cl} \cdot \text{H}_2\text{O}$ complex it is shifted at 258 nm and in complex $[\text{Co}(\text{MAPBEBTH})_2(\text{H}_2\text{O})_2]\text{Cl}_2$. Band is observed at 266 nm this shifting of band is due the complex formation.

2.2 I.R. Spectra

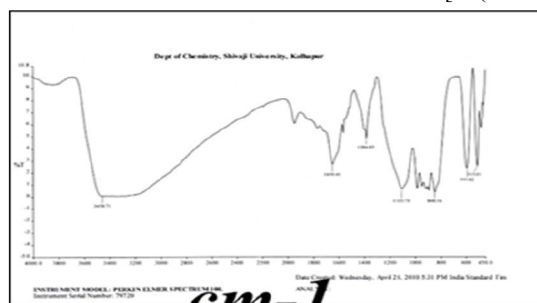
A sharp strong band is observed in I.R. spectra of ligand at 1665 in ligand it is due to the C=N of thiazole ring nitrogen. This band is shifted in Fe^{+2} complex as well as in Co^{+3} complex. In Fe^{+3} complex it is observed at 1645 and in Co^{+2} complex it is observed at 1606 this shifting of band in both complexes it indicate that the Nitrogen of thiazole ring is involve in the complex formation. Another band is observed at 1602 in ligand. This band is support to the presence of C=N (azomethazine) group in ligand. This band is shifted in Fe^{+3} and Co^{+2} complexes. The band is observed in Fe^{+3} complex at 1590 where in Co^{+2} complex it is observed at 1510. This shifting of band indicate that the azomethazine nitrogen involve in the complex formation. One band is observed at 3302 in ligand it may be due to the presence of N-H group. This band is also observed in Fe^{+3} and Co^{+2} complexes it is evidence that the N-H group is not involve in the complex formation. In Co^{+2} complex one band is observed at 3606 which is absent in ligand and in Fe^{+3} complex. it indicate that the water molecule is coordinate with metal. Another one band is observed in both complexes but absent in ligand. In Fe^{+3} complex it is observed at 481 where as in Co^{+2} complex it is observed at 468 it indicate that there is a formation of M-L bond. Thus the ligand act as a bidentate. It coordinate through azomethazine, Nitrogen of thiazole ring.



I.R. Of MAPBEBTH



I.R. Of $[\text{Fe}(\text{MAPBEBTH})_2\text{Cl}_2] \text{Cl} \cdot \text{H}_2\text{O}$



I.R. Of $[\text{Co}(\text{MAPBEBTH})_2(\text{H}_2\text{O})_2]\text{Cl}_2$

2.3 Electron spin Resonance Spectroscopy

The X-band E.S.R. spectrum of the powder $\text{Fe}(\text{II})$ and $\text{Co}(\text{II})$ complexes was recorded at room temperature. The calculated values of $\text{Fe}(\text{II})$ is g_{\parallel} , g_{\perp} , g_{avg} , and G are 2.18171, 2.08286, 2.11581, 4.26457 respectively. And $\text{Co}(\text{II})$ is g_{\parallel} , g_{\perp} , g_{avg} , and G are 2.21932, 2.06947, 2.11942, 4.288792 respectively. The values are typical for one unpaired electron in an orbital of mostly d_{xy} character. If g_{\parallel} value is less than 2.3 the compound is covalent and g_{\parallel} value is greater than 2.3 then it is ionic. Present values indicate that the complexes are covalent. G value is greater than 4 it indicate that the ligand is weak field ligand.

2.4 Thermal Analysis

Results of TG analysis were used to determine the nature of water molecules present and decomposition pattern of the complexes. Lattice water molecules were lost in the 70-110 °C temperature range while coordinate water molecules were eliminated at relatively high temperature range of 150-240 °C. complete decomposition of ligand occur at about 800 °C and observed residue corresponds to respective metaloxide.

Present losses of material as obtained from TGA curve are good agreement with calculated percent loss in mass. Thermo gravimetric results coincide well with DTA peaks. TGA/DTA scans are depicted in fig.

2.5 TGA/DTA of [Fe(MAPBEBTH)₂Cl₂] Cl H₂O

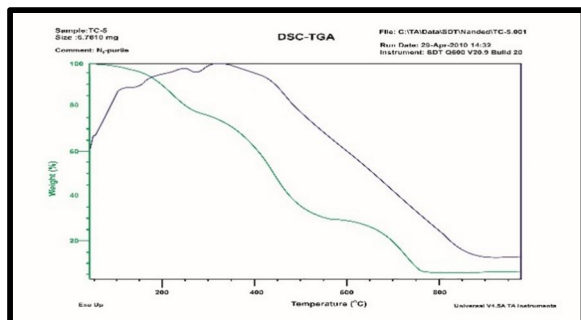
TGA/DTA plot of [Fe(MAPBEBTH)₂Cl₂] Cl H₂O shows five peak of decomposition. The first peak is observed at the temperature range 50-130°C and 9.023% loss of mass is observed. This loss of mass is due to the elimination of lattice chloride and water molecule from the compound. In second peak 18.047% loss is observed in the temperature range 130-280°C. The loss of mass is due to the elimination of two molecule of N(CH₃) and ethoxy group form the complex. Third peak is observed in the temperature range 280-430°C and 15.411% mass is lost. This loss in mass is due to the elimination of two benzene ring from the molecule. In the fourth peak 31.228% mass is lost in the temperature range 430-570°C. The loss of mass is due to the elimination of two bromobenzene rings from the complex. Last peak is observed in the temperature range 570-760°C. In this peak 20.277% mass is lost. This loss in weight is due to the elimination of thiazole ring part and its substituent chain NH-N=CH. From the temperature 760°C curve of graph show constant value. It indicate that remaining mass is of metal oxide. Calculated value are coincide with observed value.

2.6 TGA/DTA [Co(MAPBEBTH)₂(H₂O)₂]Cl₂ Complex

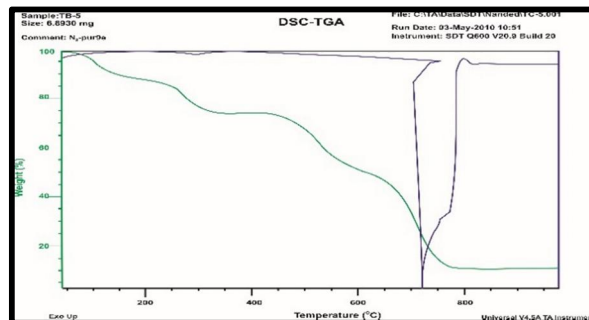
TGA/DTA plot of [Co(MAPBEBTH)₂(H₂O)₂]Cl₂. Complex Shows five peaks of decomposition. First peak is observed at temperature range 50-110°C and 6.208% mass is lost. This loss in mass is due to the elimination of lattice chloride from the complex. In second peak 9.356% mass is lost in the temperature range 110-260°C. This loss in weight is due to the burning of coordinate chloride and water molecule. Observed values are in good agreement with calculated values. Third peak is observed at the temperature range 260-490°C. In this temperature range 15.564% weight is lost form the complex compound. this loss of mass is due to the elimination of N(CH₃)₂ and OC₂H₅ group from complex. Fourth peak is observed at temperature range 490-620°C and 40.622% weight is lost. This loss in weight is due to the elimination of bromobenzen ring. In last fifth peak 17.488% mass is lost in the temperature range 620-770°C this loss in mass is due to the elimination of thiazole ring part and its substituent chain NH-N=CH. Form the temperature range 770°C curve of the graph show constant value of weight of complex it indicate that remaining mass is of metal oxide. Observed figures and calculated figures are approximately equal.

Temp. range °C	% loss	Nature of decomposition
50-130	9.023(9.087)	Lattice chloride & water molecule
130-280	18.047(18.022)	N(CH ₃) ₂ & OC ₂ H ₅
280-430	15.411(15.241)	Two benzene ring
430-570	31.228(31.385)	Two bromo Benzene ring
5570-760	20.277(20.262)	Thiazole ring part and substituted chain.

Temp. range °C	% loss	Nature of decomposition
50-110	6.208(6.069)	Lattice chloride
110-260	9.356 (6.325)	Coordinated chloride & water molecule
2260-490	15.564(15.495)	N(CH ₃) ₂ & OC ₂ H ₅
490-620	40.223(40.269)	Two Benzen ring & Br.
620-770	17.488(17.40)	Thiazole ring and substituted chain.

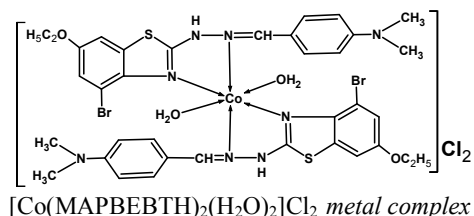
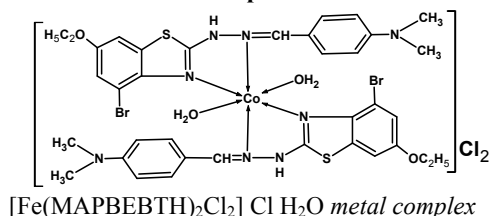


Thermal decomposition value of
[Fe(MAPBEBTH)₂Cl₂] Cl H₂O metal complex

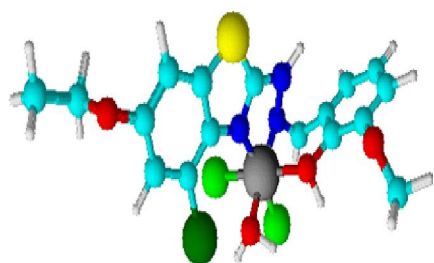


Thermal decomposition value of
[Co(MAPBEBTH)₂(H₂O)₂]Cl₂ metal complex

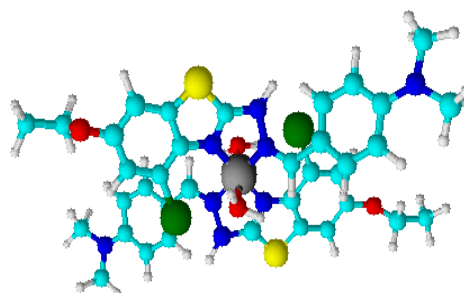
Proposed Structure of Complexes



Proposed 3D Structure Metal Complexes



[Fe(MAPBEBTH)₂Cl₂] Cl H₂O



[Co(MAPBEBTH)₂(H₂O)₂]Cl₂

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Synthesis, Characterization of Cr⁺³, Mn⁺² Metal Ion Chelates with Newly Synthesized Benzothiazolyl Hydrazone Derivatives

Bhagat S.M¹

¹Department of Chemistry, I.C.S. College of Art's, Comm. And Science, Khed, Dist.- Ratnagiri, Maharashtra, India

ABSTRACT

The transition Metal ion chelates of Cr⁺³, Mn⁺² is synthesized by using 2-(4'-dimethylamion phenyl)-4-bromo-6-ethoxy benzothiazolyl hydrazones and characterized by different analytical procedure and spectral study. These metal ion chelates are insoluble in common organic solvents. Infrared spectrum showed the bonding through azomethizine N and ring N.

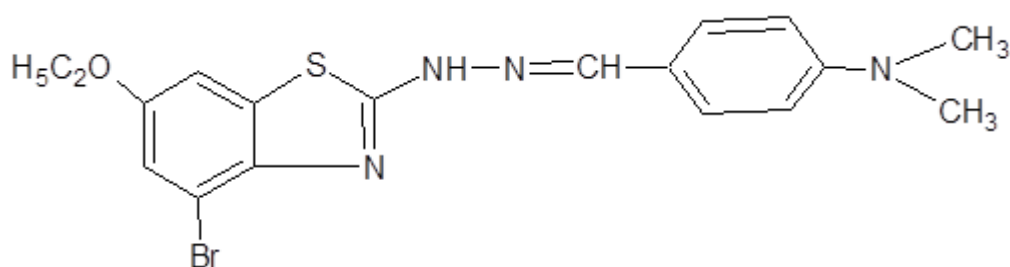
Keywords: - benzothiazolyl hydrazones, Metal ion chelates.

