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DIVERSITY OF SPIDERS FROM THE FAMILY CLUBIONIDAE (ARANEA) FROM MIDDLE PLAINS OF NARMADA BASIN OF MADHYA PRADESH, INDIA

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ABSTRACT

A detail survey of spiders from Clubionidae family was carried out in Narmada basin of Madhya Pradesh. Clubiona is a very short sighted hunting spider that lives on bushes of Narmada basin and constructs silken nets with tunnels formed by rolled up leaves. In the present investigation we have reported one genus *Clubionadrassodes* O. P.-Cambridge, 1874 (male) and female holotype are described along with photographic evidence. The maximum species diversity was noted from August to January, 2012. Riparian and grassland ecosystems are found to be rich in spider fauna.

Keywords: Spiders, Diversity, Taxonomy, Narmada Basin, Madhya Pradesh.

INTRODUCTION

The sac spiders of the family Clubionidae have a very confusing taxonomic history. Once this family was a large catch-all taxon for a disparate collection of spiders, similar only in that they had eight eyes arranged in two rows, conical anterior spinnerets that touched and were wandering predators that built silken retreats, or sacs, usually on plant terminals, between leaves, under bark or under rocks. These are now recognized to include several families, some of which are more closely related to the three-clawed spiders, like lynx and wolf spiders, than to true "clubionoids.

MATERIAL AND METHODS

Study Area (River Narmada): The river Narmada is the longest westerly flowing river of the country, out of a total length of 1323 kms of the river flowing between the famous Vindhyas and Satpura ranges, 82% of the river flows through Madhya Pradesh for another 34 kms, it forms the boundary between M.P. and Maharashtra and the rest through Maharashtra and Gujarat state. The river finally meets the gulf of Cambay in Arabian Sea. Originates from Amarkantak at a height of 1051M. Afterwards it forms steep fall up. Therefore it flows in slow gradient upto Barwani in M.P. and in the same gradient in Maharashtra and Gujarat. It forms an estuary before joining the Arabian sea. The river Narmada receives 41 principal tributaries 19 (18 in M.P. and 1 in Gujarat) join the river from north and 22 (21 in M.P. and 1 in Gujarat) from south. Besides, there are as many as 50 rivulets joining directly Narmada river. The following specimens were collected in the Narmada basin near Omkareshwar dam longitude 22.2839° N, 76.4714° E and latitude 22.2839° N, 76.4714° E (Indira Sagar, Madhya Pradesh, India).

METHODS OF COLLECTION

Following are a few basic methods used while collecting spiders. Spider survey is carried out for ground spiders and spiders along slow flowing shallow streams, spiders from decaying barks of trees, from shrubs and crevices of rocks. Field Methodsincludes (i) Sweep Netting, (ii) Ground Hand Collecting,(iii) Aerial Hand Collecting, (iv) Vegetation Beating, (v) Litter sampling etc.

Preservation and Identification of specimens

Collected specimens were transferred to 70% alcohol. All adult specimens are identified to family, genus and species level. Species are distinguished by examination of external and internal genitalia. Sexes are matched by colour pattern and somatic features. While identifying structures like sternum, labium, maxillae, chelicerae, presence or absence of cribellum, leg characters, leg formula, eye arrangement, number of eyes etc.

The collected specimens of the spiders are identified with the help of above references and catalogues from Arachnology Laboratory, Department of Zoology, Sant Gadge Baba Amravati University, Amravati under the guidance of Professor and Head Dr. G. N. Vankhede.

OBSERVATIONS AND RESULTS

Genus- *Clubiona*Latreille, 1804

The genus *Clubiona*was erected by Latreille in 1804. Up to the present, 466 species have been recorded in the world under *Clubiona*and of these 19 valid species occur in India (Platnick, 2012; Keswani*et al.*, 2012). From this genus 2 species male & female are reported during present investigation.

***1. Clubionadrassodes* O. P. - Cambridge, 1874 (female)**

Class : Arachnida

Order : Araneae

Suborder : Araneomorphae

Family : Clubionidae

Genus : ***Clubiona***

Species **:** ***drassodes*(female)**

Description:

General: Cephalothorax brownish pale in colour, legs and abdomen cream in colour.

Cephalothorax	**Abdomen**
L = 2.55 mm	L = 4.80 mm
W =1.83 mm	W = 2.41 mm

Total Body Length = 7.77 mm

Cephalothorax: Brownish cream in colour, longer than wide, anteriorly narrow, middle broader, clothed with pubescence, mid longitudinal thoracic groove present, cephalic region raised, clothed with pubescence.

Ocular region light brown, ocular quad longer than wide forming trapezium which is narrow anteriorly than behind, posterior medians are white, anterior row of eyes black, both and recurved, posterior row of eyes slightly procurved, anterior laterals are close to anterior medians, clypeus almost low, three long hairs on anterior margin of carapace.

Sternum: Cream in colour, longer than wide, posterior end narrow, clothed with hairs, margins dark with precoxalsclerites.

Labium: Brownish in colour, broad, longer than wide, posterior end narrow, laterally notched, clothed with hairs at distal end, pale in colour.

Endites: Brownish in colour, distal end pale in colour with scopula and serrula, anteriorly broad, posteriorly narrow, and clothed with hairs.

Chelicerae: Brownish black in colour, clothed with hairs, dorsum provided with lateral condyle, cheliceral furrow with scopula, retromargin provided with two teeth, equal in size, promargin provided with three teeth which are unequal in size, second one larger than others, fang short and small.

Legs: Cream in colour, two tarsal claws, dented with claw tufts, leg formula 4213, legs are prograde, legs clothed with hairs, trichobothria and setae, tarsus and metatarsus with ventral scopula, two rows of trichobothria on tarsus, metatarsus and tibia, femur provided with three pairs of setae, two and three pairs of spines present ventrally on tibia and metatarsus, all the coxae with sternocoxal space.

Leg measurements: (in mm)

Leg segments	Leg 1	Leg 2	Leg 3	Leg 4
Coxae	0.55	0.63	0.53	0.72
Trochanter	0.30	0.36	0.30	0.36
Femur	1.39	1.41	1.13	1.19
Patella	0.50	0.66	0.58	0.69
Tibia	1.36	1.60	1.17	1.80
Metatarsus	0.94	1.22	0.89	1.83
Tarsus	0.60	0.46	0.53	0.80
Total Length	**5.64**	**6.34**	**5.13**	**7.39**

Abdomen: Oval, longer than wide, brownish cream in colour, decorated with black patch, and mid longitudinal dorsum clothed with hairs and pubescence, posteriorly narrower, venter pale in colour, clothed with fine hairs.

Epigyne: Long, spermatheca oval with coiled ducts, pale brown in colour.

Spinnerets: Anterior spinnerets cylindrical, clothed with hairs, white patch at the base of the spinnerets, posterior spinnerets long, thin and segmented.

Type locality: Omkareshwar dam M. P.

***2. Clubionadrassodes* O. P.-Cambridge, 1874 (male)**

Class : Arachnida

Order : Araneae

Suborder : Araneomorphae

Family : Clubionidae

Genus : ***Clubiona***

Species **:** ***drassodes* (male)**

Description:

General: Cephalothorax brownish pale in colour, legs and abdomen blackish brown decorated with patches.

Cephalothorax	**Abdomen**
L= 2.55 mm	L= 3.94 mm
W= 1.69 mm	W= 1.75 mm

Total Body Length = 6.49 mm

Cephalothorax: Longer than wide, carapace convex, raised, smooth carapace, clothed with pubescence, mid-longitudinal fovea, anteriorly narrow and slightly forwarded, posterior margin with short hairs bunch. Ocular region light brown, ocular quad longer than wide forming trapezium, anteriorly narrow than behind,

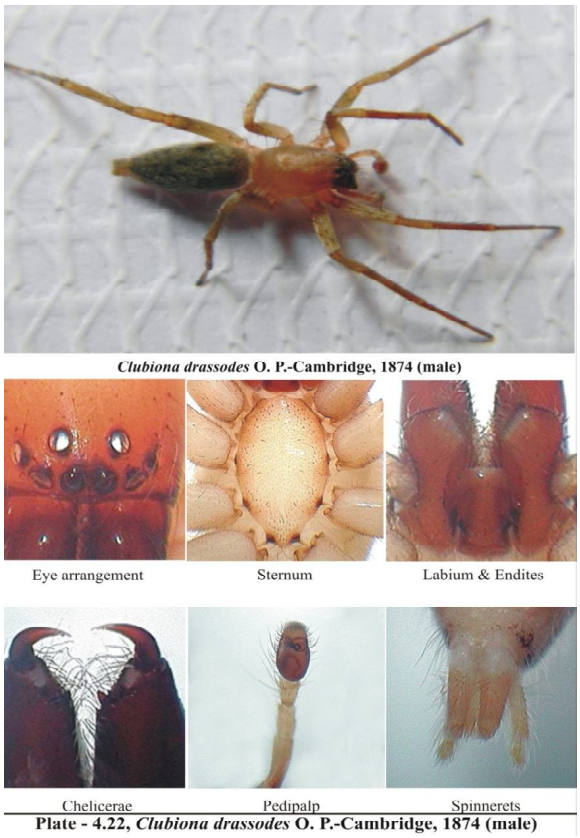

Plate - 4.22, *Clubiona drassodes* O. P.-Cambridge, 1874 (male)

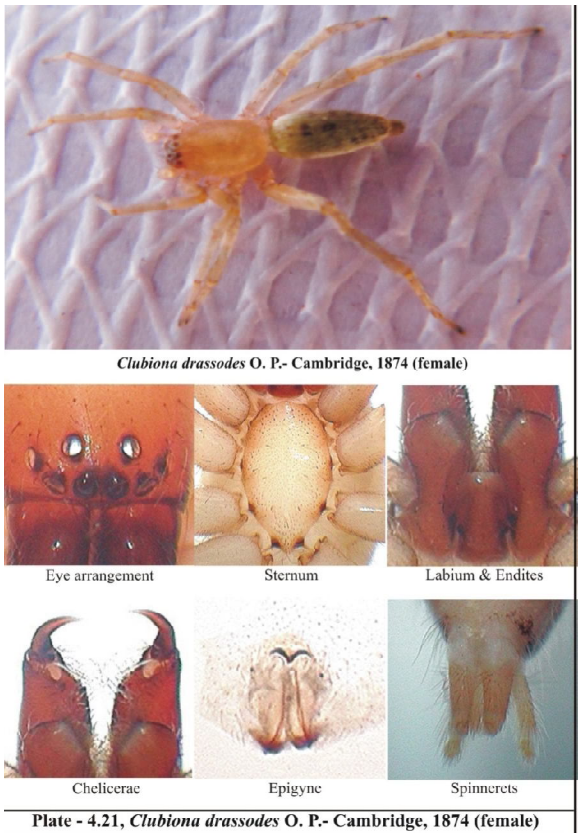

Plate - 4.21, *Clubiona drassodes* O. P.- Cambridge, 1874 (female)

anterior row of eyes recurved, posterior row of eyes slightly procurved, posterior row slightly longer than anterior row, clypeus low.

Sternum: Oval, pale in colour, longer than wide, posterior end narrow, clothed with hairs, precoxal sclerotized with black patch on sternum margin.

Labium: Longer than wide, brown in colour, distal end pale, clothed with hairs, laterally notched.

Endites: Longer than wide, light brown in colour, distal end pale with serrula and scopula, laterally bent margin, narrow posteriorly.