I. INTRODUCTION

Chemistry of ligand:- The coordination chemistry of hydrazones is an intensive area of study and numerous metal complexes of these ligand have been investigated¹. The development of the field of bioinorganic chemistry has increased the interest in Schiff base complexes, since it has been recognized that many of these complexes may serve as models for biologically important species²⁻⁴. The hydrazones metal complexes have found application in various process like sensor, medicine, nonlinear optics etc. they are well known for their metal binding ability and exhibit interesting coordinating behavior with transition metal ion^{5,6}. Coordination compound derived from aryl hydrazones have been reported because of their anti-tuberculosis, antimicrobial and corrosion inhibitor⁷⁻⁹. Hydrazones have been drawing much attention from coordination chemistry to transition metal¹⁰. In the context of the above application we have tried to the synthesis and characterization of transition metal complexes of 2-(4'-dimethyl amino phenyl)-4-bromo-6-ethoxy benzothiazolyl hydrazones. Prepared complexes were dried and the physical and chemical properties were recorded. analysis of the complexes and different spectral studies like I.R. , Electronic spectra of the complex were used for find out the donor site of the ligand.

II. SYNTHESIS OF LIGAND

Preparation of 2-(4'-dimethylamion phenyl)-4-bromo-6-ethoxy benzothiazolyl hydrazones from 4-bromo-6-ethoxy benzothiazolyl hydrazones. To the ethanolic solution of 4-bromo-6-ethoxy benzothiazol was added in ethanolic solution of 4-dimethylaminobenzaldehyde. The mixture was refluxed on water bath for two hours. Obtained solid is cooled filtered, washed with ethanol and recrystallized from hot benzene
Structure of ligand.



2-(4'-dimethylamion phenyl)-4-bromo-6-ethoxy benzothiazolyl hydrazones

Physical parameter-

III. SYNTHESIS OF COMPLEXES.

i) Synthesis of Bis 2-(4'-dimethylamion phenyl)-4-bromo-6-ethoxy benzothiazolyl hydrazones Cr ^{III} chloride complex

100 ml 0.1 M CrCl₃.6H₂O were prepared in alcohol and 2-(4'-dimethylamion phenyl)-4-bromo-6-ethoxy benzothiazolyl hydrazones, 0.2 M solution were prepared in ethyl alcohol. These two solutions were mixed and transfer into 500 ml round bottom flask attached water condenser, 6.5 pH is of the reaction mixture were adjusted by adding basic buffer solution pH-10. Reaction mixture were fefluxed for one hour in water bath. The precipitate was obtained . it is digested, after cooling it is filtered through buckner funnel , the precipitate of complex were furified by washing with ethyl alcohol, the complex were dried by keeping it in oven. The product was packed into sample bottle.

ii) Synthesis of Bis 2-(4'-dimethylamion phenyl)-4-bromo-6-ethoxy benzothiazolyl hydrazones Mn II chloride complex

100 ml 0.1M alcoholic solution of MnCl₂.4H₂O were treated with 100 ml of alcoholic ,0.2 M 2-(4'-dimethylamion phenyl)-4-bromo-6-ethoxy benzothiazolyl hydrazones in 500 ml flask. The Ph of reaction mixture were kept 6-8 by adding alcoholic solution of basic buffer solution drop by drop. The precipitate was further digested and cooled and the precipitate was filtered through Buckner funnel, the precipitate was washed with alcohol and dried it by keeping in oven.

IV. PHYSICAL PARAMETER AND ELEMENTAL ANALYSIS

Decomposition point was determined with the help of melting point apparatus by open capillary method. M:L ratio was determined by heating known weight of complex in platinum crucible. Metal ion percentage in a complex is determined by E.D.T.A. titration method. Chloride is estimated by Mohr's method.

Physical parameter and analytical data of the Cr(III), Mn(II), complexes and ligand 2-(4'-dimethylamion phenyl)-4-bromo-6-ethoxy benzothiazolyl hydrazones (MAPBEBTH). Are given in table no. 5.1. metal ligand ratio and empirical formula were assigned on the basis of T.G.A. measurement and elemental analysis is given in table no.5.2.

V. CHARACTERIZATION OF COMPLEXES

U.V. and visible spectra of complexes and ligand recorded on U.V. SHIMADZU UV3600 spectrophotometer at range 200-800 nm by using D.M.S.O. solvent at P.G. department of chemistry Shivaji University Kolhapur. I.R. spectra of ligand were recorded at Yeshwant Mahavidyala Nanded and I.R. spectra of complexes are recorded at PERKIN ELMER spectrum-100/79720 by KBr platelet method at Shivaji University Kolhapur. Thermo gravimetric analysis (T.G./D.T.A.) measurement are recorded on thermo gravimetric analyzer on TA model S.T.D-2960 at Shivaji University Kolhapur in Nitrogen atmosphere. XRD pattern of the complexes recorded on PW-3719/1710 Philips -Holland spectrometer at Shivaji University Kolhapur and E.S.R. is recorded at IIT, pawai, Mumbai.

VI. RESULT AND DISCUSSION

The complexes of Cr(III), Mn(II). are prepared with the ligand 2-(4'-dimethylamion phenyl)-4-bromo-6-ethoxy benzothiazolyl hydrazones (MAPBEBTH). This complexes are coloured. These complexes are soluble in D.M.S.O. but insoluble in water, alcohol, chloroform, and D.M.F. Decomposition point of complexes are in the range of 240-300°C. It suggest that they have good thermal stability at room temperature

Table.5.1: physical property of (MAPBEBTH) metal complexes.

Complex	color	D.P.	Yield%	%Cl
[Cr (MAPBEBTH) ₂ Cl ₂] ₂ H ₂ O Cl	Light blue	272-276	70	10.492
[Mn (MAPBEBTH) ₂ (H ₂ O) ₂] Cl ₂ .	Creamy	270-278	63	7.097

Table.2.2: Percent C,H,N and metal ion in HMPBMBTH metal *complex*

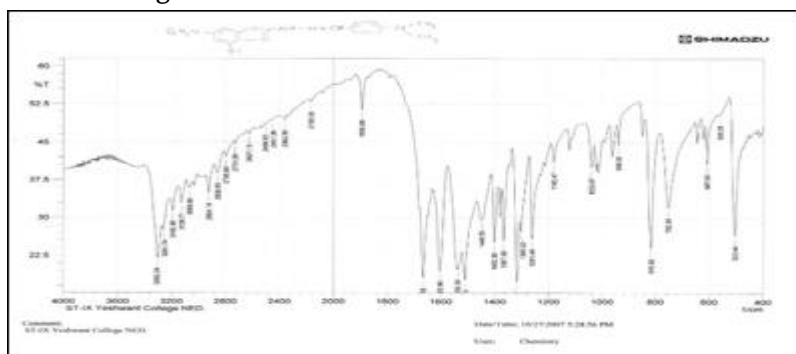
compond	M.wt	Empirical formula	%C	%H	%N	%M
MAPBEBTH	419.20	C ₁₈ H ₁₉ N ₄ BrSO	51.576	4.532	13.365	-
[Cr (MAPBEBTH) ₂ Cl ₂] ₂ H ₂ O Cl	1015	C ₃₆ H ₄₀ Cl ₃ CrN ₈ S ₂ Br ₂ O ₃	42.602	3.940	11.034	5.124
[Mn (MAPBEBTH) ₂ (H ₂ O) ₂] Cl ₂	1000.3	C ₃₆ H ₄₂ Cl ₂ MnN ₈ S ₂ Br ₂ O ₄	43.228	4.198	11.196	5.488

U.V.

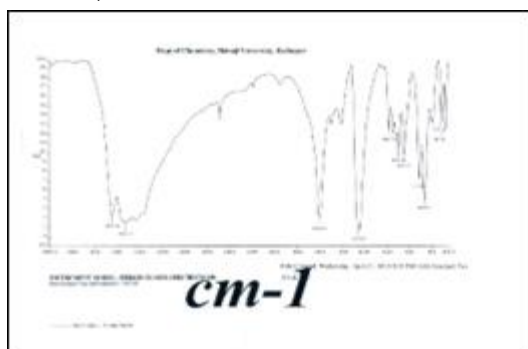
U.V. and visible spectra of complexes and ligand recorded on U.V. SHIMADZU UV3600 spectrophotometer at range 200-800 nm by using D.M.S.O. solvent at P.G. department of chemistry Shivaji University Kolhapur. The ligand 2-(4'-dimethylamion phenyl)-4-bromo-6-ethoxy benzothiazolyl hydrazones has exhibited one characteristic maxima in U.V. region at 246 nm where in $[\text{Cr}(\text{MAPBEBTH})_2\text{Cl}_2]\text{H}_2\text{O}$ Cl complex it is shifted at 258 nm and in complex $[\text{Mn}(\text{MAPBEBTH})_2(\text{H}_2\text{O})_2]\text{Cl}_2$. Band is observed at 266 nm this shifting of band is due the complex formation.

I.R. spectra-

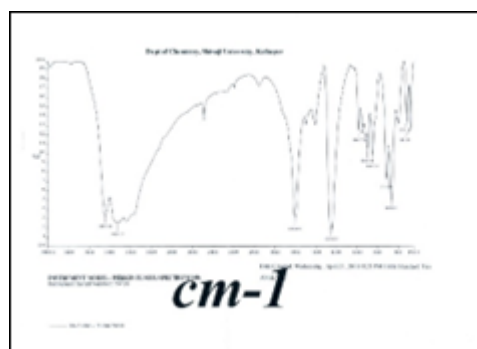
A sharp strong band is observed in I.R. spectra of ligand at 1665 in ligand it is due to the C=N of thiazole ring nitrogen. This band is shifted in Cr^{+3} complex as well as in Mn^{+2} complex. In Cr^{+3} complex it is observed at 1645 and in Mn^{+2} complex it is observed at 1606 this shifting of band in both complexes it indicate that the Nitrogen of thiazole ring is involve in the complex formation. Another band is observed at 1602 in ligand. This band is support to the presence of C=N (azomethazine) group in ligand. This band is shifted in Cr^{+3} and Mn^{+2} complexes. The band is observed in Cr^{+3} complex at 1590 where in Mn^{+2} complex it is observed at 1510. This shifting of band indicate that the azomethazine nitrogen involve in the complex formation. One band is observed at 3302 in ligand it may be due to the presence of N-H group. This band is not observed in Cr^{+3} and Mn^{+2} complexes it is evidence that the N-H group is involve in the complex formation. One more band is observed at 481 where as in Mn^{+2} complex it is observed at 468 but not in ligand it indicate that there is a formation of M-L bond. Thus the ligand act as a bidentate. It coordinate through azomethazine, Nitrogen of thiazole ring.



I.R. of (MAPBEBTH)



I.R. of $[\text{Cr}(\text{MAPBEBTH})_2\text{Cl}_2]\text{H}_2\text{O}$ Cl



I.R. of $[\text{Mn}(\text{MAPBEBTH})_2(\text{H}_2\text{O})_2]\text{Cl}_2$.

Thermal analysis:-

Results of TG analysis were used to determine the nature of water molecules present and decomposition pattern of the complexes. Lattice water molecules were lost in the 70-110 °C temperature range while coordinate water molecules were eliminated at relatively high temperature range of 150-240 °C. complete decomposition of ligand occur at about 800 °C and observed residue corresponds to respective metaloxide. Present losses of material as obtained from TGA curve are good agreement with calculated percent loss in mass. Thermo gravimetric results coincide well with DTA peaks. TGA/DTA scans are depicted in fig.

TGA/DTA of [Cr (MAPBEBTH)₂Cl₂] H₂O Cl

TGA/DTA plot of [Cr (MAPBEBTH)₂Cl₂] H₂O Cl shows five peak of decomposition. The first peak is observed at the temperature range 50-130°C and 9.023% loss of mass is observed . This loss of mass is due to the elimination of lattice chloride and water molecule from the compound. In second peak 18.047% loss is observed in the temperature range 130-280°C. The loss of mass is due to the elimination of two molecule of N(CH₃) and ethoxy group from the complex. Third peak is observed in the temperature range 280-430°C and 15.411% mass is lost . This loss in mass is due to the elimination of two benzene ring from the molecule. In the fourth peak 31.228% mass is lost in the temperature range 430-570°C. The loss of mass is due to the elimination of two bromobenzene rings from the complex. Last peak is observed in the temperature range 570-760°C . In this peak 20.277% mass is lost. This loss in weight is due to the elimination of thiazole ring part and its substituent chain NH-N=CH. From the temperature 760°C curve of graph show constant value. It indicate that remaining mass is of metal oxide. Calculated value are coincide with observed value.

TGA/DTA [Mn (MAPBEBTH)₂ (H₂O)₂] Cl₂ complex

TGA/DTA plot of [Mn (MAPBEBTH)₂ (H₂O)₂] Cl₂ Complex Shows five peaks of decomposition. First peak is observed at temperature range 50-110°C and 6.208% mass is lost. This loss in mass is due to the elimination of lattice chloride from the complex. In second peak 9.356% mass is lost in the temperature range 110-260°C. This loss in weight is due to the burning of coordinate chloride and water molecule. Observed values are in good agreement with calculated values. Third peak is observed at the temperature range 260-490°C . In this temperature range 15.564% weight is lost from the complex compound . this loss of mass is due to the elimination of N(CH₃)₂ and OC₂H₅ group from complex. Fourth peak is observed at temperature range 490-620°C and 40.622% weight is lost. This loss in weight is due to the elimination of bromobenzen ring. In last fifth peak 17.488% mass is lost in the temperature range 620-770°C this loss in mass is due to the elimination of thiazole ring part and its substituent chain NH-N=CH. From the temperature range 770°C curve of the graph show constant value of weight of complex it indicate that remaining mass is of metal oxide. Observed figures and calculated figures are approximately equal.

Temp. range °C	% loss	Nature of decomposition
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130-280	18.047(18.022)	N(CH ₃) ₂ & OC ₂ H ₅

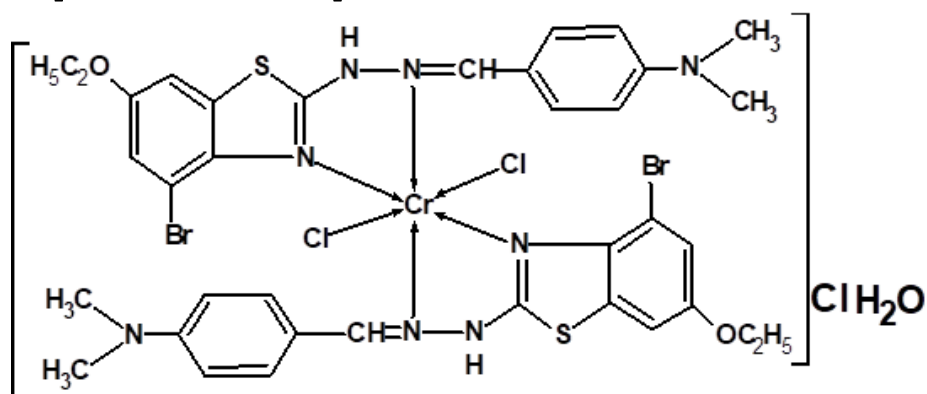
280-430	15.411(15.241)	Two benzene ring
430-570	31.228(31.385)	Two bromo Benzene ring
5570-760	20.277 (20.262)	Thiazole ring part and substituted chain.

Thermal decomposition value of $[\text{Cr}(\text{MAPBEBTH})_2\text{Cl}_2]\text{H}_2\text{O Cl}$ complex

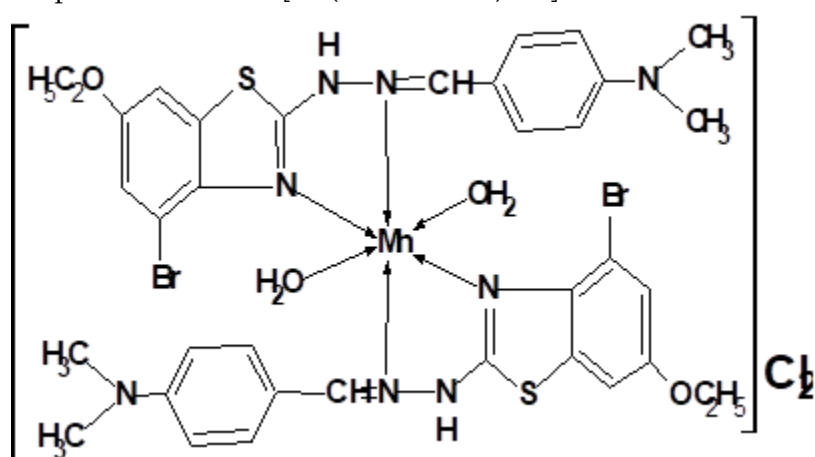
Temp. range °C	% loss	Nature of decomposition
50-130	9.023(9.087)	Lattice chloride & water molecule
130-280	18.047(18.022)	$\text{N}(\text{CH}_3)_2$ & OC_2H_5
280-430	15.411(15.241)	Two benzene ring
430-570	31.228(31.385)	Two bromo Benzene ring
5570-760	20.277 (20.262)	Thiazole ring part and substituted chain.

Thermal decomposition value of $[\text{Mn}(\text{MAPBEBTH})_2(\text{H}_2\text{O})_2]\text{Cl}_2$ metal

Proposed structure of complexes

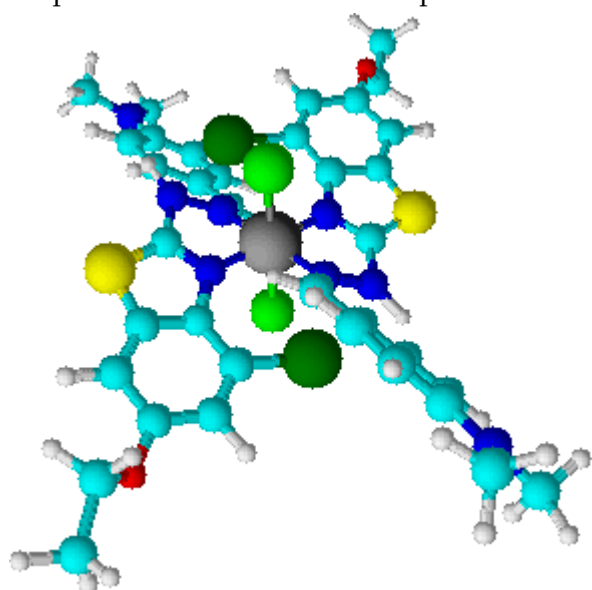
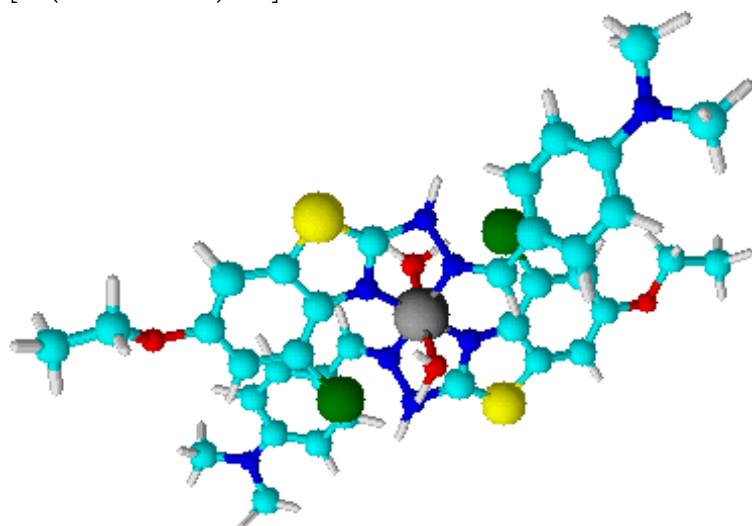


Proposed structure of $[\text{Cr}(\text{MAPBEBTH})_2\text{Cl}_2]\text{Cl H}_2\text{O}$



Proposed structure of $[\text{Mn}(\text{MAPBEBTH})_2(\text{H}_2\text{O})_2]\text{Cl}_2\text{H}_2\text{O}$

Proposed 3D structure metal complexes

 $[Cr(MAPBEBTH)_2Cl_2] Cl H_2O$  $[Mn(MAPBEBTH)_2(H_2O)_2] Cl_2H_2O$

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IMPACT OF SOME MEDICINAL PLANT EXTRACTS ON THE ECONOMIC TRAITS OF MULBERRY SILKWORM *Bombyx mori* L.

Rajendra S. Bhalerao Department of Zoology, I.C.S. College of Arts, Commerce and Science,
Khed, Dist. Ratnagiri (M.S.)

Abstract:

The aqueous extracts of four medicinal plants i. e., *Phyllanthus niruri* (whole plants without root), *Tephrosia purpurea* (root of plants), *Phyllanthus emblica* (fruit) and *Phyllanthus amarus* (plant without root) were fortified with the mulberry leaves. The mulberry silk worm, *Bombyx mori* L last instar larvae were fed on the mulberry larvae fortified with the aqueous plant extract @ 4 ml per day at first feeding up to spinning and its impact on the larval weight, mortality (during rearing and while spinning), cocoon weight, shell weight, pupal weight, shell ratio %, average filament length, average weight of filament, average denier of filament were investigated. The result were very interesting and were positive in many of the parameters under study.

Key words: Plant extract, *Bombyx mori*, economic Traits, *Phyllanthus*.

Introduction:

The nutrition background of the larvae influences greatly on the resulting pupa, adults and silk production. The leaves of superior quality enhance the chances of good cocoon crop. The dietary nutritional management influences directly on quality and quantity of silk production in *B. mori* L., Muragan, et al., (1998), Shridevi, G. (2004). In recent years, many attempts have been made either to fortify the leaves with nutrients, spraying with antibiotics, juvenile hormone, plant products with JH mimic principles or using extracts of plants etc. to improve the quantity and quality of silk. The fortification or supplementation of nutrients along with natural diet, enrich the nutritional value of the diet, making it more useful from the nutritional point of view, Bajpeyi, (1991), Hippargi, (2001) and Divya, et al. (2016).

Recently plant extract particularly weeds are being used extensively in sericulture to increase the silk cocoon and egg yield of *Bombyx mori* Rajasekhargouda, (1991). As the weeds are easily available and help to bring down the cost of production. It is seen that, there are very scanty attempts made by using the plants product fortification for improving the status of sericulture industry. Hence, attempt made to find out the effect of extract prepared from four medicinal plants viz. *Phyllanthus niruri*, *Tephrosia purpurea*, *Phyllanthus emblica*, and *Phyllanthus amarus* on the biological parameters of silkworm *Bombyx mori* L. As it is cheap, easy and effective methodology can be utilized by farmer to earn more in the same efforts.

MATERIALS AND METHODS:

The disease free laying of CSR2 x CSR4 strain of silk worm, *Bombyx mori* L. were used for the evaluation of fortification studies and biological characteristic of silkworm. The experiments were conducted by taking randomly fresh 4th moult parsed 5th instar larvae in five groups each containing 50 larvae with three replicas. For fortification the fresh parts of plant, *Phyllanthus niruri* (plants without root), *Tephrosia purpurea* (root of plants), *Phyllanthus emblica* (fruit) and *Phyllanthus amarus* (plant without root) were procured from the Dr. Babasaheb Ambedkar Marathwada University campus Aurangabad and different parts as shown in parentheses were used to prepare the test solution.

The test solution were prepared by crushing 25g of the plant material by using 100 ml distilled water filtered through muslin cloth and the filtrates was used as stock solution, kept in refrigerator. The quantity of feed given to the all groups with 40 g of matured mulberry chopped leaves for each feed and 4 feedings per day were provided. One group was kept control giving the first feeding by using non treated only distilled water for first feed but the experimental group was given first feed sprinkled, mixed with the 4 ml of test solution till the larvae went on spinning. All the rearing operations were carried out as per technology suggested by Krishnaswami, (1978) and Hiware, (2001).

The evaluation of fortification was based on the larval weight, mortality of larvae, cocoon weight, shell weight, pupal weight, shell ratio percentage, filament length, filament weight and denier of filament were recorded and the values were compared in between experimental and control groups by showing per cent change over control.

For fortification study the significant difference between control and experimental groups were observed by t - test (Mungikar, 2003).