Chelicerae: Brownish colour, clothed with hairs, dorsum with condyle, ventral cheliceral furrow with scopula, promargin provided with three teeth, unequal in size, second teeth larger than other, retromargin provided with two teeth, equal in size.

Legs: Long, pale brown in colour, legs are prograde, two tarsal claws with claw tufts, leg formula – 4213, legs armed with hairs, spines and trichobothria, two rows of trichobothria on tibia and metatarsus, femur armed with long setae, short scopula present dorsally on tarsus and metatarsus, tibia provided with two pairs of ventrolateral spine, metatarsus of leg IV more spiny than that of leg I, coxae with intercoxalsclerites, trochanter with short hairs tufts laterally.

Leg measurements (in mm)

Leg segments	Leg 1	Leg 2	Leg 3	Leg 4
Coxae	0.58	0.60	0.66	0.80
Trochanter	0.36	0.36	0.33	0.44
Femur	1.58	1.69	1.41	1.60
Patella	0.89	1.00	0.72	0.58
Tibia	1.63	1.69	1.27	1.69
Metatarsus	0.94	1.10	1.36	1.36
Tarsus	0.75	0.86	0.69	0.60
Total Length	**6.73**	**7.30**	**6.44**	**7.07**

Abdomen: Cone shaped, elongated, grayish brown in colour, decorated with patches laterally and clothed with pubescence, anterior edge with short hairs in a bunch, posteriorly narrow with grey black patches laterally and mid-longitudinally, two pairs of sigilla present mid-longitudinally, light pale brown ventrally, sclerotized epigastric furrow, light brown patch present below epigastric furrow.

Palp : Short, cymbium covered with hairs, apically short scopulae hairs, bulbous swollen, conductor thin and coiled at distally, sperm duct is clear, embolus thin pointed.

Spinnerets : Spinnerets are long, light brown pale in colour, anterior spinnerets long cylindrical, clothed with hairs and pubescence, median spinnerets thin and shorter than others, posterior spinnerets fairly longer than anterior and all the spinnerets are scattered, white cream patch present at the base of the spinnerets.

Type locality: Omkareshwar dam M. P.

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IMPACT OF BAT GUANO ON DEGRADATION OF SOIL POLLUTANTS IN OF MALKAPUR TAHSIL, BULDANA DISTRICT, MS (INDIA)

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ABSTRACT

The word guano originated from the Quichua language of the Inca civilization and means "the droppings of bat". The bats forage at night for insects over a particular area, and they return to the old temples during the day to sleep and care for their young. They attach themselves to ceiling, and their excrement accumulates on the floor below. In some situations the guano can reach a depth of feet in many years and appeared as guano-hip, and it has a valuable importance.

Bat guano was collected from the temple of Lonar crater of Lonar, Buldana District, Maharashtra. The bat guano, was dissolved in soil of Malkapur Tahsil, (100:1000) concentration was prepared and kept undisturbed till 30 days and parameters was noted at an interval of 2 hour and thereafter 5 days for about 24 hours and 30 days respectively. Resulted into increasing in pH and decline in chloride, nitrate, phosphate and sulphate content of soil after the addition of bat guano. Our investigation results indicated that bat guano used for degradation of soil pollutants and bioremediation of agricultural ecosystem.

Key words: Bioremediation, bat guano, Soil pollutants etc.

INTRODUCTION

Lonar crater is situated in village Lonar in the Buldhana District of Maharashtra, India. It has an almost perfectly circular shape and accumulated with water in the deeper parts of basin. Rocks in the crater reveal many characteristic features of the moon rocks. There are many old temples on the peripheral boundary of the crater which have now become roosting places for bats. Ramgaya Temple has become the source of sweet drinking water, as this is the only sweet water stream available in the crater; rest of the crater water is highly saline. Kamalja Devi temple is situated at the southern base of the crater. Morache temple (Peafowl's temple) is now famous for existence of thousands of bats and peacocks. Waghache temple (Leopards temple) is also famous for bats and people have seen leopard found in it many times.

BAT GUANO

The word guano originated from the Quichua language of the Inca civilization and means "the droppings of bat". The bats forage at night for insects over a particular area, and they return to the old temples during the day to sleep and care for their young. They attach themselves to ceiling, and their excrement accumulates on the floor below. In some situations the guano can reach a depth of feet in many years and appeared as guano-hip, and it has a valuable importance.

BIOREMEDIATION AND BAT GUANO

One of the most serious universal, international problems facing us today is the removal of harmful compounds from the soil. If it is remain in soil longer period, a process called eutrophication occurs (Prince, 2003).

Now a days excessive use of fertilizers, chemicals and polluted irrigation, the quality of agricultural ecosystem (soil), that degrades the various environments is a vital concern to the public. Thus it is crucial to develop and implement accurate means to clean and preserve our precious and deteriorating environment. Although there are many techniques in cleaning environmental contaminations, one process has the most potential, namely bioremediation. Bioremediation, or commonly referred to as biodegradation, is a process in which microbes such as bacteria, fungi, yeast, or micro algae are involved in degrading toxic wastes (Pace, 1997 and Knezevich, 2006).

A marvelous symbiosis exits between the microorganisms and bat guano. Bacteria in the mammalian intestinal tract aid in the breakdown of food during digestion. These organisms synthesize enzymes capable of degrading a vast array of substances. Innumerable microbes are regularly excreted along with waste products and together with other organisms; they constitute the microbial population of a bat guano deposit (Steele, 1989).

Large populations of bat deposit thousands of kilograms of dropping annually. An ounce of bat guano contains billions of bacteria, and a single guano deposit may contain thousands of bacterial species. Guano being rich in bioremediation microbes cleans up toxic substances, (Barry et al., 1997). At present we do not know these species.

MATERIALS AND METHODS

To study the impact of bat guano on soil, 100 mg bat guano was dissolved in 1000 mg of Malkapur Tahsil soil (100:1000 proportions) for every times. After addition of bat guano in soil, then the soil was analyzed for the change in its pH, chloride, nitrate (NO_2), phosphate (PO_4) and sulphate (SO_4) contents. The change in soil parameters were noted after every two hour upto 24 hours. Thereafter, the samples were kept undisturbed and analyses were carried out for 30 days at an interval of 5 days. The soil was analyzed by using standard methods for water analysis suggested by APHA (1998).

OBSERVATIONS AND RESULTS

When bat guano was dissolved in soil with pH 5.00. After 2 hours the pH was found to be changed to 6.15 and after 4 hours increased gradually and it reached to 7.25 after 24 hours (Table, 1). The soil was kept undisturbed till 30 days and the pH was noted after every 5 days upto 30 days. After 5 days the pH was seen to be increased upto 20 days and then it remained constant during 25 to 30 days of observations (Table 2).

When bat guano was dissolved in soil with chloride (201); nitrate (56.5); phosphate (57.5) and sulphate (46.0), after 2 hours the parameters was found to be changed to chloride (187), nitrate (52.4), phosphate (56.5) and sulphate (46.0) and after 4 hours decreased gradually to chloride (91), nitrate (24.4), phosphate (29.5) and sulphate (29.6) upto 24 hours (Table, 1). The soil was kept undisturbed till 30 days and the chloride, nitrate, phosphate and sulphate was noted after every 5 days upto 30 days. After 5 days the parameters was seen to be decreased upto 20 days and then it remained

Table, 1: Impact of bat guano on soil content of Malkapur Tahsil at an interval of 2 hrs.

Ps	Sg	Time (Hrs)												
		0	2	4	6	8	10	12	14	16	18	20	22	24
pH	W1	5.00	6.15	6.49	6.55	6.65	6.82	6.55	6.84	6.85	7.91	7.95	7.02	7.25
ClorSn	W1	201	187	173	160	155	143	132	125	115	107	98	93	91
NO_2	W1	56.5	52.4	48.8	47.0	44.8	41.5	39.5	29.5	27.8	26.1	25.4	24.8	24.4
PO_4	W1	57.5	56.5	55.0	45.0	44.0	43.5	39.5	35.5	32.0	31.5	30.5	29.5	29.5
SO_4	W1	46.8	46.0	45.6	44.5	43.8	42.3	39.5	37.2	34.8	33.2	30.5	29.6	29.6

All values are the mean of five replicates; Ps – Parameters; Sg – Sampling; Sn – Salinity; W1 – Soil from Malkapur Tahsil.

Table, 2: Impact of bat guano on soil content of Malkapur Tahsil at an interval of 5 days.

Ps	Sg	Time (days)							
		0	1	5	10	15	20	25	30
pH	W1	5.00±0.37	7.25±0.39 (+45.00)	7.42±0.24 (+48.40)	7.38±0.30 (+47.60)	7.40±0.32 (+48.00)	7.43±0.40 (+48.60)	7.55±0.45 (+51.00)	7.55±0.40 (+51.00)
ClorSn	W1	201±7.60	91±8.83 (-54.73)	86±10.95 (-57.21)	84±10.09 (-47.26)	83±9.73 (-58.21)	82±9.41 (-58.71)	81±11.06 (-59.70)	81±9.68 (-59.70)
NO_2	W1	56.5±2.71	24.4±1.12 (-56.81)	24.0±1.25 (-57.52)	23.6±1.49 (-58.23)	23.1±1.28 (-58.94)	22.8±1.13 (-59.29)	22.2±1.29 (-59.29)	22.2±1.40 (-59.29)
PO_4	W1	57.5±3.05	29.5±1.68 (-48.70)	27.5±1.96 (-47.83)	26.4±1.45 (-54.09)	25.3±1.29 (-56.00)	23.0±1.15 (-60.00)	21.4±1.28 (-62.78)	21.4±1.20 (-62.78)
SO_4	W1	46.8±2.48	29.6±1.68 (-37.18)	28.9±1.59 (-38.25)	28.1±1.43 (-39.96)	27.8±1.39 (-40.60)	26.9±1.61 (-42.52)	26.1±1.46 (-44.23)	26.1±1.70 (-44.23)

constant during 25 to 30 days of observations (Table 2).

All values are the mean ±SE of five replicates; Figures in parenthesis indicate percent change over the result on 0 day; Ps – Parameters; Sg – Sampling;Sn – Salinity; W1 – Soil from Malkapur Tahsil.

DISCUSSION

Tilak et al. (2005) reported a number of bacterial species associated with the bat guano belonging to genera, *Azospirillum, Alcaligens, Arthrobacter, Acinetobacter, Bacillus, Burkholderia, Enterobacter, Erwinia, Flavobacterium, Pseudomonas, Rhizobium* and *Serratia*. He also suggested that this bacterium has high bioremediation capacity. Hutchens et al. (2004) had demonstrated aerobic methane oxidizing bacteria, Methylomonas and Methylococcus in bat guano.

The bacterial enzymes capable of degrading a number of substances (Martin, 1991; Dvorak et al., 1992; Edenborn et al., 1992; Bechard et al., 1994; White and Chang, 1996; Frank, 2000; Kaksonen, et al., 2003; Vallero et al., 2003; Boshoff, et al., 2004; Miranda, 2005; Seena, 2005; Tilak et al., 2005). Murphy (1989), demonstrated a nutritious broth formation when the bat guano was added in water and further he proved that this broth supported the growth of numerous microbes.

Alley and Mary (1996), stated that an ounce of bat guano contains billions of bacteria and thousands of bacterial species and these bacteria are important to bioremediation. Sridhar et al. (2006), and Pawar et al. (2004), examined the fungal fauna of bat guano and used for bioremediation of Lack soil.