Table 1 Effect of *P. niruri*, *T. purpurea*, *P. emblica* and *P. amarus* plants extracts on biological characters of silkworm

Sr. No.	Charact ers	Control group	Treatment group	Percentage change over control (%)
---------	-------------	---------------	-----------------	------------------------------------

			T1	T2	T3	T4	T1	T2	T3	T4
1	Larval weight (g)	3.104	3.508*	3.450*	3.472*	3.306*	11.516	10.028	10.599	6.110
2	Total mortality	04	16**	18**	06	07	70.00	77.78	33.33	42.85
3	Cocoon weight (g)	1.782	1.625	1.705	1.730	1.734	-9.661	-4.516	-3.005	-2.768
4	Shell weight (g)	0.355	0.322	0.382*	0.385*	0.347	-10.248	7.068	7.792	-2.305
5	Pupal weight (g)	1.427	1.303*	1.323*	1.345*	1.387*	-9.516	-7.860	-6.096	-2.883
6	Shell ratio (%)	19.920	19.815	22.40*	22.254**	20.01	-0.529	11.071	10.488	0.449
7	Filament length (m)	767	908**	755	894**	811	15.528	-1.589	14.205	5.425
8	Filament weight (g)	0.202	0.223*	0.201	0.224*	0.212	9.417	-0.497	9.821	4.716
9	Denier	2.360	2.205*	2.396*	2.255*	2.352	-7.029	1.502	-4.656	-0.340

* < 0.05

T1 = *Phyllanthus niruri* (whole plant without roots)

** < 0.01

T2 = *Tephrosia purpurea* (root of plant)

t- test

T3 = *Phyllanthus emblica* (fruit)

T4 = *Phyllanthus amarus* (plant without root)

Results:

The results obtained (Table-1) were very interesting in all the treated cases. In the group treatment with *Phyllanthus niruri* (whole plant) and *Tephrosia purpurea* (root) extract, it were observed that the larval weight was seen increased by 11.516% and 10.028% when compared with the control group but the mortality has also shown positive trend during the rearing it was 75.00% and 77.78 % respectively. It indicates that both the extracts had increased mortality to remarkable extent. So it can be used as larvicidal with more concentration and it requires further detail study.

In the groups treated with *Phyllanthus emblica* (fruit) and *Phyllanthus amarus*, (whole plant) similar trend was observed for larval weight was increased by 10.599% and 6.110% respectively with mortality by values 33.33% and 42.85%.

In the group treated with *P. niruri* plant extract recorded significantly maximum filament length (908 m), filament weight (0.223 g) and fine denier (2.205), when compared with control group by the values 15.528%, 9.417% and -7.029% respectively, but the cocoon weight (1.625g), shell weight (0.322g), pupal weight (1.303g) went down approximately 09.661%, -10.248% and 09.516% respectively when compared with control group and shell ratio per cent by only -0.555%.

The treatment with *T. purpura* had very deleterious effects on all the characters under study except larval weight (3.450 g), shell weight (0.382 g) and shell ratio percentage (22.40 %) only and had positive change over control with values 10.028%,

7.068% and 11.071% respectively. There was a trend favoring in the group treated with *P. emblica* plant extract in all characters observed except cocoon weight (1.730 g) and pupal weight (1.345g) when compared to control group with values -3.005% and 6.096% respectively.

Significantly increase in cocoon shell weight (0.385 g) by value 7.792 %, shell ratio percentage (22.25 %) with value 10.488 %, filament length (894m) by 14.205%, filament weight (0.224g) by values 9.821% and fine denier (2.55) by value 4.656% in the group treated with extract *P. emblica* over the control group.

The group treated with *P. amarus* showed positive trend in all character observed except cocoon weight (1.734g), shell weight (0.347g) and pupal weight (1.387g) by values -2.768%, -2.305% and -2.883% respectively. Plant extract of *P. amarus* recorded more shell ratio percentage (20.01 %), filament length (811m), filament weight (0.212g) and fine denier (2.352) over control group by values 0.449%, 5.425%, 4.716% and -0.346% respectively but it was not significant.

Discussion:

The plant extract show a marginal tendency to improve many of biological characters of silkworm (Murugan et al., 1998). The result revealed that in group treated with *Phyllanthus niruri* and *Tephrosia purpurea* recorded significantly more larval weight and mortality over control group. In groups treated with *phyllanthus emblica* and *phyllanthus amarus* also showed significantly more larval weight and equal mortality compare to control group. The present finding of increased larval weight was in accordance with the Murugan, et al., (1994); Mehesh, et al., (1999); Eswarn, et al., (2004); Bohidar et al., (2005) and Gobena, et al, (2015).

There was an increased significantly in the values of different characters; filament length (908m), filament weight (0.223g) and fine denier (2.205) in the group treated with *P. niruri* when compared with control group but cocoon weight (1.625g), shell weight (0.322g) pupal weight (1.303g) and shell ratio percentage (19.815 %) were decreased. More or less similar trend was observed in group treated with *P. emblica* and *P. amarus* for filament length (894m), filament weight (0.224g) and denier (2.205) over control group. It indicate the plant extract had shown good effect on filament of silk in which the length increased with the fine denier it is essential to produce gradable silk (Chinese silk), these results are in line with Kalpana et al., (2002), and Gobena, et al, (2015).

The shell weight (0.385g), shell ratio percentage (22.254 %) were significantly increased in group treated with *P. emblica* over control group, but cocoon weight (1.730g), pupal weight (1.345g) were decreased similar trend was observed in the group treated with *T. purpurea* with filament length (755m), filament weight (0.201g) and denier (2.396) were decreased to control group. The present finding of increase in shell weight and shell ratio percentage due to plant extract was supported by Jeyapaul, et al., (2003); and Sujatha, et al., (2003); Savitha, et al., (2005). Thus it can be concluded that, the plant products have good effects on some of the characters of *Bombyx mori* L. and are also exploited for the insecticidal activity.

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A Study of Mathematical Programming Approach to Sugarcane Industry of Maharashtra

H. P. Thorat^a and V.C. Borkar^b

*a*Department of Mathematics, I.C.S. College of Arts, Commerce and Science, Khed-415 709

*b*Department of Mathematics, YeshwantMahavidyalaya, Nanded- 431 605

Abstract:

The Sugar industry in Maharashtra is highly popular in the cooperative sector, as farmers own a portion in the sugar factories. This work determines the optimum use tactics for bagasse study domestic and environmental objectives. Additionally, alternative of sill bagasse and utilizing it in the boiler are also weigh. The major problem of sugarcane in India is based on monsoon and water supply. The cyclical nature in sugar production has caused distortions in the export of sugar in India. This study analyzes the state-wise production and reasons for the changes in production of sugarcane in the time period of 2000-2010.

Keywords: Planning, cultivation, sugarcane, optimization problem.

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I. Introduction:

The Bhartiya Agro Industries Foundation which begun a diffusive cattle development programme during 1969–70 in Western India was able to convince the cooperatives that dairy cattle maintenance could perfect very well with sugarcane performance and would be an exquisite spring of further vocation and income to the farmers as well as to the landless labourers practical in that area. This affords a muscular nurture for exploring industrial ecology advances for the district. The Maharashtra Sugar Industry has seen a spectacular growth owing to the different conducive in the state. One of the chief crops in Maharashtra is sugarcane, with a host of sugar industries been set up over the years [1]. The Maharashtra sugar industry has been contributing nearly 40% of India's total sugar production. The cooperative sugar industry in Maharashtra has seen the growth its heights with future trading being implemented in sugar manufacturing. This in turn enhances the sugar-alcohol industrial sector as it increase profits and decrease costs. In this context the need for a decision support technique that helps the mill manager to obtain an optimized planning system for sugarcane production is evident. Due to the complexities involved, this system necessarily needs to contain one or more mathematical optimization tools. The literature contains some works focused in planning the cultivation of sugarcane using optimization techniques with the objective of improving the quality and quantity of the raw material in sugar-alcohol mill. These are reviewed below. Piewthongngam et al. (2009) propose an optimization model for planning and cultivating sugarcane [2]. The model aims to select the period and variety for planting in order to avoid oversupply during the peak harvest time. The plan ensures that the cane is cut properly throughout the harvest period, hence optimizing the global sugar production.

II. Optimization Problem:

Regional integration of sugar mills increased the NPV by 37%. Sugarcane bagasse is a costly lignocelluloses biomass resort in India. The conspirator sugar hatter has empower the farmers to appear together and made them realize their aptitude in systematize themselves for sweeten production and overall education. About 50 000 crossbreds have been bear through these centralized with farmers [3].

The primary decision variables are the use copy of bagasse and refuse cool from farmstead. Starting with a few centralized for hybrid covering a few a thousand animals in 1969–70 the BAIF has during the last few donkey's been at work(predicate) more than 50 centers tegument 100 000 cattle in the sweeten encompass. A product with pH of 3.6, raw protein satiate of 6.25 percent and good acceptableness by animals could be obtained. The amount of foremilk generated increased so roundly that disconnect cooperatives have been formed in separate districts and dairy Bos keeping, which was never a traditive call in this area, has fall an important part of the agriculture system. Around 40 tonnes per hectare as against 100 tonnes per hectare or more in some States like Maharashtra, Andhra Pradesh etc. This results in the formulation of a combined whole lineal programming proposition with three different objectives. In many States revival is between 8 to 9 percent as against about 11 percent in Maharashtra. The regional integration increased the NPV of the sector by 37%.

Trials conducted on ensiling of sugarcane top-boots with urea produced inspiring inference and kind temper silage could be obtained.

The factories use professionals who help to systematize and design culture, harvesting, pressure and processing of sugarcane and supplies. The fashion was refer to a mill processing 181 Mg/hr of sugarcane in Kolhapur sphere of Maharashtra, India. Ensiling of sugarcane was proven along with 0.5 percent carbamide

III. Result And Discussion:

Dr.S.D.Sundarsingh and R. Veeraputhiranhas had conducted a study on “irrigation management in sugarcane”(2000) and concluded that Tamil Nadu was the leading producer of sugarcane was compared to other states[4]. But, the scarcity of water was a limiting factor. Water was vital in certain stages of growth of sugarcane. Irrigation water was essential yet a constraint in sugarcane production, efficient supply of water, considering the soil, climate, crop, environment conditions was important [1]. The various strategies include selection of varieties, mulching, and gradual widening of furrows, alternate furrow method of irrigation, drip irrigation, and an innovative method called surge irrigation. The authors stressed in the fact that an optimum soil moisture environment was a pre-requisite to reduce the adverse of shoot borer in sugarcane.5 In this paper it will analyze the sugarcane production in all states in Maharashtra and it updates the trend and relevant need for changes that would lead to progress the production of sugarcane in Maharashtra

From the following table, Hariyana had 14 units of working sugar factories in the year 2015-16. However, in the year 2019-20 it recorded as 14 units of working sugar factories. Thus there was no any increase and decrease of working sugar factories during the period of 2015 to 2020 with a no percentage.

Maharashtra had 184 units of working sugar factories in the year 2015-16. However, in the year 2019-20 it recorded as 195 units of working sugar factories. Thus there was increase of 11 units of working sugar factories during the period of 2015 to 2020 with a percentage rise of 5.98.

Table No. 1

**STATEMENT SHOWING OF WORKING SUGAR FACTORIES
(NO. OF UNITS)**

Sr. No.	State	2015-2016	2019-2020	Increase/Decrease	Growth %
1	Andhra Pradesh + Telangana	32	24	-8	-25.00
2	Bihar	11	11	0	0.00
3	Gujrat	19	17	-2	-10.53
4	Hariyana	14	14	0	0.00
5	Karnataka	65	68	3	4.62
6	Madhyapradesh + Chhatisgarh	18	22	4	22.22
7	Maharashtra	184	195	11	5.98
8	Punjab	16	16	0	0.00
9	Tamilnadu	44	32	-12	-27.27
10	Uttarpradesh + Uttarakhand	127	126	-1	-0.79
	TOTAL	530	525	-5	-0.94

The highest production of sugarcane in Gujarat was at 2006-07 about 15630 thousand tones. Gujarat stood fifth place in yield of sugarcane and in production it took the seventh place [1]. There was low production in 2001-02 was negative at -1.2 percent. In 2002-03 the production has increased to 14071 thousand tonnes from 12465 thousand tonne in 2001-02. In 2003-04, the area and production was negative but the productivity was high because of increase in electricity supply to agriculture for promoting irrigation and thus the output rose[3]. In 2004-05 also, there was an increase in production and it continued till 2011-12, except one year 2009-10 during which an increase in productivity was witnessed.

IV. Conclusion:

Development scheme and integration with exploit fruit by the sugar cooperatives in Maharashtra with a view to lengthening the farmer's profit and optimize usage of land and clod labour are worth meditation. The possibilities of its employment draw care particularly during the severe aridity in 1974–75 in Maharashtra and Gujarat States. An optimization shape is formulated for an existent sugar-coat mill and three potential products of bagasse protuberance, namely, electricity, fermentation alcohol, and pebble are study.

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OPTIMAL SOLUTION FOR SUGARCANE INDUSTRY IN MAHARASHTRA

H. P. Thorat, Department of Mathematics, I.C.S. College of Arts, Commerce and Science, Khed 415 709, India

Abstract: *Mathematical program can be a better guide for economic decisions. Sugar industry is one of the significant industries where a number of decisions are taken. The improvements were in the direction of including more economic theory and institutional and economic realities observed in the models. In this paper we discuss the optimization technique and represent the main problems as mathematical models.*

Keywords: *sugarcane industry, dynamic programming, decision problems, optimal solution.*

Introduction:

This work is based on the important decisions taken continuously in the cultivation and harvesting of sugarcane. Its purpose is to suggest such decisions to support employment in the sugarcane industry. The decision support system will be implemented on the basis of optimization techniques and the main problem will be shown in the form of a mathematical model. Sugar industry in Maharashtra is one of the most important and large-scale sugar producing regions in the country. The sugar industry in Maharashtra is very popular in the cooperative sector because of the share of farmers in cooperative sugar factories. The Maharashtra sugar industry has witnessed great growth due to various adaptations in the state. Sugarcane is one of the major crops of Maharashtra and the number of sugar industries has been huge in the last few years. The Maharashtra sugar industry accounts for about 40% of India's total sugar productions.

Statement & Significance of The Study:

Mathematical Programming is the application of scientific methods techniques and tools to problems involving the operations of systems, so as to provide those in control of operations with optimum solutions to the problems.

The Concept of Mathematical Programming:

Mathematical Programming is the of modern science on complex problems arising in the direction and management of large systems of men, machines, materials and money in industry, business,

government and defence[1]. The distinctive approach is to develop the scientific model of system incorporating measurement of factors such as chance and risk, with which to predict and compare the outcomes of alternative decisions, strategies or controls[2]. The purpose is to help management determine its policies and actions scientifically.

Dynamic Programming:

Dynamic programming is a recently created mathematical tool that can be used to solve a variety of decision-making difficulties. In most of the situations we've discussed in this paper, where a sequence of decisions must be taken in a sequential order, the best overall policy may be determined by weighing the impacts of each option separately [3]. There are many positions in the inventory area, for example. There are some situations where the policy of producing each month to reduce the cost of inventory for the month affected will directly reduce the cost of inventory for the whole year. However, in many other issues, it is by no means clear that the total return from performing the optimization over each individual period is the best that can be achieved [4]. It may be, for example, that a small sacrifice in the return of January might put us in a much stronger position with respect to February, etc. Dynamic programming is a way to investigate such possibilities.

Principles of Solving Linear Programming Problems:

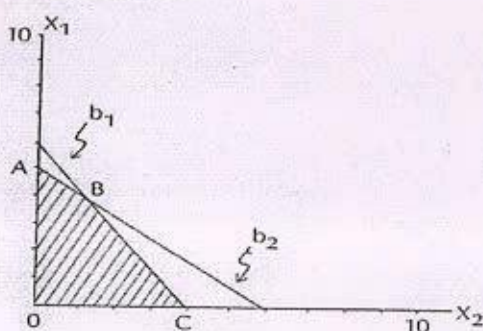
The solution to a linear programming problem is usually a unique farm plan in terms of the optimal activity levels chosen. There are generally an infinite number of farm plans to choose from that satisfy the resource constraints. Consider the following linear programming problem:

$$\max Z = 5X_1 + 6X_2 \text{ such that } 2X_1 + 3X_2 \leq 12$$

resource b_1

$$\text{and } 6X_1 + 5X_2 \leq 30 \text{ resource } b_2 \quad X_1, X_2 \geq 0$$

If we plot the activity levels on the axes of a graph, then the constraints of this problem can be shown as in Graph 1



Graph 1

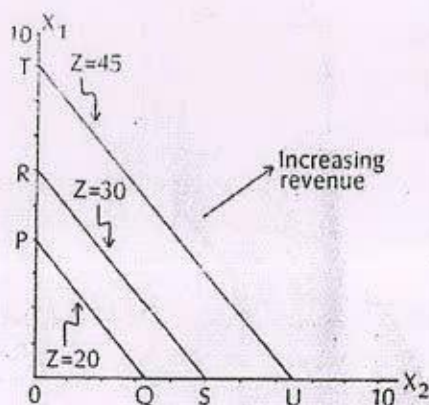
Each constraint is represented by a straight line which intersects the axes at the maximum level of each activity that can be produced with the assumed supply of the associated resource. For the j th activity and the i th resource, the maximum activity level is b_i/a_{ij} .

For example, the line for b_1 cuts the X_1 axis at $12/2 = 6$ units, and the X_2 axis at $12/3 = 4$ units. Intermediate points along a constraint depict linear combinations of the activities that also exactly exhaust the resource. One permissible combination for b_1 is 3 units of X_1 and 2 units of X_2 . The amount of b_1 used is then $(2)(3) + (3)(2) = 12$. Another possible combination is 5 units of X_1 and $((12) - (2)(5))/3 = 0.667$ units of X_2 .

For a farm plan to be eligible for consideration as the optimal solution to the linear programming problem, it must be feasible (i.e., not use more of a resource than the available supply) for

all of the resource constraints. In Graph 1, this limits consideration to those combination of X_1 and X_2 contained in the shaded area $OABC$, ABC is known as the production possibility frontier; it defines the maximum amounts of X_1 and X_2 that can be produced for all possible ratios of the levels of these activities.

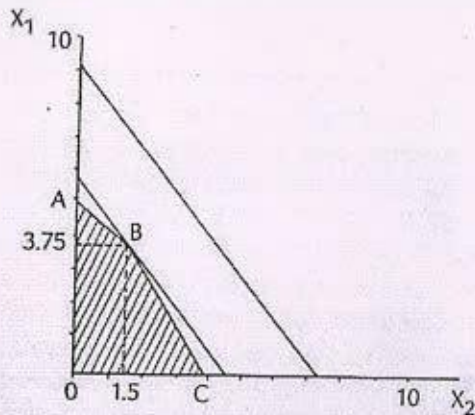
To identify the optimal farm plan in Graph 1 It is necessary to introduce the objective function Z . This is done by drawing isorevenue lines which define the combination of X_1 and X_2 that can be used to attain some fixed amount of total gross margin Z , this is shown in graph 2.



Graph 2 : Iso-Revenue Curve

In Graph 2, PQ is the isorevenue line corresponding to $Z = 20$. Since X_1 has a gross margin of 5, the isorevenue line intersects the X_1 axis at $X_1 = 4$. Similarly, since X_2 has a gross margin of 6, the isorevenue line cuts the X_2 axis at $X_2 = 3.33$. An isorevenue line can be drawn for any desired value of Z . For example, RS and TU in Graph 2 are isorevenue lines corresponding to $Z = 30$ and $Z = 45$, respectively. Iso-revenue lines are always parallel, and the ones corresponding to larger values of Z always lie above and to the right to those corresponding to smaller values of Z .

With a view to maximize Z , the optimal farm plan is clearly the feasible plan that lies on the highest attainable isorevenue line. This is shown in graph No.3



Graph 3 : Optimal Solution

In graph 3 the iso revenue lines are fitted to the set of possible farm plans from graph 1. The highest iso revenue line touches the production

possibility frontier at B. So B is the optimal solution to the linear programming problem. It requires 3.75 units of X1 and 1.5 units of X2 to be produced, and the gross margin is 27.75.

Conclusion:

This paper contains an overview of the major development in dynamic programming modeling. Mathematical programming is an evolutionary science. It is a journey with continued understanding and application of economic knowledge - theories, models, concepts and categories in dealing with emerging business/mathematical situations and problems in dynamic programming.

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USE OF AI TO IMPROVE TEACHING AND LEARNING CHALLENGES

Sampurna Sarode Assistant Professor, Department of IT and CS, VPM's R Z Shah College, Mulund(E), Mumbai-400081

Vinayak Pujari Assistant Professor, Department of IT, I.C.S. College of Arts, Commerce and Science, Khed, Ratnagiri.

Abstract:

"Education is the most powerful weapon which you can use to change the world." - Nelson Mandela
In instructive framework, taking care of man-made reasoning (AI), in educating and learning measure, had an astounding development. The instructive objectives can be better accomplished and overseen by new innovation of training. Utilizing AI we can have better investigation of every single understudies in a class who is a lethargic student or adequately apathetic to comprehend the themes which has been clarified by teacher. Examination will give clear thought regarding understudy's understanding on every single point. In the event that understudy is slacking in certain regions or he/she can't comprehend not many subjects then AI investigation would grandstand this report to instructor or educator or guardians so that suitable move can be made. Computer based intelligence investigation ought to likewise suggest the subjects with fundamental models or in a simple way to understudy so he/she can improve his/her expertise in the specific territory where he/she is awkward.

Key Words: Artificial Intelligence; face value, Teaching and learning Process

Introduction

Man-made reasoning can call attention to places where courses need to improve. Instructors may not generally know about holes in their talks and instructive materials that can leave understudies confounded about specific ideas. Various understudies have distinctive learning styles, capacities, interests and needs. One educator in a study hall of 30 understudies can seldom oblige every one of those requirements. Schoolwork and classes could be modified dependent on an understudy profile, interests can be developed and upgraded by presenting understudies to various courses and substance. [2] Artificial Intelligence offers an approach to take care of that issue. For a case, Coursera, a gigantic open online course supplier, is now trying this. At the point when an enormous number of understudies are found to present some unacceptable response to a schoolwork task, the framework cautions the educator and gives future understudies a tweaked message that offers clues to the right answer. This kind of framework assists with filling in the holes in clarification that can happen in courses, and assists with guaranteeing that all understudies are building a similar theoretical establishment. As opposed to standing by to hear back from the educator, understudies get quick criticism that assists them with understanding an idea and recollect how to do it accurately the following time around. Here are only a couple of the ways those instruments, and those that will follow them, will shape and characterize the instructive experience of things to come.

Artificial intelligence consciousness can robotize essential exercises in training, such as evaluating.

In school, reviewing schoolwork and tests for enormous talk courses can be dreary work, in any event, when TAs split it between them. Indeed, even in lower grades, educators regularly find that reviewing takes up a lot of time, time that could be utilized to communicate with understudies, plan for class, or work on proficient turn of events. While AI may not at any point have the option to genuinely supplant human evaluating, it's getting very close. It's presently feasible for instructors to computerize evaluating for virtually a wide range of numerous decision and fill-in-the-clear testing and mechanized reviewing of understudy composing may not be a long ways behind. Today, paper reviewing programming is as yet in its early stages and not exactly satisfactory, yet it can (and will) improve throughout the next few years, permitting instructors to zero in additional on in-class exercises and understudy interface than evaluating.

Understudies could get extra help from AI mentors.

While there are clearly things that human coaches can offer that machines can't, at any rate not yet, the future could see more understudies being guided by mentors that lone exist in zeros and ones. Some mentoring programs dependent on computerized reasoning as of now exist and can help understudies through essential science, composing, and different subjects.

These projects can show understudies basics, yet so far aren't ideal for assisting understudies with learning request thinking and innovativeness, something that true instructors are as yet needed to encourage. However that shouldn't preclude the chance of AI coaches having the option to do these things later on. With the fast speed of mechanical progression that has denoted the previous few decades, progressed coaching frameworks may not be an unrealistic fantasy.