CONCLUSIONS

Excessive use of fertilizers, chemicals, anthropogenic activities, municipalities, various industries disposing their waste into the various water resources which is used for irrigation. It is of utmost importance, hence, to prevent the pollution of various resources and soil, by all possible means to control its quality from further deterioration. Applying microorganisms for soil pollution control is an area of interest all over the world.

In the present investigation is an attempt to study the impact of bat guano with its rich microbial flora on bioremediation of soil. The results revealed that within a period of 30 days, there was a remarkable reduction in the physico-chemical parameters of river pollutants, thus stabilizing the soil pollutants, suggesting that soil pollutants can be effectively treated by bat guano and is the excellent bioremediatant.

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ADSORPTION OF DYES ONTO A COAL FLY ASH SYNTHESIZED CFA-MCM-41:A CONVERSION OF WASTE TO WEALTH

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ABSTRACT

The adsorption of acid dye Amido Naphthol onto hexa-decyl-tri-methyl-ammonium chloride (HDTMAC) modified mont-morillonite and basic dye Basic Violet 10, BV10 onto CFA-MCM-41 was premeditated to study its impending nature for the elimination of acid and basic dye from wastewater. The revolutions of surface and pore structure of montmorillonite induced by surfactant modified process were characterized based on the analysis of the N_2-isotherms as well as the X-ray diffraction patterns. The adsorption on CFA-MCM-41 with regard to contact time, pH, and temperature was then measured to provide more information about the adsorption characteristics of CFA-MCM-41. Both Langmuir and Freundlich adsorption models were applied to describe the equilibrium isotherms and the pseudo-second-order kinetic model.

Key Words: CFA-MCM-41, dyes, adsorption, XRD, FTIR etc.

INTRODUCTION

The extensive application of dyes in printing, dyeing, textiles etc. has created a hugequantity of dye wastewater which may be carcinogenic and toxic.The elimination of dyes from wastewater turns out to be a vital issue in the ecological shield. Moreover, the colour produced by diminutive amounts of organic dyes in water is of enormous apprehension as it is aesthetically disagreeable. This recommends a rigorous search for the best accessible technology for the exclusion of dyes.

A number of physico-chemical methods like advanced oxidation and biological process, coagulants, oxidizing agents, membrane, electrochemical, adsorption techniques[1,2]etc have been proposed to satisfy the above requirements.

Among these methods, the adsorption technique is found to be a proficient and cost-effective process to remove dyes and also to control the biochemical oxygen requirement. Various studies have been dedicated to the dyes adsorption kinetics, equilibrium modeling, and mechanism in addition to the aspects that influence adsorption.

The inspected adsorbents embrace activated carbon, mesoporous molecular sieves, some natural adsorbents and agricultural by-products[3-5]. Amongst these adsorbents, mont-morillonite has been recognized as one of the suitable inexpensive adsorbents for the exclusion of dyes from waste water[6].

In recent times, mesoporous molecular sieves for instance MCM-41 have as well established a substantial gratitude owing to their large pore-space and special surface property[7].

It is recognized that the (-) charge of CFA is balanced by redeemable cations Na+ and Ca++. As CFA have little or no affinity for anionic species such as that of acid dyes, to improve their adsorption ability and capacity, the replacement of the natural inorganic cations with surfactant cations such as quaternary ammonium compounds was frequently observed and the obtained surfactant-modified CFA were then used to adsorb the neutral and anionic organic compounds.

On these applications, it is found that when larger organic cations HDTMA are used, the hydrophobic tails interact with each other producing an organic phase which act as a partition medium into which non-ionic organic molecules partition from water. In addition to the adsorption of nonionic organic compounds, quaternary ammonium compounds-CFA complexes have been shown to have the ability to remove inorganic anions from aqueous solution with an adsorption mechanism that appears to be replacement of counterion of the surfactant by anionic species.

The innovation of ordered mesoporous materials has led to the research in the synthesis, characterization and application of mesoporous materials[8,9]. Mesoporous material MCM-41 provides exhilarating prospects for elementary and functional studies on mesoporous materials due to its high surface area, high pore volume.

The inimitable pore structures of MCM-41 offer a special atmosphere for chemical severances and reactions. Recently, Ho et al.[7] have shown that materials prepared by grafting amino- and carboxylic-containing functional groups onto MCM-41 might be a useful adsorbent for the removal of Acid Blue 25 and methylene blue dyes from waste water and these

adsorbents can be regenerated by simple washing with alkaline or acid solution to recover the adsorbents and adsorbed dyes.

In this study, our intention is to inspect the prospective of surfactant modified mont-morillonite and MCM-41 for the removal of acid and basic dye, respectively, by measuring the adsorption data of Amido Naphthol Red Gon CFA and Basic Violet 10 (BV10) on MCM-41.

The changes of surface and pore structure of mont-morillonite induced by surfactant modified process were characterized based on the analysis of the N_2 isotherms as well as the X-ray diffraction (XRD) patterns. The adsorption processes with respect to pH, contact time, and temperature were measured to provide more information about the adsorption characteristics of CFA and MCM-41. The equilibrium data were fitted into Langmuir and Freundlich equations to determine the correlation between the isotherm models and experimental data. The kinetic and thermodynamic parameters were calculated to determine the adsorption mechanisms.

MATERIALS AND ADSORPTION ISOTHERMS

Mesoporous MCM-41 has been successfully prepared using different synthesis procedures and conditions. For this study, the MCM-41 powder was crystallized from an alkaline solution containing cetyl-tri-methyl-ammonium bromide (CTAB, 99%, Merck), sodium silicate solution, sulfuric acid (98%, Merck) and deionized water in the molar ratio of

1.1CTABr: 1.92 Na_2O: 6.63 SiO_2: 341.53 H_2O: 1.25 H_2SO_4.

After 18h of crystallization at room temperature, the CFA-MCM-41 powder was filtered, rinsed, and dehydrated before it was calcined in aoven at 550 °C for 2h to eradicate the organic template. Adsorbates AR1 and BV10 were preferred as adsorbates to confer the adsorption characteristics of CFA-MCM-41 correspondingly. The structures of both dyes are shown in Fig. 1.

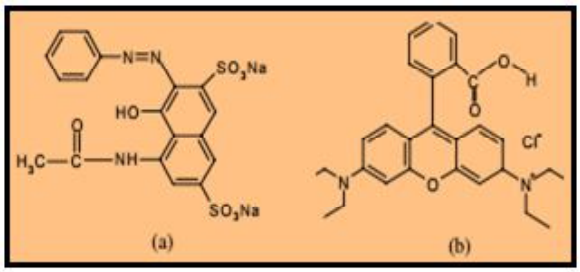

Fig.1 The structure of Dyes(a) AR1 and (b) BV10

The dye adsorption statistics from water solutions were achieved by the captivation method. AR1 and BV10 were first dried at 380K for 18h to remove wetness previous to use. The entire dye solution was prepared with distilled water.

For adsorption experiments, 0.15 gadsorbent was added into 150mL of dye water solutions at the preferred concentration.

The pH of the solution was attuned with a petite quantity of NaOH solution to uphold a constant value. The preliminary experiment exposed that about 45 min was required for the adsorption process to reach equilibrium with a reciprocating shaker.

The solution and solid phase were separated by centrifugation at 150Hz for 20 min in a reactor. A 10mL aliquot of the supernatant was removed and analyzed for AR1 and BV10 by UV (Hitachi, U-2000) at the wave length of 5300 and 5550A^0, respectively.

The adsorption capacity of dyes was then calculated using the relation $Q = V\Delta C/m$,

Where, V= Volume of the liquid phase,

m = Mass of the solid,

ΔC = Difference between the initial and final UV readings.

For the experiments of adsorption kinetics, the dye adsorption amounts were determined by analyzing the solution at suitable time periods.

The consequences of temperature and pH on the adsorption data were conceded out by performing the adsorption experiments at a variety of temperatures (300, 325 and 335K) and a range of pHs (3.7-11.7), respectively.

The effects of substituted surfactant on the phase structure of mont-morillonite as well as the phase structure and pore size of CFA-MCM-41 were appraised from the X-ray diffraction patterns obtained from X-ray diffractometer equipped with a CuK1α radiation.

The porous structure characteristics, including surface area and pore volume, were obtained from the conventional analysis of nitrogen isotherms measured at 80K with. At least three runs were conducted for each samples and the average value was recorded.

RESULTS AND DISCUSSION

Fig.2 shows the nitrogen adsorption desorption isotherms measured on the examined adsorbents. For mont-morillonites, it can be seen that the monolayer capacity, thus the BET surface area, decreases with the order: Mont >CFA.

It is well known that mont-morillonite has the capability of interlamellar expansion and it is often found that the

larger organic cations may act as pillars, increasing the spacing between the tetrahedral sheets [23]. This behavior can make the BET surface area increase or decrease depending on the arrangement, thus the packing, of organic cationsin the space among the aluminosilicate sheets. Obviously, larger HDTMA cations may possess compact packing in the inter-lamellar and result in serious pore blocking that inhibits the passage of nitrogen molecules.

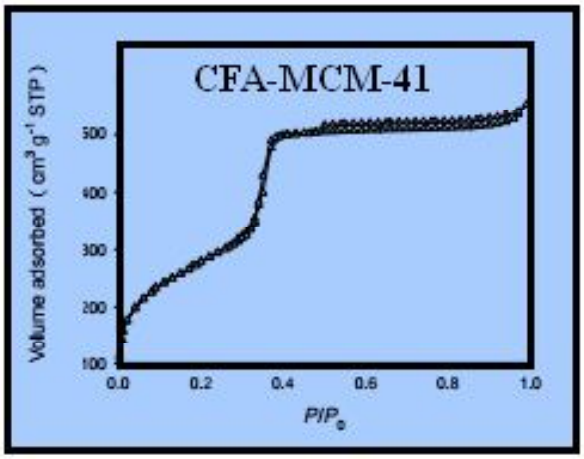

Fig. 2. Nitrogen isotherms of CFA-MCM-41

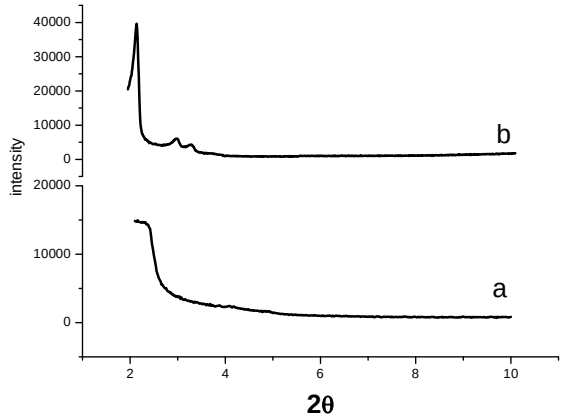

Fig. 3. XRD patterns of CFA-MCM-41.

The XRD patterns of CFA-MCM-41 are demonstrated in Fig. 3. It is clearly observed that the CFA-MCM-41 is best crystalline indicated by the decreasing of the intensity of most of the smectite peaks. On the other hand, the maximum peak for CFA-MCM-41 is more further tothe left, suggesting that the ion-exchange process indeed increases the distance between the tetrahedral sheets.

The d_{100}values of the examined mont-morillonites are as shown in XRD pattern. The trend in d_{100} values is consistent with the tendency in average pore diameters evaluated from the nitrogen isotherms. On the other hand, as presented in Fig. the presence of both (100) and (200) diffraction peaks in the CFA-MCM-41 pattern is evidence of good crystallinity of the prepared powder.