Artificial intelligence driven projects can give understudies and instructors accommodating input.

Simulated intelligence can not just assistance instructors and understudies to create courses that are tweaked to their requirements, however it can likewise give input to both about the accomplishment of the course all in all. A few schools, particularly those with online contributions, are utilizing AI frameworks to screen understudy progress and to caution educators when there may be an issue with understudy execution.

These sorts of AI frameworks permit understudies to get the help they need and for educators to discover zones where they can improve guidance for understudies who may battle with the topic. Man-made intelligence programs at these schools aren't simply offering exhortation on singular courses, notwithstanding. Some are attempting to create frameworks that can assist understudies with picking majors dependent on zones where they succeed and battle. While understudies don't need to take the counsel, it could stamp a state-of-the-art existence of school significant determination for future understudies.

Simulated intelligence could change the part of educators.

There will consistently be a job for educators in training, however what that job is and what it involves may change because of new innovation as shrewd figuring frameworks. As we've effectively examined, AI can assume control over undertakings like reviewing, can assist understudies with improving learning, and may even fill in for genuine world coaching. However AI could be adjusted to numerous different parts of instructing also. Artificial intelligence frameworks could be modified to give aptitude, filling in as a spot for understudies to pose inquiries and discover data or could even possibly replace educators for exceptionally fundamental course materials. Much of the time, nonetheless, AI will move the part of the instructor to that of facilitator.

Educators will enhance AI exercises, help understudies who are battling, and give human connection and involved encounters for understudies. From numerous points of view, innovation is as of now driving a portion of these adjustments in the homeroom, particularly in schools that are on the web or embrace the flipped study hall model.

Simulated intelligence can make experimentation learning less scary.

Experimentation is a basic piece of learning, yet for some understudies, fizzling, or even not knowing the appropriate response, is incapacitating. Some essentially don't care for being called out before their friends or authority figures like an instructor. A smart PC framework, intended to assist understudies with learning, is a substantially less overwhelming approach to manage experimentation. Man-made consciousness could offer understudies an approach to test and learn in a generally without judgment climate, particularly when AI coaches can offer answers for development. Truth be told, AI is the ideal configuration for supporting this sort of learning, as AI frameworks themselves frequently learn by an experimentation strategy.

AI intelligence may change where understudies realize, who shows them, and how they get fundamental abilities.

While significant changes may in any case be years and years later, actually man-made consciousness can possibly drastically change pretty much all that we underestimate about schooling. [2] Utilizing AI frameworks, programming, and backing, understudies can gain from anyplace on the planet whenever, and with these sorts of projects replacing particular kinds of homeroom guidance, AI may simply supplant educators in certain examples (regardless). Instructive projects controlled by AI are now assisting understudies with acquiring essential abilities, however as these projects develop and as engineers find out additional, they will probably offer understudies a lot more extensive scope of administrations.

Issue Statement

In an educating and learning climate, understudies' dynamic interest with exercises just as the utilization of learning approaches that assist understudies with recalling what they realize are significant measurements. Compelling learning approaches increment the nature of learning. Understudies learn best by doing and encountering. To be viable and proficient, science instructing programs should be understudy fixated and dependent on exploration and examination, and ought to incorporate trial exercises. In an agreeable learning approach, understudy and instructors are in a condition of dynamic collaboration in the study hall.

Every understudies' have distinctive learning capacity. One illustration of a point clarified by an instructor can be comprehend by understudy in one go or it will take more than a few illustration of a similar theme to comprehend the subject. Some of the time, it may happen that understudy was missing for the past class. Some of the time, educator can't give suitable model which is adequately simple to comprehend by every single understudy in a homeroom.

Recognizing Patterns

Instructors who can accept innovation as an establishment for their encouraging procedure can receive the rewards of programmed information catch made from their understudies' commitment. The enormous benefit of advanced data frameworks is their capacity to store and quickly measure tremendous measures of data in a short space of time.

Joined with particular calculations, these frameworks can recognize and figure out understudy commitment and personal conduct standards that arise in an educator's class and report these discoveries to the instructor.

The capacity for instructors to be helped by innovation in the administration of their classes implies that they can invest less energy pencil-pushing and additional time acquiring valuable bits of knowledge from their homeroom AI devices to convey better expectations of educating.

The Process of Learning and Teaching

[5] To learn and teach is main problem of a knowledge - oriented society, and its procedure to solve can be affect the future of each country. Optimum solving of teaching and learning must be done, based on dominant culture Various models have presented, including Keller learning model (ARCS). Keller believes that, motivation is under effect of individual, environmental, specialties and learning materials. Keller, in his motivational, educational designing, composing theories and motivational procedures with educational designing, and forms an application result that causes learners to do more struggle to achieve educational goals EQ emotional model. This model emotion or feeling has much effect on learning Sam 2009. After making emotional remembrance as and values in the society. The model of teaching and learning must pose as suitable as with society compare with text reports. that essential motive comes manifest the emotional model of human is, as a positive spectrum of emotions like joy, pleasure, hope and sympathy and negative spectrum consist of sadness, anger, fear disappointment and aggressiveness, emotion in the procedure of education must be in positive spectrum and preferably must be in the form of active and several of learning model which must take care to archive goals.

The AI Process

[2] An example scenario of a teacher's interaction with their classroom AI tools could be as follows

Instructor: Show me the understudies who experience issues getting divisions.

AI: I have discovered 14 understudies who show three classes of trouble in getting parts. [Shows rundown of students]

Educator: Why does Amit not get divisions?

AI: My investigation shows that Amit missed the principal exercise where divisions were clarified. His connections recommends that he doesn't comprehend the idea of parts.

Educator: What activities are suggested for Amit's trouble in parts?

AI: You ought to request that your encouraging right hand give Amit the data from the primary exercise at the most punctual chance, trailed by the arrangement of schoolwork thing A12. [Click this to review]

Educator: Which different understudies can these activities be applied to?

AI: Vinayak and Rajesh were likewise missing from the main parts exercise, however they are showing better capacities in understanding the subject.

Educator: Is the upcoming exercise plan reasonable for these understudies?

AI: No, in light of the fact that none of the recognized understudies are showing a full comprehension of parts as of now. [2]

Conclusion

The capacity for data frameworks to give this degree of knowledge saves time, yet can give the degree of detail that may not be self-evident or feasible for instructors to perceive at face esteem. Study hall AI instruments have capacities in breaking down various wellsprings of information and contrasting them with known examples. This can recognize the main drivers for issues, and furthermore drive towards more steady results across various classes, paying little mind to the experience of educating staff.

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NAAC Sponsored One Day National level E- Seminar ON

**Revised Accreditation Framework For Assessment
And Accreditation Of Affiliated Colleges**

Internal Quality Assurance Cell (IQAC)



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Mr. Ramkisan A. More
Dr. Sopan N. Jadhav

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chenchu become aware of unjust caste discrimination, the human rights, the legal provisions available for their protection.

5. Evidence of Success

Two Chenchupentas (hamlet called as penta) namely **Yurlapenta** and **Balmur Colony** are active pentas are under study for the academic year of 2019-20. ASC of this college was carried out awareness campaign as well as education needs of abandoning Podu (Shift Cultivation) among the chenchu families.

6. Problems Encountered and Resources Required

- * The modest and diffident chenchu were reluctant to cross their living borders affecting the successful conduct of awareness programmes.
- * Ensuring the all-round support and participation of lecturers in the programmes is also a tough task.
- * Organizing various programmes during working hours, sometimes, has led to sacrifice the agriculture work.
- * Sometimes, the organizers were put to disappointment as the chenchu did not turn up for the awareness camp.
- * Implementation of this practice plan and its monitoring has become a tough task in view of tight academic schedule.

CONCLUSION

The best practices of this institution, SUM Government Degree College, are worthwhile, institution specific and are in new guidelines of NAAC Accreditation process.

ACKNOWLEDGEMENT

I am very thankful to faculty who are actively participated in these best practices, while I am working in this college as faculty and Coordinator of IQAC.

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04

Best Practices of College Libraries with reference to NAAC Assessment & Accreditation process

Dr. Rajesh S. Rajam
Librarian,

I.C.S. College, Khed
Tal. Khed, Dist. Ratnagiri

Abstract –

Educational institutions and entities providing higher education are gradually realizing the importance of quality. There is a growing trend towards quality education, not just education. The NAAC assessment is now mandatory for higher education institutions to be assessed by the National Assessment and Accreditation Council (NAAC). The NAAC recently revised the framework of its assessment process in 2017. The efficiency of college libraries needs to be evaluated at regular intervals to maintain and enhance their quality. In higher education, the library and information services play a vital role in the academic, research and development. College libraries are referred to as the 'backbone of the college'. The role of librarians is also important in the overall development of the college. Due to the extreme use of mobiles and other similar reasons, the number of students visiting the library regularly in college libraries seems to be declining. This can be a problem in NAAC assessment. One solution to this is the various best practices implemented by the library. This paper discusses the best practices followed by the academic libraries for enhancing the quality of teaching learning process.

Keywords : NAAC, Best Practices, College Library, Quality

Introduction :

The NAAC is now mandated to evaluate higher education institutions. As a result, all higher education institutions are beginning to evaluate themselves. The library is a non-profit organisation. A Library's fundamental function is to assist the parent organization's teaching, research, and other academic programmes. Libraries are now considered to be centres of knowledge and information. In today's high-tech learning environment, the library as a learning resource is taking up ever more academic space and time in the life of a learner. This will be much more true in the future. Several causes are causing academic libraries to evolve. A best practise might be creative, such as a philosophy, policy, strategy, programme, method, or practise that addresses a problem or creates new possibilities for the organisation as a whole (NAAC, 2006)

Best practises are nothing more than designing personalized service, going above and beyond with given resources, and pleasing users. Best practises are used to maintain quality. Best practises are processes, procedures, and systems found in public and private organisations that work extremely well and are commonly accepted for increasing an organization's performance and efficiency in a certain area. The term "Best Practice" has been used to better define "what works" in that certain context or situation.

Due to the extreme use of mobile phones and other similar reasons, the number of students visiting the library regularly in college libraries seems to be declining. This can be a problem in NAAC assessment. An effective solution to this is that the library should adopt various best practices to attract readers. The number of readers coming to the library will increase due to the best practices which are very useful in attracting students.

Objectives :

1. To introduce NAAC.
2. To discuss Varies best practices.

3. To Make recommendations for best practices in college libraries.

NAAC :

The National Assessment and Accreditation Council (NAAC) evaluates and accredits Higher Educational Institutions such as colleges, universities, and other recognised institutions in order to determine the institution's 'Quality Status.' NAAC assesses universities for their compliance with quality criteria in terms of educational processes and results, curriculum coverage, teaching-learning processes, faculty, research, infrastructure, learning resources, organisation, governance, financial well-being, and student services.

The NAAC's aim is "to make quality the defining aspect of higher education in India through a combination of self and external quality evaluation, promotion, and sustainability initiatives." NAAC is a member of the International Quality Assurance Agencies in Higher Education (INQAAHE) and (APQN). NAAC's goals are to evaluate and accredit institutions of higher learning, universities, and colleges, or one or more of its units, such as departments, schools, institutes, programmes, and so on. NAAC (2016).

As colleges need to be evaluated by the NAAC considering the college level, the colleges have now got the direction of progress as per the 7 criteria laid down by the NAAC.

College Library

A college is an academic institution of higher learning that offers three-year degree programmes. The library is a significant aspect at colleges, and it is an essential and vital element of the educational programme. It is not only a storehouse of books, but an active workshop instrument in the manufacture of new creative thought. The goals of college education and college libraries are inextricably linked. College library gives chances for self-education to the worthy and interested students without any distinction. These libraries promote a

feeling of responsibility in each student's pursuit of knowledge. The college library encourages students to access, assess, and identify knowledge, as well as familiarise themselves with knowledge trends for higher education and studying new disciplines.

The library received just 20 points in the NAAC evaluation of the college, however the library and its programs are linked to many other departments. That is why the college library plays an important part in NAAC assessment.