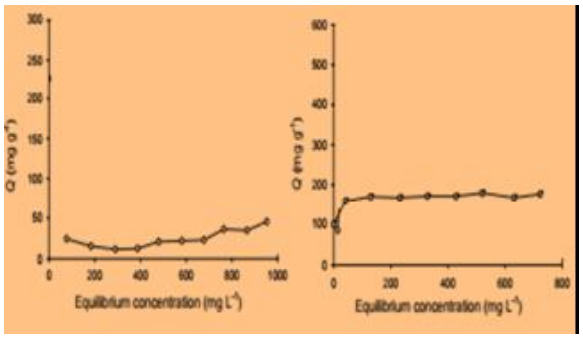

Fig. 4.Adsorption isotherms CFA at 300K and pH 4.7 CFA-MCM-41 at 300K and pH 4.

The pH value of the solution is an important con-trolling parameter in the adsorption process, as characterized in Fig. 4. It shows that the adsorption capacity of CFA-MCM-41 increases (decreases) slightly (significantly) at low (3-4) and high (11-12) pH values.

This result indicates that both CFA-MCM-41 and BV10 can be recovered by simply washing with alkaline or acid solution. It is noteworthy that although a more alkaline solution (pH > 10) may give a better recovery of basic dyes, the dissolution of the silica matrix is also more likely to occur at this pH range.

CONCLUSIONS

This study examined the potential of CFA- MCM-41 for the removal of acid and basic dyes, respectively.

It was experimentally concluded that CFA- MCM-41might be good adsorbents for the removal of acid and basic dyes from wastewater, respectively.

With respect to the effects of pH, contact time, and temperature on AR1/CFA and BV10/MCM-41, it is found that low or high pH values are favorable for the adsorption of AR1 onto CFA- MCM-41 adsorbent could be regenerated by simple washing with alkaline or acid solution due to the insignificant adsorption capacity of BV10 at low or high pH values.

The Langmuir model was found to provide good prediction for the adsorption of AR1 and BV10.

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PHYTOCHEMICAL ANALYSIS OF ETHANOL LEAF EXTRACT OF *RICINUS COMMUNIS* L. TO CURE JAUNDICE

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ABSTRACT

Plants have ben used traditionally in local people for treatment of jaundice. Most of the plant parts (extract) identified eg.(leaf) serve as major source of active ingredient and products of secondary metabolites e.g alkaloid, terpenoids etc used in curing diseases, production of drugs as well as in maintaining good health by the traditional practitioners. Several visits were made to the various tribal people like satpuda hill area and other local area, to the various communities between February- 2015 and October- 2015 for collection. The phytochemical analysis of Ricinus communis Lwas evaluated to ascertain some of the secondary metabolites that exhibit medicinal properties. The results of phytochemical screening of ethanol crude leaf extract of *Ricinus communis* L. revealed the presence of alkaloids, tannins, saponins and flavonoids. These *Ricinus communis* Lby traditional herbalists. These metabolites observer by various techniques like solvent extraction secondary metabolites could be responsible for the observed medicinal properties of, microwave oven, ultrasonicator, rotavapour, thin layer chromatography column separation technique.This will involve a synergy between the traditional and orthodox practitioners that will aim at formulating an integrative health for the overall goal of maintaining, enhancing and sustaining good health care.

Keywords: Phytochemical, Medicinal plant, traditional and Metabolites.

INTRODUCTION

Ricinus communis L, a member of Euphorbiaceae family commonly known as "Arandi." in in almost all hot places of India specially Amravati region.The Leaves of Ricinus communis Lare up to 24cm long, petioles. It is fairly common in field side which grown in hotter part of the India. Plant *Ricinus communis* L. is extensively utilized for the treatment of pharmaceutical disorders antioxidative, antitumor, antidiabetic, antifungal,antibacterial, hypoglycemic and hepatoprotective properties (1). It has been reputed in Siddha system of medicine as a remedy to treat jaundice, plants are an essential and integral component in the world of prescription medicine and have the ability to make various chemical constituents like flavonoids, alkaloids, and steroids. In some places, juice from the leaves of the plant is used in combination with the liquid extract to treat jaundice.

The present study is to review the overall information on the taxonomical classification, morphology, distribution, traditional uses, phytochemical constituents and recent scientific investigations of Ricinus communis L.

Fig 1.a) *Ricinus communis* L.

MATERIAL AND METHODS

Plant material

Ricinus communis L. leaves were collected during the month of February2015-Octomber 2015, from Satpuda hill area near to Amravati region Maharashtra , India. The fresh leaves were separated and kept for shade drying.Dried leaf material was powdered using mechanical grinder and heat in microwave oven to get the powder of desired coarseness. Powdered material was preserved in an air tight container.

Preparation of extracts

Dried *Ricinus communis* L. leaf powder mixed with ethanol and keep in ultrasonicator for half and hour to mix all chemical constituents in ethanol solvent wassubjected to successive extraction in asoxhlet extractor using ethanol andwater. The extracts were filtered andthe filtrates were concentrated under Rota vapour at room temperature to obtain the extracts as solid residues.

Phytochemical screening

Phyto chemical screening was performed using standard procedures is given (5).

Thin Layer Chromatography (TLC)

TLC analysis was carried out for the plant extracts dissolved in ethanol and water solvent. For theanalysis the silica gel sheet was used, fresh leaf extracts and the cold dried leaves extracts were analyzed using TLC.

The sheets are kept in TLC Chamber for one hour, depending on the polarity of the eluted fractions to be analyzed. The sheets were treated with 1% ninhydrin diluted to acetone and heated in anoven at 40°C for 30 seconds.

Test for Anthraquinones

The 0.5 g of the extract was boiled with 10 ml of sulphuric acid (H_2SO_4) and filtered while hot. The filtrate was shaken with 5 ml of chloroform. The chloroform layer was pipette into another test tube and 1 ml of dilute ammonia was added. The resulting solution was observed for color changes.

Test for Terpenoids (Salkowski test)

The 0.5 g each of the extract was added 2 ml of chloroform. Concentrated H_2SO_4 (3 ml) was carefully added to form a layer. A reddish brown coloration of the interface indicates the presence of terpenoids.

Test for Flavonoids

Three methods were used to test for flavonoids. First, dilute ammonia (5ml) was added to a portion of an aqueous filtrate of the extract. Concentrated sulphuric acid (1 ml) was added. Second, a few drops of 1% aluminium solution were added to a portion of the filtrate. Third, a portion of the extract was heated with 10 ml of ethyl acetate over a steam bath for 3 min. The mixture was filtered and 4 ml of the filtrate was shaken with 1 ml of dilute ammonia solution. In all the cases, a yellow colorations indicating the presence of flavonoids was observed.

Test for Saponins

The 0.5 g of extract was added 5 ml of distilled water in a test tube. The solution was shaken vigorously and the mixture is observed for astable persistent froth. The frothing was mixed with 3 drops of olive oil and shaken vigorously after which it was observed for the formation of an emulsion.

Test for Tannins

The 0.5 g of the extract was boiled in 10 ml of water in a test tube and then filtered. A few drops of 0.1% ferric chloride was added and observed for brownish green or a blue-black colouration.

Test for steroids (Liebermann-Burchard'stest)

One ml of the extract was dissolved in 10 ml of chloroform and equal volume of concentrated sulphuric acid was added by sides of the test tube. The upper layer turns red and sulphuric acid layer showed yellow with green fluorescence. This indicated the presence of steroids (7).

RESULTS AND DISCUSSION

Phytochemical investigation:

The Phytochemical screening of *Ricinus communis* L. showedpositive results as the tests like Anthraquinone, Terpenoids, Flavonoids,Saponins, Tannins and steroidsofRicinuscommunis L.This data clear that there is presence of various phytochemical in *Ricinus communis* L. plant.

Quantitatives pectrophotometric analysis for phenolic content and flavonoids:

The total phenolic and flavonoids content of plant aqueous extract were determined spectrophotometrically using the tannic acid and quercetin standard calibration curves, respectively, as per Ranjana sing et al (2015). Both standard curves showed linearity with R_2 value 0.962 and 0.956. The total phenolic and flavonoids content was found as per given table 3.2 .as antioxidant used in medicinal application to cure jaundice.

Table1 : Phytochemical screening of extracts of medicinal plants

S.N.	Test perform	*Ricinus communis* L. leaves ethanolic extract	*Ricinus communis* L. leaves aqueous extract
1	Anthraquinone	+	+
2	Terpenoids	+	+
3	Flavonoids	+	+
4	Saponins	+	+
5	Tannins	+	+
6	Steroids	+	+

Table (3.2): Total phenolic and flavonoids contain in *Ricinus communis* plant

S.N.	Plant name	Total phenolic (ug/ml)	Total flavonoids (ug/ml)
1	*Ricinus communis* L.	7.232	8.324

Purification of the extracts

The TLC of ethanolic extract of *Ricinuscommunis* L. plant is shown in (Figure 3.c) with their RF values. From the figures it isevident that there are many components that are responsible for theantioxidant activity. Hence, further investigations are required toisolate, purify and characterize those compounds which are responsiblefor the antioxidant activity used in medicinal application to cure jaundice.

Fig 3. TLC purification and partition *Ricinus communis* L.plant

CONCLUSIONS

In the present investigation, *Ricinus communis* L. Medicinal plant species used to treat jaundice and hepatitis were reported. The uses of these plants to treat various illnesses by the communities, because of poor socio-economic conditions, the high cost and a difficult access to allopathic medicines. The majority of the reported species are wild and rare. These demand an urgent attention to conserve such vital resources so as to optimize their use in the primary health care system. Now a day, conservation of traditional knowledge is necessary related to modernization of the region and lack of interest in traditional patrician, in transferring it to next generation. In this context, screening for active substances and testing their activities against jaundice and hepatitis as an interesting subject for the feature studies. Further advanced spectroscopic studies are required for the structural elucidation and identification of compounds.

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A NEW KINETICS AND MECHANISM STUDY OF IRIDIUM (III) CATALYSED OXIDATION OF ALCOHOL BY CERIUM (IV) IN AQUEOUS ACIDIC MEDIA

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ABSTRACT

Alcohol has different applications in chemical research and is used extensively at various phases during the drug development process. Alcohol is used in prediction of drug solubility from structure as solubility of drug is an important factor affecting its bioavailability. In view of such importance of different alcohols, in the present study the Kinetics and mechanism of iridium (III) catalyst used oxidation of alcohol by cerium (IV) in aqueous sulphuric acid medium have been investigated at different temperatures [Alcohol] >> Ce (IV) >> (IR) (10–5 mol/dm3) in 1 mol dm–3 sulphuric acid medium. The reactions are found to be the zero order with respect to Ce (IV) ion. From the [HSO4] dependence, Ce (IV) has been found kinetically active the proposed mechanism involves a pre-equilibrium interaction between the catalyst and substrate. The process is acid catalyzed. Activation parameters have been determined to investigate the effect of temperature; and probable rate law and mechanism has been proposed.

Key word: Alcohol = 5-methyl 2-pentanol.

INTRODUCTION

The use of Ir (III) and Ru (III) in trace amounts as an efficient catalysts in the homogeneous reactions involving Ce (IV) as an oxidant has been reported[1,2] several kinetic investigations on redox reactions involving Ce (IV) and different organic and inorganic compounds including different alcohols have been carried out[3-8].