Best Practices :

The phrase "Best Practice" emerged from the industrial company's interest in and use of benchmarking. A best practise is a method or approach that is widely acknowledged as superior to other alternatives because it generates better outcomes than other methods or because it has become a standard way of doing things, such as complying with legal or ethical standards. (Wikipedia)

In his paper "Best Practices in Higher Education for Quality Management," Prof. V. S. Prasad explains the objective of best practises." The best practices should -

- be dynamic and revisited periodically;
- recognize diversity and cultural and historical contexts;
- not lead to dominance of one specific view or approach; and
- promote quality of performance.

These principles should be interpreted and applied appropriately to different contexts, while identifying the practices."

In a nutshell, best practises are procedures that improve the present operation and activity of any system.

The following best practises were reviewed and promoted during the NAAC workshop on 'Identifying Best Practices in Library and Information Services' on October 26th, 2005

1. Institutional trips to see other library practises
2. In-service training

3. Staff promotional practise
4. Service area maintenance
5. Scheme for special deposits
6. Resource generation (via external membership) (through external membership)
7. Resource creation (through internet service)
8. Student internship programme
9. Participatory student programme
10. Earn while learn programme
11. Library science as an elective course/paper
12. Compact storing of infrequently used collections
13. Collection development in various formats
14. Exhibition of library books
15. Extended library hours
16. Extended service hours
17. Collection improvement in hybrid library
18. User Education (Information literacy programme)
19. Introduction to newcomers (Information Literacy Program)
20. Preparatory course for (Information literacy programme)
21. User-friendly (Information literacy programme)
22. Aids to Information (Information literacy programme)
23. Library and Information Science course module (Information literacy)
24. Statistics on library usage
25. Library best user award
26. Experiment with alternative types of user feedback.
27. User Feedback Experiment with Suggestion Boxes
28. Online information retrieval (Internet access facility)
29. Unit for (Internet access facility)
30. Broad band Internet Center (Internet access facility) (Internet access facility)
31. Information distribution library homepage
32. Website for a Dynamic Library
33. User comments via the library's site
34. 24/7 Access to electronic resources

35. Group concessional Night Services offer for outside students and scholars in accessing e-resources.
36. Access to the digital repository via the library
37. Electronic access to all internal records
38. Digital repositories 38
39. CD Mirror Server Service
40. CD NET server availability
41. Manuscript digitization
42. Multilingual, integrated, web-enabled database with full automation of internal functions
43. Using own built integrated Library software (Automation of in-house services) (Automation of in-house services)
44. Web OPAC
45. Web OPAC information retrieval
46. A campus-wide local area network (LAN).
47. Database construction utilising international standard standards
48. Electronic surveillance system

Although many of the best practises have been discussed in the preceding workshops, these best practises can be improved if they are correctly customised to the local needs Librarians must adapt these best practises to satisfy the expectation of local libraries and readers.

In addition to the above mentioned best practises, librarians can make some adjustments and adopt some of the best practises at the local level. For examples, "Thought for the Day" and "Importance of the Day," VachanKatta, competitive Katta, Meet the writers, Displaying student-related news and information across universities, Writing significant news headlines at the entrance to the College Library, Displaying a variety of significant websites and email addresses, Displaying newspaper clippings on the notice boards, Creating an Institutional Repository, Index of articles in the specified subject, Collection of Book reviews, Showcasing new arrivals, Organizing Book Talks, presenting Suggestion Form through QR code, etc. Organizing cultural events and Guest Lectures Career counselling and job search assistance, Additional Books for Advanced Students, Audio Video Club, availability of Library user handbook at entry of the library, Donations can be acquired through staff members, alumni, and other sources. Many such approaches may be

developed and efficiently used in libraries. While we may not be able to apply all of the practises listed above in our library, some of these practises, which we can implement, can certainly assist enhance quality.

Suggestions :

1. Every college library should use best practises to maintain and improve quality.
2. UGC, AICTE. Institutions like these should periodically publicise the best practises that are valuable and strive to implement them in the college library.
3. College management should give the finances required to implement new best practises.
4. At the federal level, librarians should be given proper respect and encouragement in college libraries where best practises are being implemented.
5. The best library practises must reach as many pupils as possible.
6. Using contemporary technology, additional best practises should be introduced in libraries.

Conclusion :

It is critical to follow such best practises in libraries in order to improve the quality of not only the library but also of the entire college. These best practises must be chosen based on the library's local needs and the reader's study. These excellent practises should be more and more attractive. It may also be utilised to increase the number of people who read. Overall, implementing best practises for quality improvement is a significant undertaking. Best practises in the use of information and communication technologies play an important part in the development of any library system.

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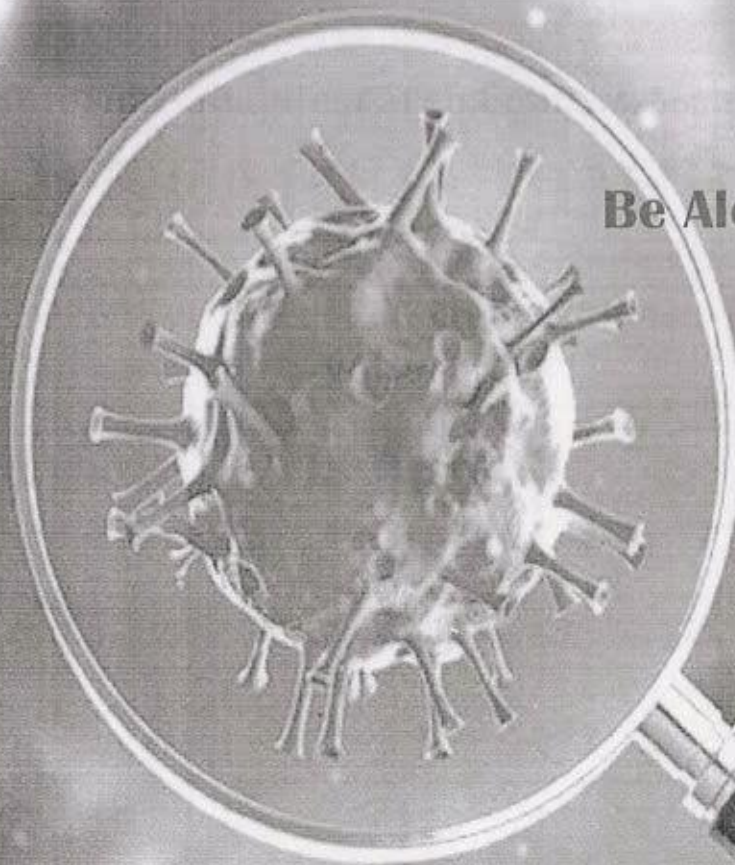
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A Study of the Disaster Management in Ratnagiri District College Libraries

Dr. Rajesh S. Rajam

Librarian,

I.C.S.College, Khed

Tal – Khed, Dist – Ratnagiri

Cell – 9405860640

E-mail – rajesh_rajam@rediffmail.com

Abstract :

In today's information age, the importance of information is well known, and the importance of libraries appears to be increasing. Rare and important reading material is now available in a variety of forms and mediums in today's libraries. Of course, it is also critical to preserve and safeguard it. Natural and man-made disasters can both devastate such valuable resources. To avoid damage, libraries require disaster management. This necessitates the development of a disaster management plan, the construction of infrastructure, and the training of both consumers and staff in disaster management. Considering the college libraries, training programs, purchase and storage of emergency equipment, pre-disaster planning are very important. What is the status of disaster management in Arts, Commerce and Science aided colleges in Ratnagiri district? This study was conducted to determine this.

Keywords – College Library, Disaster Management, Pre-disaster planning

Introduction –

Libraries are considered as centers of learning. Libraries play an important role in preserving cultural heritage. Libraries play an important role in collecting, storing, processing and disseminating knowledge. Libraries are doing important work in many fields like formal education, non-formal education, research, cultural activities, spirituality and entertainment. Today, there is a huge demand for information. Today's society is called information society. In that sense, the importance of libraries seems to be increasing. Libraries today have books, journals as well as a variety of literature. In fact, a large number of non-book materials are entering the library. Educational libraries are considered to be the heart of the institution.

With the advancement of science, information and knowledge in various forms are being introduced in today's libraries. Preserving these stocks is a challenge for libraries. In view of the increasing number of natural disasters in recent times, libraries need to be vigilant. It is very important to protect reading material from any kind of disaster. In view of this, it is time for the library to develop its own disaster management system. In the present study, what is the mechanism of disaster management in the libraries of aided senior colleges in Ratnagiri district? How does it work? This has been studied.

Objectives –

1. To study library disaster management
2. To study pre-disaster planning
3. To study the precautionary measures to be taken by the Librarian.
4. To make suggestions for library disaster management.

Research Methods -

The descriptive method used for this study. Information was gathered by sending questionnaires to librarians from Arts, Commerce & Science college libraries in the Ratnagiri

district. Conclusions were drawn by analysing the information obtained. Information about library disaster management is obtained from reference books and literature on the Internet.

Scope & Limitations –

1. This study conducted for the libraries of Arts, Commerce, and Science aided colleges in the Ratnagiri district.
2. This study considers both natural and man-made types of disaster management.
3. Only questionnaires were used to collect data from librarians for the study.

Library Disaster Management –

Disaster management is broadly defined as the management of any type of calamity that may occur, as well as the mitigation of the damage caused by it. It is defined as "Disaster management is a process of effectively preparing for and responding to disasters. It involves strategically organizing resources to lessen the harm that disasters cause. It also involves a systematic approach to managing the responsibilities of disaster prevention, preparedness, response, and recovery."¹ by Tulane University's School of Public Health and Tropical Medicine. This definition covers all aspects of disaster management. Library Disaster Management is the management of the library to prevent any such disaster. Dr. Rehman, A. ur. Stated the following dangers

"Acts of war and terrorism Fires, Water (broken pipes, leaking roofs, blocked drains) Explosions, Liquid chemical pollution Building deficiencies (Structure, design, environment, maintenance) Power failures, Collapse of shelving and other indoor structural accidents, Computer system failure, Elevator failure Power failure, heating and cooling system failure, Telecommunication failure"² in his article 'Importance and Measures of Disaster Management in Libraries'.

Eden and Mathew (1996) defined disaster in libraries as any incident which threatens to damage a library building, collections, contents, facilities, or services. Disaster could be natural or human-made."³ Disaster may occur in the library due to some of the above mentioned man-made causes or some natural causes like Earthquake, flood, tsunami, Tornadoes and Hurricanes, Wildfires etc..

Establishment of libraries -

The following is a list of studied aided senior college libraries in the Ratnagiri district, along with the years they were established. They are also assigned code numbers for convenience of study.

Table – 1
List of College Libraries

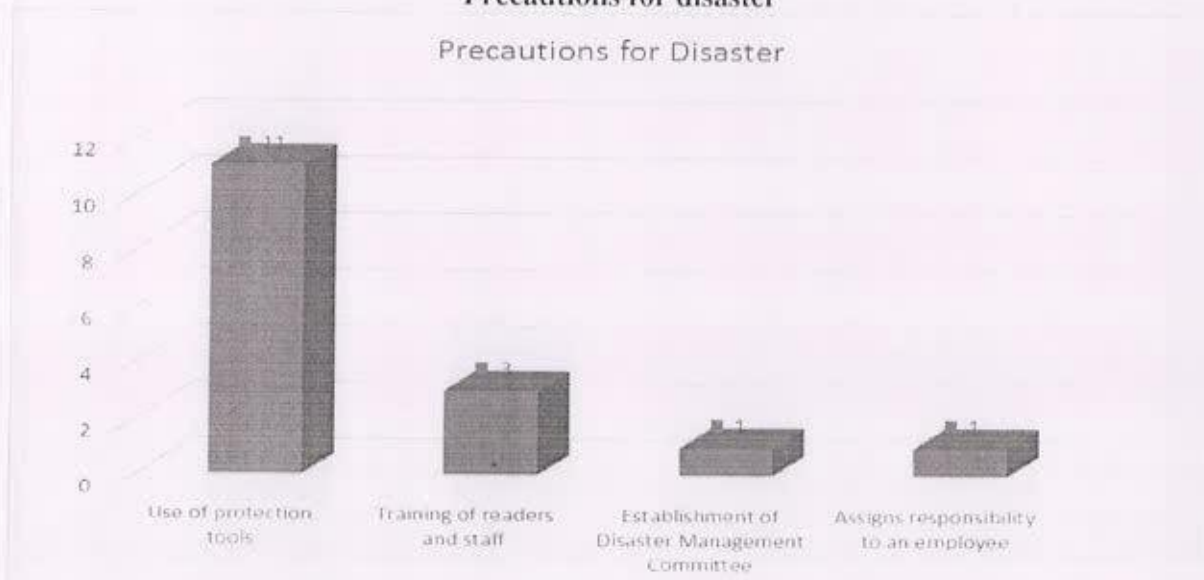
S. N.	Name of the College –	Code	Establishment
1	I.C.S.College, Khed	A	1990
2	D.B.J. College, Chiplun	B	1965
3	LGM College, Mandangad,	C	1996
4	N.K.Varadkar College, Dapoli.	D	1974
5	Patpanhale Arts, Commerce and Science College	E	1992
6	Athalye Sapre, Pitre College, Devrukh	F	1972
7	Abasaheb Marathe College, Rajapur	G	1994
8	Dr. Tayasaheb Natu College, Margatamhane	H	1992
9	Arts, Commerce and Science College, Lanja	I	1996
10	Dapoli Urban Bank Senior Science College, Dapoli	J	1996
11	Shri. M. H. K. College of Arts and Com., Pachal	K	1994

This study looked at 11 Arts, Commerce, and Science aided colleges in the Ratnagiri district that were established between 1945 and 1996.