Kinetic study on the oxidation of ethanol by Ce (IV) in perchloric acid media have been reported by glycols by Ce (IV) and oxalic acid[9], malonic acid[10], aliphatic ketones and aldehydes[11], isobutylic acid and 3-bromopropanoic acid[12,13] have been studied. Various investigations are also made on Ce(IV) aqueous H_2SO_4, where it forms strong sulphato complex[14,16]. Hence we reported here kinetics and mechanism of Iridium (III) catalyzed oxidation of alcohol and glycol by Ce(IV) in aqueous acidic medium.

The kinetic study shows that oxidation of Alcohol and Glycol by Ce (IV) in aqueous sulphuric acid media is slow but gets catalysed by Ir (III) at trace concentration (10^{-5} mol dm^{-3}). It prompted us to explore the kinetic behaviour of the title reaction in detail on metal ion catalysis in Ce (IV) oxidation.

MATERIALS AND METHODS

Cerium (IV) stock solution was obtained by dissolving Ce (IV) (Himedia A.R.) in 1.0 mol dm^{-3} sulphuric acid. The stock solutions were kept at room temperature for more than 49 hours to attain equilibrium and was standardised with ammonium iron (II) sulphate solution using ferroin as an indicator Glycols were of Across Organics grade. Doubly distilled water was used throughout the experiment. Ir (III) solution was prepared in 1 mol dm^{-3} H_2SO_4 solution.

Procedure and Kinetic Measurements:

Kinetic measurements were carried out on a Elico (CL 157 Colorimeter). The progress of the reaction was monitored by measuring absorbance of at 350 nm. The kinetic study was carried out under pseudo-first order conditions using [Glycols] >> [Ce (IV)]. To a thermally equilibrated solution containing Ce (IV), H_2SO_4, Ir (III) and glycol solutions were added to form the reaction mixture and progress of the reaction was monitored at regular time intervals by observing variation of optical density with time. H^+ ion concentration was maintained by the addition of required amounts of H_2SO_4. The pseudo first order rate constants were computed by the graphical method and the experimental values were reproducible within $\pm$3%.

RESULTS AND DISCUSSION

Under varying concentration of [Alcohols], [Glycols] and [Ce(IV)] kinetics of Ir (III) catalyzed oxidation of Alcohol and Glycol by Ce (IV) in aqueous sulphuric acid media was investigated at several concentrations of the reactants indicating first order kinetics with alcohol and first order with respect to glycol. The results are shown in Table 1.

The rates of the reactions were studied under varying [Ce (IV)]. Plots of log [O.D.] versus time were linear indicating a first order dependence in [Ce(IV)] from the pseudo-first order rate constants were computed. Under varying [Ce (IV)]. Plots of log [O.D.] versus time were indicating first order dependence in [Ce(IV)] with respect to alcohol and zero order with respect to glycol.

The rates were increased with increase in [Glycols]. From the plots of log [O.D.] versus time, the Pseudo-first order rate constants (K_{obs}) were evaluated at, different values of [Glycols]. The order in [Glycols] was found to be first order indicating the formation of a complex between Ir(III) and [Glycols]. The fact is supported by the linearity of plot of $1/K_{Obs}$ Versus 1/ [Glycols] giving intercept. Under the kinetic conditions, at fixed [Ir] the plot of K_{Obs}. Vs [substrate] indicating first order for substrate.

Keeping [Ce(IV)], [Alcohol] and [Glycols] constant, increase in Ir (III) increased the rate and the order in Ir (III) was found to be first order indicating the complex formation between them which has been confirmed by reciprocal plots of $1/K_{Obs}$ Versus 1/Ir (III).

There results could be explained by proposing the following equilibrium in which the neutral Ce (IV) was assumed to be the reactive species. The reactions were studied at different temperatures and rate constants at 15-45 ^{0}C (where used to calculate K (specific rate constant)). ?H$^{\#}$ and ?S$^{\#}$ for the oxidation of each alcohol and glycol and their values are reported in Table 2.

Under the experimental conditions, from an independent experiment, in the absence of substrate, it has been found that Ir (III) catalysed oxidation of water by Ce (IV) is insignificant. Hence, this path was not taken into consideration to calculate the k_{obs}.

When Ir(III) is mixed with excess of Ce(IV) it is oxidized[11-13] rapidly to Ir(IV) by Ce(IV) as shown in equation (1).

Table 1 : Pseudo-first order rate constants at 298.15 K for the Ir (III) catalysed oxidation of alcohol and glycol by Ce (IV) in aqueous sulphuric acid medium 0.25 mol/dm^3, [H$^+$] = 0.1 mol dm^{-3} [Ir (III)] = 1 x 10^{-5} mol dm^{-3}.

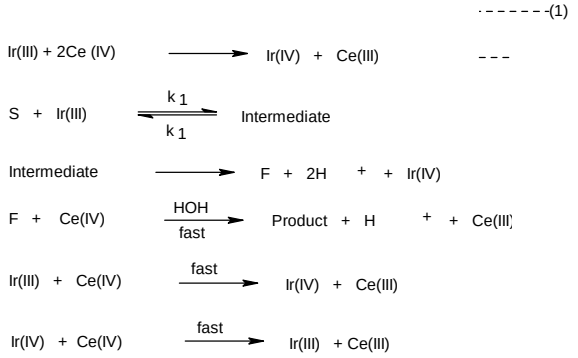
[Substrate] x 10^{-2} mol dm^{-3}	K_{obs} x 10^2 (min^{-1})	
	5-methyl 2-pentanol	2-methyl 2,4-pentane glycol
6.48	0.341	02.21
7.40	0.387	02.737
8.33	0.445	03.066
9.25	0.475	03.46
10.18	0.521	03.896
10.61	0.684	04.418
11.38	0.834	04.788

The effect of temperature has been studied from the range of 15^{0}C to 45^{0}C, under the experimental conditions. The energy of activation was computed by the Arrhenius plots. The calculated pseudo-first order rate constants at 298.15 k are shown in Table 2.

Table 2 : Activation parameters at 298.15K for the Ir (III) catalysed oxidation of Alcohol and Glycol by Ce (IV) in aqueous H_2SO_4 medium.

Susbtrate	K_{Obs} 10^{-4} Sec^{-1}	Ea J Mol^{-1}	?H$^{\#}$ J^{-1} Mol^{-1}	?S$^{\#}$ J^{-1} Mol^{-1}
5-methyl 2-pentanol	1.153	2136.9879	1544.862	-49.8226
2-methyl 2, 4-pentane glycol	7.782	9933.0736	9340.948	-24.1311

Based on experimental facts such as the rate data, induced polymerization, orders of the species of activation parameters, the most probable mechanism, proposed is as shown in Scheme 1.



Scheme 1 :

$$\frac{-d\,[Ce(IV)]}{dt} = K_1\,[S]\,[Ir(IV)]$$ Since Ir(IV) = Ir(I

Hence it can be written as,

$$\frac{-d\,[Ce(IV)]}{dt} = K_1\,[S]\,[Ir(III)]$$

Scheme 1 leads to rate law which is in the form of the experimentally observed one -

Where k obtained from experimentally from the effect of [substrate] on k_{obs}.

At constant [Ir (III)] the plot of $1/K_{obs}$ Versus 1/ [substrate] was found to be linear and from the slope and intercept of which the values of formation constant K and bimolecular rate constants k were calculated.

Constancy in the calculated values of ?G$^{\#}$ for these oxidation reactions indicates that the same type of the reaction mechanism could be operative for the oxidation reactions. The complex formation between Substrate and Ir (III) takes place & finally the complex decomposes into products as per detailed proposed mechanism of oxidation as shown in Scheme 1.

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SURVEY OF MEDICINAL PANTS AND THEIR USES FROM PUSAD AND ADJOINING HILLY REGION

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ABSTRACT

Medicinal plants are the basis of traditional medication system of India and other parts of the world. The present investigational survey was carried out to report traditional uses of medicinal plants for the treatment of various ailments in different regions of Pusad and its adjoining forest areas. In this survey 20 plants species like *Acacia Arabica, Aloe vera, Asparagus raecemosus, Couroupita guianensis, Lantana camara, Tamarindus indica, Ziziphus mauritiana* etc. belongs to 15 families are reported from which some are cultivated and some are widely occur in city, adjoining hilly areas, and waste lands; used by local peoples traditionally in their routine life. Thus the present investigation provides an idea for the discovery of new drugs.

Keywords: Pusad, medicinal plants, tribals, traditional knowledge

INTRODUCTION

Pusad tahsil is situated on the bank of river Pus and in the mountainous hilly region in Yavatmal district of Maharashtra state. The river Pus flows in the cutting hills of ranges of Satpuda. Although officially a Taluka place, Pusad is comparable to the size of a District in terms of size and revenue. It is located at 19°542 N 77°352 Eÿþ / ÿþ19.9°N 77.58°Eÿþ / 19.9; 77.58. It has an average elevation of 315 metres (1033 feet). It receives an average rainfall of about 471mm per year. Climate of Pusad is very high with the temperature going as high as 49 degree Celsius during summers and as low as 5 degree during the time of winters. The forest is deep with teak vegetation with different types of shrubs, tress and climbers. The region is effective for medicinal plants growth and development. Most of the locality present in Pusad and around area is of tribal peoples which is depend upon the forest resources like firewood, medicinal plants, etc.

Traditionally from prehistoric times, the use of different parts of medicinal plants was practiced to cure specific ailments evidently due to presence of some bioactive compounds like alkaloids, flavonoids, essential oil, glycosides, tannins, terpenoids, steroids and others. Many of the drugs, currently in use have been isolated from natural sources based on information about curative agent in folklore medicine (Sameera and Mandakini, 2015). About 47000 plant species are found in different parts of India, of them 17,000 flowering plants, 6850 species are endemic to India and 8000 are ethnobotanically important (Wildlife Institute of India, 2007). Singh (1999) reported that out of 250,000 to 300,000 total plants of the world, India harbors' about 45,000 plants. Out of 20,000 medicinal plants of the world, India contributes about 3000-5000 plants. Biodiversity is one of the key components of our basic life support system. The traditional herbal medicines are still practiced in large part of our country in tribal and rural areas. The present attempt is to survey of different regions of Pusad and its surrounding area for medicinal plants and contribution to the knowledge of traditional uses of medicinal plants of this region.

MATERIALS AND METHODS

For the study of different types of plants author visited different localities of Pusad and adjoining hilly region. During visits various types of plant were found viz., trees, shrubs, herbs, grasses, ornamentals & medicinal and aromatic plants. For collection of these plants the author was plan to visit different localities at different times. The collected plants at the time of flowering were identified with the help of local names and Botanical flora (Ugemuge, 1986). The medicinal uses of plants and plant parts were recorded from local peoples and the literature.

OBSERVATIONS

S. N.	Botanical name, Common name, Family	Medicinal uses
1	***Acacia arabica*** Babul - Mimosaceae	The stem bark is astringent, demulcent used in diarrhoea, dysentery, diabetes as astringent, antihelmentic, in skin disease, cough, bleeding piles, and gonorrhea. The tender twigs are used as toothbrushes while the thorns are used for joints pains.

2. ***Adhatoda vasica*** Adulsa - Acanthaceae	The plants parts are useful in the treatment of diseases like nervous disorder, diarrhoea, dysentery, tumours, inflammations, tuberculosis and epilepsy.
3. ***Aloe vera*** Korphad – Liliaceae	It has been used to treat burns, genital herpes, dandruff, osteoarthritis, inflammatory bowel disease, asthma and epilepsy.
4. ***Asparagus raecemosus*** Shatawari – Liliaceae	This plant is recommended in Ayurvedic tests for prevention and treatment of gastric ulcers, inflammation, nervous disorder, liver diseases dyspepsia and as a galactogogue.
5. ***Bougainvillea glabra*** Bougainvillea – Nyctaginaceae	It is used in variety of disorders like diarrhoea, reduce stomach acidity, cough and sore throught; decoction of dried flowers for blood vessels and leucorrohea and decoction of the stem in hepatitis.
6. ***Butea monosperma*** Palas - Fabaceae	Flowers are astringent to bowel, in cure "Kapha", leprosy, strangury, gout, skin diseases, thirst; flower juice is useful in eye diseases. Flower is bitter, aphrodisiac, expectorant, tonic, diuretic, good in biliousness, inflammation and gonorrhoea.
7. ***Carica papaya*** Papai - Caricaceae	It is used in the treatment of a numerous diseases like warts, corns, eczema, cutaneous tubercles, glandular tumors, blood pressure, dyspepsia, constipation, amenorrhoea, general debility, expel worms and stimulate reproductive organs.
8. ***Bombax ceiba*** Katesavri - Malvaceae	The plant has been used extensively for treatment of some diseases like anti-inflammatory, anti-HIV, hepato-protective, hypotensive, antiangiogenic, antioxidant activities.
9. ***Couroupita guianensis*** Canon ball tree - Lecythidaceae	It is used in the treatment of skin infection, odontalgia, stomachache, enteral gas formation, tumors, pains, piles, scabies, hemorrhage, dysentery, scorpion poison, etc.
10. ***Cyperus rotundus*** Nagarmotha - Cyperaceae	There are many properties are present like anti-inflammatory, antipyretic, anti-diabetic, anti-diarrhoeal, antimicrobial and cure gastrointestinal diseases. This plant is used for treating fevers, digestive system disorders, wounds, pain reduction; for muscle relaxation.
11. ***Cassia tora*** Tarota - Caesalpinaceae	It is used to treat a variety of medical complications like bronchitis, ulcer, hypertension, liver damage, fungal infection, diabetes, ringworm, skin diseases.
12. ***Ficus benghalensis*** Wad – Moraceae	The barks, leaves, fruits and latex are considered to be very effective in various treatments, such as diabetes, skin diseases, ulcers, dysentry, diarrohoea, stomachache, piles, etc.
13. ***Ficus religiosa*** Pimpal - Moraceae	It is beneficial in the treatment of diseases like diabetes, skin infections, respiratory disorders, central nervous system disorder, gastric problems, cough, sexual disorder, etc
14. ***Hibiscus rosa-sinensis*** Jaswund - Malvaceae	The plant is used in epilepsy, leprosy, bronchial catarrh, diabetes, diarrhea, blackening hair, remove burning of the body, urinary discharges, seminal weakness, piles, uterine and vaginal discharges.
15. ***Lantana camara*** Ghaneri - Verbenaceae	It is used widely to cure a varieties of diseases like cough, incessant high fever, malaria, cervical lymph node tuberculosis, dermatitis, eczema, rheumatism, wounds, tetanus, toothaches, ulcers and swellings.
16. ***Ocimum sanctum*** Tulus – Lamiaceae	It reduces stress; enhances stamina and endurance; boosts the immune system; reduces inflammation; protects against

	radiation damage; lessens aging factors; supports the heart, lungs and liver.
17. ***Psidium guajava*** Guava - Myrtaceae	This plant is used for treating diarrhea, cancer dysmenorrhoea, bleeding gums, scurvy; hypertension and malaria, etc.
18. ***Tamarindus indica*** Chinch - Caesalpinaceae	It is for the treatment of cold, fever, stomach disorder, diarrhea, jaundice, yellow fever, blood tonic, gastrointestinal, urinary tract and wound infections, typhoid fever and skin cleanser.
19. ***Tridax procumbens*** Kambarmodi - Asteraceae	The plant promising wound healing activity, antidiabetic, hypotensive effect, antimicrobial, insect repellent activity, anti-inflammatory and antioxidant, again use for the treatment of bronchial catarrh, dysentery, diarrhea.
20. ***Ziziphus mauritiana*** Bor - Rhamnaceae	It is used for the treatment of various diseases such as digestive disorders, urinary troubles, diabetes, skin infections, diarrhea, fever, bronchitis, liver complaints, anaemia, etc.

CONCLUSIONS

The plants collected and reported from Pusad, District Yavatmal in the present study are used by the local peoples and tribal in their routine treatment practices. All the traditional drugs obtained from different medicinal plants studied in present attempt are very effective, cheap and available around agricultural fields and in wastelands and surrounded hilly areas. So the tribals are using these plants as alternative to allopathic medicines. Further research on these plants on scientific lines may help in developing effective drugs for human health care.

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STUDIES ON FLOWERING PHENOLOGY IN *GOSSYPIUM HIRSUTUM L.*

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ABSTRACT

The present investigations are being carried out during the three successive years at Amravati. In *Gossypium hirsutum* L. the investigation was done on different aspect of flowering phenology and floral biology. The plant species were visited daily or on alternate day, for collection of blooming phenology. While carrying out present study it observed that the first flower opened on 12th September to 28th September. Whereas timing of anthesis and anther dehiscence observed 08.30 hrs. The flower opens at 09.00 hrs. and the anther dehisces was noted at 09.30 hrs. The pollen production was found to be 13774.22 ± 1223.67 to 15299.69 ± 1383.88. The pollen: ovule ratio was found to be 550.96 to 1235.49. The pollen viability was measured to be 93.58 to 96.54 %.

Keywords- Amravati, *Gossypium hirsutum* L., anthesis, *Pollen.*

INTRODUCTION

Gossypium hirsutum L. is an important fiber yielding plant cultivated in many states of India. It is one of the major cash crops cultivated by the farmers of Vidarbha region of Maharashtra. G. hirsutum is annual or perennial herb with hairy stem, it is commonly known as "Cotton". It is important to study the flowering phenology for higher yield. It is one of the major cash crops of Vidharbha region of Maharashtra. Most of the works on flowering phenology of *Gossypium* were studied in European countries and other parts of India but for Vidharbha region very less work was done. In crop plants, flowers are very diverse in size, shape and colour. Functionally, a flower is a compound organ in which all its structural complexities are presumable adapted to sexual reproduction. Therefore, flower structure, phenology and the evolutionary ecology of pollination partnership are interwoven, so much so that systematists rely on floral structure for identification and phylogentic studies (Kevan, 1984).

To know the possible details and events in reproduction and pollination of crop plant pollination ecology provides the platform. Pollination ecology is a fast growing field which also deals with the inter relationship between plants and insects in environment in addition to floral biology.

Flowering phenology refers to duration of biological events or seasonal timing of flowering. It is of significance for both ecological and evolutionary reason. It provides a mechanism for reproductive isolation or speciation over evolutionary time (Schmitt, 1983). Flowering and anthesis of most of the plants synchronizes with the availability of the pollinators (Sihag, 1993). On the other hand daily flowering has been regarded as an adaptation for regular attraction of pollinators (Baker, 1961 and Faegri and Pijl, 1979). Therefore, looking into an importance of these aspects it felt necessary to study the flowering phenology and flower dynamics of economically important crop.

MATERIALS AND METHODS

The present investigations were being carried out during the period 2005-2007 at Amravati ($20^0$54' to $20^0$57' North Latitude and $77^0$43' to $77^0$48' East Longitude) situated in Amravati district of Maharashtra State. The observations were taken from different cultivated fields around Amravati city. Three different study sites were selected for study. The plant species were visited daily or on alternate day for collection of blooming phonological data. The timing of onset, progress, termination and blooming were observed. The opening of flower and anthesis were observed with help of hand lens (10 x) as per method followed by Tidke (2005).

Simple method of Nair and Rastogi (1963) was adopted to know the pollen production per anther/ flower. Pollen viability rates were observed with tetrazolium (TTC) test method (Loken, 1942) to determine the pollen viability *in vitro*. By dividing the number of pollen grains produced per flower by the number of ovules in the flower the pollen: ovule ratio of plants under investigation was obtained (Cruden, 1977).

RESULTS AND DISCUSSION

The present research work was initiated with the aim to know the role flowering Phenology in *Gossyipum* crop cultivated in Vidarbha and thus to enhance the yield of crops. During the present investigation it is observed that the first flower opened on 12th

September to 28th September and last flower was observed on 26th December to 24th January. The peak period of flowering was during 18th September to 25th November. During three years at three study sites (Table No.1). Anthesis and anther dehiscence are most important event in the process of flower development. In *G. hirsutum* anthesis started at 07.30 hrs. all the flower open by 08.30 hrs. and the pollen liberation started simultaneously with the anthesis of flower (Mohana Rao *et al.*, 1995). Whereas during the present study timing of anthesis and anther dehiscence in *G. hirsutum* observed was at 08.30 hrs. The flower opened at 09.00 hrs. and the anther dehisces was noted at 09.30 hrs. It was observed that anthesis started during morning hours. The process of anthesis was delayed by an hour during rainy days. The present findings on anther dehiscence are in agreement with the Deodikar *et al.* (1976). Patil and Zingre (1976) observed anther dehisces generally in the morning period in majority of the crop plants. The environmental factors such as temperature, relative humidity (RH) and rainfall influence the time of anthesis.

According to Vaissiere (1991) cotton flower produces an average of 30,000 to 40,000 pollen grains represent a mass of 19 to 26 mg of fresh pollen. In the present study pollen production was found to be 13774.22 + 1223.67 to 15299.69 + 1383.88 (Table No.2) at three different study sites. Stone *et al.* (1995) pointed out the need for assessing the viability of pollen used in hand pollination experiment. The pollen viability means capacity to live, grow, germinate or develop (Lincoln *et al.*, 1982). In the present investigation, the pollen viability was found to be 93.58 to 96.54 % (Table No. 3).

The pollen: ovule ratio was determined by counting the number of pollen grains produced per flower and divided by the number of ovules per flower (Cruden, 1977). There is a strong correlation between pollen:ovule and breeding system (Cruden, 1977 and Preston, 1986). During present investigation pollen: ovule ratio was found to be 550.96 to 1235.49 (Table No.4).

Stigmas have been studied extensively in plants that exhibit self-incompatibility, a process that restricts inbreeding. Self-incompatible stigmas reject self-pollen by inhibiting pollen hydration, germination, and tube invasion (Wheeler *et al.*, 2001). While doing present investigation the stigma becomes receptive during 09.00 hrs. at the time of anther dehiscence. The receptivity ceases during 17.00 hrs. to 18.00 hrs. After the loss of receptivity stigma became blackish in colour.

Table No.: 1 Blooming phenology of *G. hirsutum* observed during three years.

Year	Study site	First flower	Full bloom	Last flower
I	Site-1	27th Sept.	15th Oct. – 10th Nov.	30th Dec.
	Site-2	12th Sept.	18th Sept. – 08th Oct.	24th Jan.
	Site-3	14th Sept.	28th Sept. – 17th Oct.	06th Jan.
II	Site-1	26th Sept.	15th Oct. – 20th Nov.	03rd Jan.
	Site-2	28th Sept.	17th Oct. – 22nd Nov.	30th Dec.
	Site-3	20th Sept.	18th Oct. – 16th Nov.	28th Dec.
III	Site-1	28th Sept.	16th Oct. – 25th Nov.	8th Jan.
	Site-2	26th Sept.	14th Oct. – 19th Nov.	26th Dec.
	Site-3	25th Sept.	20th Oct. – 19th Nov.	1st Jan.

Table No. 2 : Pollen production in successive flowers *G. hirsutum*.