Precautions for disaster -

At any time, a man-made or natural disaster could strike the library. What does the library's administration think about this? What precautions are taken in this regard? This is illustrated in the graph below.

Graph No 1
Precautions for disaster

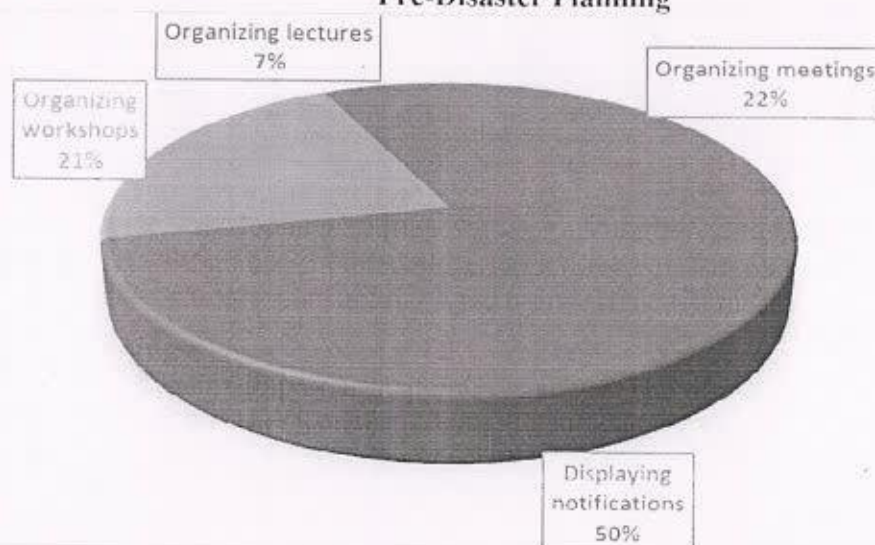


According to the graph above, all 11 colleges use protection tools. Readers and staff are trained in three colleges: 'B,' 'D,' and 'F.' In the college library 'F,' a disaster management committee has been formed. In this regard, responsibilities have been assigned in the college library 'G.'

Pre-Disaster Planning-

The library contains important material resources. The library contains books as well as non-book material.. A disaster can cause significant damage in a matter of seconds. This necessitates pre-disaster planning. The pie chart below shows how such management is carried out.

Pie Chart No - 1
Pre-Disaster Planning



According to the pie-chart above, meetings for pre-disaster planning are held in three libraries: 'A,' 'E,' and 'G.' Workshops are organised for readers and staff in three college libraries: 'D,' 'F,' and 'I.' Lectures on this topic are being organised at 'K' College. Various notices in this regard are displayed on the notice boards in 'B', 'C', 'D', 'E', 'G', 'J', and 'K' colleges.

Fire Extinguisher –

How many library buildings have fire extinguishers for fire protection? Also how many trained staff are there to handle it? This is explained in the following table.

Table No. 2

Fire Extinguisher & Trained Staff

Sr. No.	College Code	Yes/No	Number of Trained Staff
1	A	Yes	1
2	B	Yes	5
3	C	No	-
4	D	Yes	2
5	E	Yes	1
6	F	Yes	3
7	G	Yes	1
8	H	No	-
9	I	Yes	2
10	J	Yes	2
11	K	Yes	2

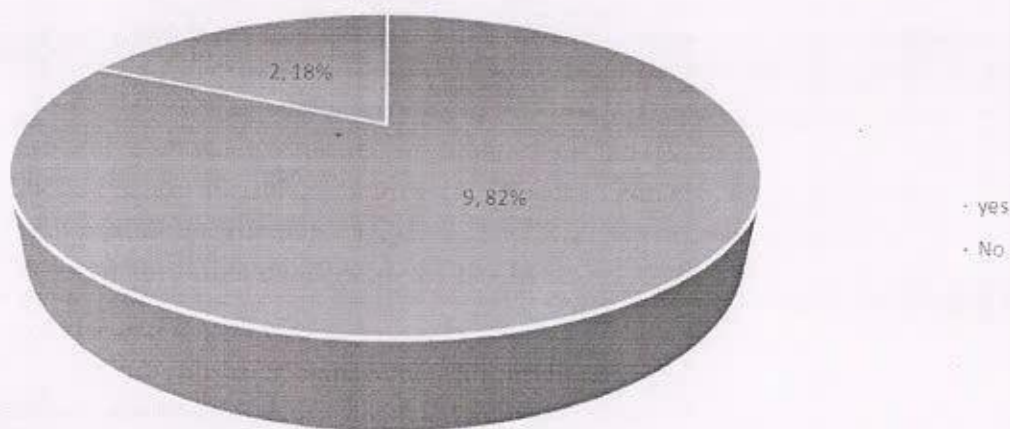
According to the table above, except for two libraries 'C' and 'H', the remaining 9 colleges have fire extinguishers. Each of the three libraries, 'A,' 'E,' and 'G,' has one trained staff member who can use it. Each of the four libraries ('D,' 'I,' 'J,' and 'K') has two trained staff members. The 'F' library has three trained staff and the 'B' library has five.

Advice of Local Disaster Agencies –

When conducting disaster management in the library, how many libraries are consulted by the local Disaster Agencies? This is depicted in the pie chart below.

Pie Chart No - 2

Advice of Local Agencies



According to the pie chart above, only two libraries, 'A' and 'H,' (18%), consult a local disaster agency when disaster planning. The remaining 82% of libraries plan on their own, without consulting with anyone.

Fix Responsibilities –

Is responsibility assigned to a specific staff member in advance in the case of a disaster in the library? This data is depicted in the graph below.

Graph No 2

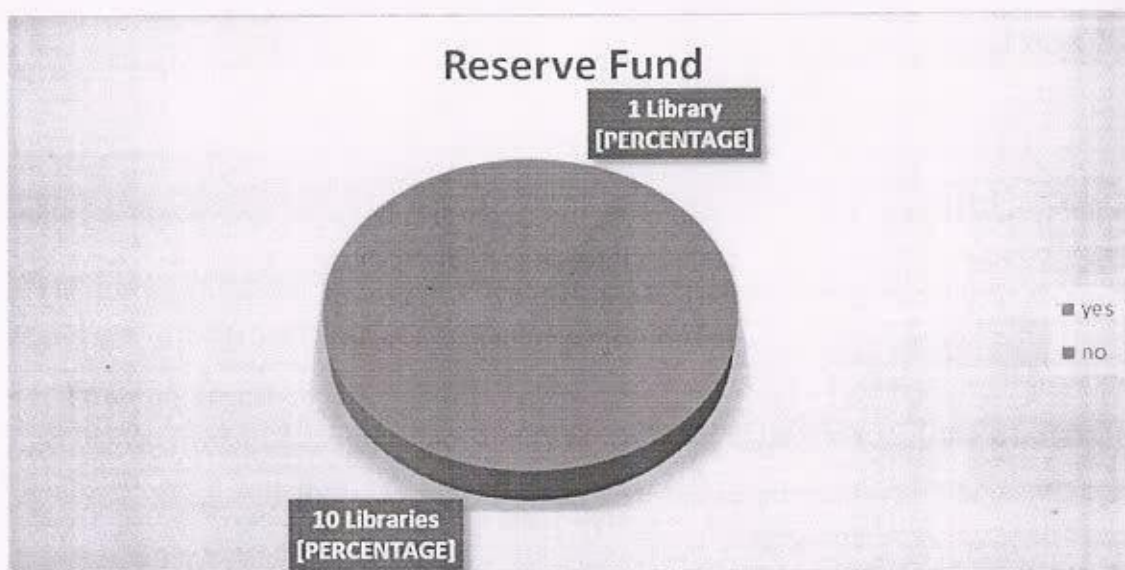


According to the graph above, the responsibility for disaster management in five libraries, namely 'A,' 'B,' 'H,' 'I,' and 'K,' has been assigned to the appropriate staff. Relevant personnel are expected to work diligently in order to avoid disaster. The remaining of the libraries do not delegate such staff members. This is a shared responsibility.

Reserve Fund for Disaster –

Is there a reserve fund for the possibility of a disaster in the library? This data is depicted in the pie-chart below.

Pie Chart No - 3



According to the pie chart above, only one library, 'G,' has a disaster reserve fund for it, taking into account the disaster. The remaining ten libraries have no such fund. When a disaster strikes, a separate provision is made to cover the cost of the disaster.

Conclusions and suggestions –

1. Only one library has a disaster management committee and only one library staff member is assigned a specific responsibility for the disaster.
2. During pre-disaster planning, 21% of libraries organize workshops. Meetings are held in 22% of libraries. Notices are posted on notice boards in 50% of libraries. Lectures are given in 7% of libraries.
3. 81% of library buildings have fire extinguishers, while the remaining 9% libraries do not have fire extinguishers.
4. One trained staff member who can use a fire extinguisher is available in 27% of libraries. 66% of libraries have two trained staff members. 5% of libraries have three trained staff members, and 5% have five trained staff members.
5. Only 18% libraries consult a local disaster agency when disaster planning. The remaining 82% of libraries plan on their own, without consulting with anyone.
6. The responsibility for disaster in 45% libraries has been assigned to the specific staff members. The remaining 55% of the libraries do not delegate such staff members. This is a shared responsibility.
7. Only 5% libraries have a disaster reserve fund for it, taking into account the disaster. The remaining 95% libraries have no such fund. When a disaster strikes, a separate provision is made to cover the cost of the disaster.

Suggestions –

1. Never assume that nothing will go wrong in the library. Disaster planning should take place in the library, assuming that any disaster could occur at any time.
2. Disaster management committee is very important when managing pre-disaster planning in the library.
3. Disaster management committee is very important in pre-disaster planning in the library. It must be established in every library.
4. Conducting workshops, meetings, displaying various disaster alerts, 'How to take pre-disaster precautions?' Measures like organizing lectures on this topic should be taken.
5. Libraries should have a solid disaster preparedness plan in place. The plan should be monitored and reviewed on a regular basis. Mock drills should be conducted on a regular basis. Buildings, equipment, storage, and computers in libraries should all be fully insured. Drainage and flood prevention systems should be in good working order. The library structure should be built in such a way that it is earthquake resistant.
6. The first priority in the event of a disaster is human safety. A list of all members of the disaster team, clearly stating their responsibilities at all stages of the disaster, should be included in the disaster control plan.

Conclusion:

The library has a significant literary wealth. It contains important documents. The administration of the library is in charge of their safety. A natural disaster can strike unexpectedly and cause significant damage. This necessitates disaster management in the library.

Disaster control planning is not only necessary, but also critical for disaster management. The necessary infrastructure for disaster management should be built, and an emergency response system should be established and improved as needed. It is critical and very important to educate people about disaster management and to raise awareness among them.

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