Year	Sites	Mean No. of p.g. per flower	S.D.	S.E.	Range	Total pollen production
I	(Site-1)	14162.44	6423.69	2031.52	4459.90-28779.30	14162.44 ± 6423.69
	(Site-2)	14536.54	1107.76	350.33	12879.20-16434.40	14536.54 ±1107.76
	(Site-3)	14601.49	2009.84	635.62	14083.10 -18704.30	14601.49 ± 2009.84
II	(Site-1)	13774.22	1223.67	386.99	12088.20 -16128.60	13774.22 ± 1223.67
	(Site-2)	15815.11	1094.96	346.28	13611.50 -17463.70	15815.11 ± 1094.96
	(Site-3)	15987.27	1243.84	393.37	14463.80 -18305.20	15987.27 ±1243.84
III	(Site-1)	14810.95	952.13	301.11	13079.30 -16788.20	14810.95 ±952.13
	(Site-2)	14869.13	1150.16	363.74	12889.20 -16788.20	14869.13 ±1150.16
	(Site-3)	15299.69	1383.88	437.66	13368.80 -1835.20	15299.69 ±1383.88

Table No. 3: Pollen viability in *Gossypium hirsutum*.

Year	Site	Av. No. of viable pollen	Av. No. of non viable pollen	Av.Total No. of Pollen	Av. Percentage of viable pollen grains	Mean
First	Site-1	115.14	4.22	119.36	96.41	96.41
	Site-2	124.86	7.04	131.90	94.588	94.59
	Site-3	119.96	6.89	126.85	94.553	94.55
Second	Site-1	124.86	7.04	131.90	94.588	94.59
	Site-2	146.76	5.13	151.89	96.539	96.54
	Site-3	119.52	7.66	127.18	93.582	93.58
Third	Site-1	116.44	4.89	121.33	95.202	95.20
	Site-2	133.30	5.13	138.43	95.627	95.63
	Site-3	119.52	5.56	125.08	95.21	95.21

Table No. 4: Pollen: ovule ratio in *G. hirsutum*.

Year	Site	Total pollen production	No. of ovule	Pollen: ovule ratio
First	Site 1	14162.44	24	590.10
	Site 2	14536.54	25	581.46
	Site 3	14601.49	24	608.39
Second	Site 1	13774.22	25	550.96
	Site 2	29651.98	24	1235.49
	Site 3	15987.27	24	666.13
Third	Site 1	14810.95	24	617.12
	Site 2	14869.13	24	619.54
	Site 3	15299.69	24	637.48

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SOFTWRE RELIABILITY MODELS: AN INTRODUCTION

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ABSTRACT

The probability of failure free software operation for a specified period of time in a specified environment is software reliability. Software reliability is an important quality characteristic that has been used for quality assurance of software. The reliability of the software is probably the principal characteristics for defining the assessment criteria since it represents the user's view of acceptance/rejection. The number of software failures or the software failure times can be modeled using mathematical function called as software reliability model. In present paper, various types of software reliability models have been introduced.

Keywords: Software reliability, software reliability model, reliability.

INTRODUCTION

The computers are being widely used because of its ability of operating complex and bulky operations at great speed, accuracy, effective communication and large storage capacity for the years. Day by day, the softwares are updating in features and its portability in the sense of quality, reliability, size and cost of software. Since, the software is artificial, multipart and of large magnitude, hence, the probability of occurring failures increase is high. It becomes obligatory to produce the software with better quality which can satisfy the user's requirement.

A computer directed by sequence of input instructions referred as program, set of such programs for transforming input to output called software. The computer is made up of hardware and software. The software play very important role in performing all types of works when it is supported computers. The software is a major part of every computer system. As the software become larger, the rate of failure increases. The failure of software may caused due to programming errors related to memory, language-specific, calling third party libraries, extra compilation, standard library etc.. Therefore, the reliability of software is essential to be assessed for better results which satisfy the needs of customer.

The research on software reliability has been started since 1950's and lots of researchers have done work on it. Many software reliability models have been developed having different types which can be classified according to Musa and Okumoto (1984). Here in present paper, types of software reliability models have been discussed based on the classification schemes introduced by the many researchers. Software reliability also defined as the probability that the software will be functioning without failure under a given environmental condition during a specified period of time (c.f. Xie, (1991)). The details about software reliability, its modeling and the parameters included in the model can be seen from Musa (1998), Musa et al. (1987) etc..

Types of Software Reliability Models:

The software reliability models can be characterized on the basis of mathematical form of failure intensity**.** The classification schemes by some researchers are as follows:

Classification by Gokhale: Gokhale et al. (1996), have classified software reliability models in two types they are Data Domain and Time domain models.

i) **Data Domain Models:** These models are based on the set of all input combinations to a computer program. The estimate of reliability can be obtained by exercising all input combinations and observing the outcomes (cf. Gokhale et al. (1996)).

a) **Fault Seeding Models:** In this type of models, an estimate of the actual number of indigenous faults is obtained by determining the ratio of discovered seeded faults and discovered actual faults.

b) **Input Domain models:** In this type of models, the reliability of software is measured by the ratio of the number of inputs that resulted in

successful execution to the total number of inputs which gives an estimate of reliability of the software product.

c) **The other models:** Models which are neither a fault seeding nor Input Domain models e.g. error seeding models.

ii) **Time Domain Models:** These types of models are based on behavior of underlying failure process of the software under consideration and use the observed failure history to estimate the residual number of faults and the time required to detect them (see Gokhale et al. (1996)).

a) **Homogeneous Markov Models:** These models assume that the initial number of faults in a software product under consideration is unknown but fixed. The failure intensity or transition rates of the Markov chain depends upon the number of residual faults in the software.

b) **Non-Homogeneous Markov Models:** These models consider that the initial number of faults in a software product under consideration is random variable and also known as NHPP models.

c) **Semi-Markov Models:** This class of models assumes that the initial number of faults in a software product under consideration is unknown but fixed and the failure intensity or transition rates of the Markov chain depends not only on the number of residual faults in the software but also on the time elapsed in that state.

d) **Other Models:** These are time domain models but neither classified as Homogeneous Markov neither Non-homogeneous Markov models and may include Bayesian models or Time Series models.

Classification by Musa & Okumoto: Musa and Okumoto (1984) have given the classification scheme for SRGMs which followed by lots of researchers. This scheme is as follows:

a) **Time:** It refers to calendar time or execution time.

b) **Category:** Depending upon the failures experienced during infinite time which may be classified in two sub categories i.e. finite Failures and infinite Failures. The finite category is further classified in two types i.e. Binomial and Poisson and infinite category as Poisson and Others.

c) **Type:** The distribution of the number of failures experienced by the time. There are two important types i.e. Binomial Type and Poisson Type.

d) **Class:** Functional form of failure intensity for finite failure models only.

e) **Family:** Functional form of failure intensity for infinite failure models only.

Other Classification scheme: Some other classification of SRGMs are also available which are briefly discussed here. Goel and Bastani (1985) have given two types of classification of software reliability models:

- Software Reliability Growth Models.
- Statistical Models.

The software reliability models are also classified by the Goel (1985) on the basis of failures and nature of time considered under study whereas Asad et. al. (2004) have classified the software reliability models on the basis of phases in the development of software life style. The software reliability models are also classified by Pham (2000) into different groups as given below.

- Error seeding models
- Failure rate models
- Curve fitting models
- Reliability growth models
- Markov structure models
- Time-series models
- Non-homogeneous Poisson process models.

Software Reliability Models with some Imperfect-debugging, Testing Coverage and Removal, Environmental Factors and calibrating have been provided by Pham (2006). Singh and Andure (2008) have introduced lognormal class software reliability growth model using the classification scheme of Musa and Okumoto (1984). Singh and Singh (2012) have introduced the concept of length biased software reliability models.

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A NEW SPECIES OF THE GENUS *CIRCUMONCOBOTHRIUM MANNENSIS* FROM A FRESH WATER FISH OPNIACEPHALUS.

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ABSTRACT

The present paper deals with the new species of the Cestode from the genus *Circumoncobothrium mannensis* this genus is erected by shinde G.B. (1968) viz *Circumoncobothrium* n. sp. collected from mann river at Balapur Dist. Akola M.S. India. The present species at the genus in having scolex is elongated, prolong shape, rostellor hooks are 43-44 in number, Neck present, testes are 245-250 is number ovary dumbell shaped, uterus globular, vitellaria follicular (2 or 3 rows)

Key words – fresh water fish Cestode, Opniocephalus & mannensis n.sp

INTRODUCTION

The genus *Circumoncobothrium* is erected by Shinde G.B. (1968) from the intestine of fresh water fish opniocephalus. Leincanpunctatus as a type species *C. ophiacephali.*

Shinde & Jadhav 1976 reported *Circumoncobothrium* described two new species of this genus C. aurangabadensis & C. raai from mastacembellus armatus Jadhav & Shinde, 1976 reported C. gachuai from opiacephalus gauchua. Shinde & Chincholikar, 1977 described true new species of the genus at S. Shinde from fresh water fish mastacenbellus armatus C. bagariusi from Bagarius n.Sp. Shinde (1977) reported C.khami from ophiacephalus striatus C. Yaimaguti (1990) describe by Jadhav et al., from mastacembellus armatus Shinde et al, 1994 added *C. alii* from mastacembellus arinatus. Patil el. al (1998) added *C. vadeaonensis* as a new species *C. vadeaonensis* as a new species C. Wongsawad & Jadhav, 1998 added C. baimii from Mastacembellus armatus *C. Manjari*, 2004 added by Tat & Jadhav Later s no species is added to this genus.

MATERIALS AND METHODS

The worims were collected from mann River at Balapur, Dist. Akola from fresh water fish ophiacephalus fixed in 4% formaline, stained with Harris haemotonxylene, dehydrated, cleared in xylene, mounted in D.P.X. Drawings were made with the aid of camera lucida. Identification carried out with the help of system Helminthes Vol. II Yamaguti, all measurements are in millimeters.

OBSERVATIONS

The parsite bases on fifteen specimens are collected from the spiral valve at Intestine of ophiacephalus (Shinde, 1968) from mann River at Balapur.

The Scolex is elongated, prolong shape of the scolex is anteriorly narrow, compact measure 6310 (5339-7281) in length and 3203 (2524-3883) breadth.

The scolex bears two botheria which are large in size, sac like in appearance, short from the rostellum, overlapping each other measure 5339 (04854-5825) in length & 2281 (0.4854-09708) breadth.

The Rostellor hooks are 43-44 in number, spindle shape, hooks are arrange in four quardent, large hooks are 32 in number measure 0.3135 (0.3106-0.3155) in length and 0.2184 (0.01456-0.02912) in breadth. The smaller hooks are 12 in number measure 0.1334 (0.1213-0.1456) in length & 0.5824 (0.09708-0.01941) in breadth.

The Neck are long measure 0.2169 (0.2427-0.2912) in length & 0.2355 (0.2184-0.2427) in breadth. Segmentation are clearly seen in mature and Gravid Segment. The mature segment are broader than long measure 0.1174 (1.553-1.796) in length & 0.5487 (0.4126-0.5048) in breadth.

In male reproductive system, Testers are 245-250 in number, rounded in shape, preovarian, distributed throughout the segment, arrange in two fields & obliquely place measure 0.2374 in diameter. The cirrus pouch is oval in shape situated in center of the segment measure. 0.147 (0.1213-0.1601) in length & 0.10679 (3883-0.6796) in breadth. The cirrus is thin, slightly curved contained with in the cirrus pouch & measure 16989 (0.08252-0.08737) in length and 0.5632 (9708-1456) in breadth. Vas deferens are short or curved in shape attach anteriorly to the cirrus pouch open into the cirrus measure 0.4621 (0.02427-0.03398) in length & 0.10193 (0.04854-0.09708) in breadth. Vagina reaches into the seminal receptaculum measure. 0.5582 (0.04854-0.06310) in length & 0.5532 (0.09708-0.01456) in breadth. Vagina is a small tube runs posteriorly to the cirrus pouch

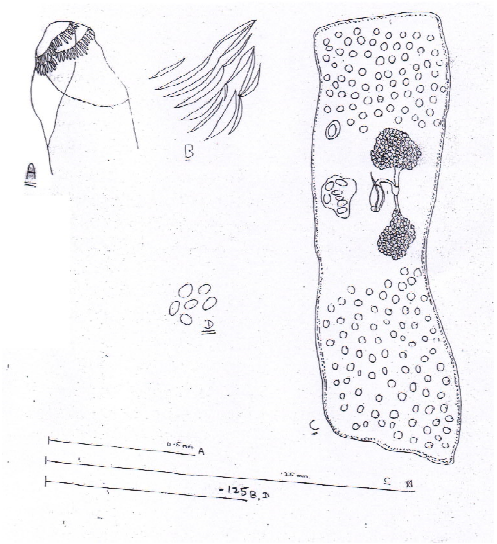
measure 0.1331 (0.1213-0.1456) in length & 0.10921 (0.09708-0.01213) & breadth.

Ovary is located almost near the posterior margin or middle of the segment, dumbbell shape, measure 0.4489 (0.3883-0.5096) in length & 0.165 (0.1359-0.1941) in width. Ovarian lobes are not equal in size, ovary consist of small, rounded, ovarian follicles or acini. Ovary is connected or attach to the isthmus measure 0.282 (0.1699-0.1941) in length & 0.8496 (0.01456-0.02427) in breadth, ootype it is small rounded in shape, attach in between the two ovarian lobe measure 0.2912 in diameter.

Utenus is globular in shape, occupy middle portion of the segment measure 0.667 (0.5824-0.6310) in length & 0.3979 (0.5824-2135) in breadth. Utenus is filled with small, rounded, double coated, yellowish colour eggs measure 0.3640 (0.02912-0.04368) in length and 0.1941 (0.01456-0.02427) in breadth. The vitellaria are follicular arrange in 2-3 rows.

DISCUSSION

The present parasite differs from *C. ophiacephali* which is having shape of the scolex (elongated, prolong Vs. broad in the middle & tapering at both the ends) (Rostellor hooks (43-44 no Vs. 80 in number) no of testes (245-250 Vs 70-80) shape of the ovary (dumbbell shape Vs. single, conical, triangular) shape of vitellaria (follicular Vs. rows on each side) differs from *C. aurangabadensis* which is having the scolex (elongated Vs. broad in the middle, narrow at both the ends) Rostellor books (43-44 Vs. 42 in number) no. of Testes (245-250 Vs. 135-145 in number) Shape of the ovary (ovarilobes with 3-4 acini Vs. doumbell shape) vitellaria (follicular Vs. granular) dibbers from *C. Singhii* which is having the scolex (elongated Vs. broad in the middle, narrow at both the ends) rostellor hooks (43-44 Vs. 46 in number) no. of testes (245-250 Vs. 210-215 in number) vitellaria (follicular Vs. granular) differs from *C. gachuai* Jadhav & Shinde which is having the scolex (elongated Vs. pear shaped) rostellar hooks (43-44 Vs. 46 in number) no of testes (245-250 Vs.375-400 in number) differs from C. Shinde / chin 1977 which is having rostellor hooks (43-44 Vs. in number) number of testes (245-250 Vs. 260-275 in number) vitellaria (follicular Vs. granular) differs from *C. bagariuse* which is having rostellar hooks (43-44 Vs. 55 in number) number of testes (245-250 Vs. 275-285 in number is two fields, differs from *C. khani* which us having shaped of the scolex (elongated Vs. cylindrical) number of rostellor hooks (43-44 Vs. 48 in number) number of testes (245-250 Vs. 190-200) differs from *C. Yamaguti* which is having number of rostellor hooks (43-44 Vs. 56 in number) number of testes (245-250 Vs. 130-150 in number) shaped of the ovary (doumbell Vs. bilobed) vitellaria (follicular Vs. granular) differs from *C. alii* which is having number of rostellor hooks (43-44 Vs. 34 in number) number of testes (245-250 Vs. 230-240 in number) shape of the ovary (doumbell Vs. bilobed) vitellaria (follicular Vs. granular) differs from *C. vadgaonesis* which is having number of rostellor hooks (43-44 Vs. 56 in number) number of testes (245-250 Vs. 490-510 in number) shape of the ovary (doumbell Vs. bilobed) vitellaria (follicular Vs. granular) differs from *C. baimaii* which us having number of hooks (43-44 Vs. 48 in number) number of testes (245-250 Vs. 88-100) differs from *C. manjari* which is having number of hooks (43-45 Vs. 48 in number) number of testes (245-250 Vs. 128-145) shape of the ovary (doumbell Vs. bilobed)



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ANALYSIS OF AIR QUALITY IN INDUSTRIAL ENVIRONMENT OF THE CITY OF NAGPUR BY AN APPLICATION OF THE POLLUTION INDEX METHOD

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ABSTRACT

The present study focuses on ambient air quality status at selected location in the industrial area of Nagpur city. The area has been studied on the basis of land use pattern and micrometeorological condition. While selecting the monitoring stations, it has been kept in mind that monitoring should be representing the background of industrial and sensitive areas. Further the data is interpreted statistically and air quality index is calculated and rated accordingly. It is observed from the present study that the SO2 and NO2 concentrations are below the national standards and the SPM concentration is found to be much excess. All the parameter showed increasing trend in the month of January, February, October, November and December and the trend of RSPM and SPM were increases during the summer seasons.

Key words: Ambient air quality, RSPM, SPM, SO2, NO2, Statistical analysis

INTRODUCTION

About Nagpur

Nagpur is located in Vidarbha Region of Maharashtra. It is a winter capital of the state of Maharashtra, the largest city in central India and third largest city in Maharashtra after Mumbai and Pune. With a population of 46,53,171 (Census -2011) Nagpur Metropolitan Area is the 13th largest urban conglomeration in India. In addition to being the seat of annual winter session of Maharashtra state assembly "Vidhan Sabha", Nagpur is also a major commercial and political centre of the Vidarbha region of Maharashtra, and is also famous throughout the country as "Orange City" for being a major trade center of oranges that are cultivated in the region. The location co-ordinates for Nagpur are 21°042 N 79°162 E. Nagpur lies precisely at the center of the country with the Zero Mile Marker indicating the geographical center of India. It receives an annual rainfall of 1,205 mm (47.44 in) from monsoon during June to September.

Source of Air Pollution:

There has been a rapid growth of industries in city, especially 900 small and medium industrial units. The major ones among them are tractor manufacturing plant, casting units, units of International Combustion, Auto parts, large confectionery manufacturing plants, Steel rolling group of companies. Nagpur is home to ice-cream manufacturer, Indian dry food manufacturers, Indian Ready to Cook food manufacturer and some pharmaceutical industries.

The Butibori industrial area is the largest in all of Asia in terms of area. The area has largest unit of synthetic polyester yarn. Other units in Butibori include the power transmission company RCC Castings plants.

Koradi Thermal Power Station and Khaparkheda Thermal Power Station are the two major thermal power stations located near Nagpur.

Slum areas around monitoring stations also contribute significant amount of unburnt carbon and particulate matter along with gaseous pollutants which are carried over atmosphere with flue gas.

There has been a rapid increase in the number of vehicle in the city over the past few years. In Nagpur there are more than 10 lakh vehicle including three wheelers, scooters, cars, motor cycles, trucks and buses. The diesel powered heavy vehicles add to the air pollution problem by emitting out jet black smoke.

The problem gets accelerated when some vehicle use adulterated petrol mixed with kerosene oil. The emission from such vehicles is very high in suspended particulate matter such as carbon and soot particles resulting in smoke.

Site Location:

The Hingna Industrial Area has been studied on the basis of land use pattern and micrometeorological conditions. Thus, three stations were set up at the following locations

1) Steel Factory (S-1)
2) Maharashtra Bank (S-2)
3) Away from industrial area (S-3)

MATERIALS AND METHODS

SPM in the ambient atmosphere were collected through a size selective inlet by High Volume Sampler through a 20.3 X 25.4 cm filter at a flow rate of 1 m^3/ min and estimated gravimetrically. Oxides of nitrogen (NO_x) were determined by bubbling the ambient air samples through a solution of sodium arsenite and sodium hydroxide. Sulphur dioxide (SO_2) is determined by bubbling the air samples through solution of sodium tetra chloro mercurate (TMC) absorbing solution. Both gaseous protocols were determined spectrophotometrically as per the CPCB guidelines.

Regular monitoring, sampling and analysis were carried out at all stations from January 2011 to December 2011.The data is presented in the form of annual average concentration of these protocols.

Air quality index (AQI): The Air Quality Index (AQI) was calculated using the method suggested by Tiwari and Ali (1987) and followed by Kaushik et al., (2006). For AQI, the air quality rating of each pollutant was calculated first by the following formula.

$$Q = [V/V(S)] \times 100$$

Where, Q represents quality rating, V the observed value of the pollutant and V(S) the standard value recommended for that pollutant. The Vs values used are the recommended national ambient air quality standards (CPCB 1994), for different areas.

RESULTS AND DISCUSSION

The results of this investigation are presented in table 1 and 2. The seasonal influence of varying weather conditions on the SPM, RSPM, SO2 and NO2 concentration is well pronounced with their annual cycles showing maximum and minimum

Seasonal Variation:

During monsoon, on an average, the concentration is at the minimum level. The factor responsible may be washout by the monsoon rains lead to decrease in pollutants. During winter there is a medium range of parameters. The minimum and maximum average values of SPM are 141 µg/m^3 and 689 µg/m^3 respectively.

During summer February to May, on an average, the concentration of gaseous pollutants and SPM are at the maximum level due to high temperature, high wind erosion, moderator stability, almost dry atmosphere and less humidity.

Table 1: Annual average concentration of SO2 and NO2 from January- December, 2011

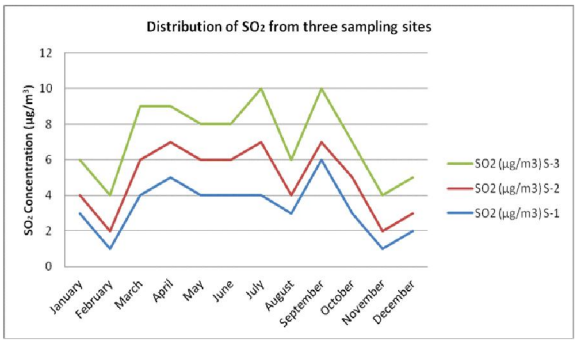
Month of 2011	SO_2 (µg/m^3)			NO2 (µg/m^3)		
	S-1	S-2	S-3	S-1	S-2	S-3
January	3	1	2	25	14	9
February	1	1	2	10	16	12
March	4	2	3	21	11	11
April	5	2	2	23	13	12
May	4	2	2	11	12	16
June	4	2	2	11	18	8
July	4	3	3	5	10	10
August	3	1	2	15	9	13
September	6	1	3	29	11	16
October	3	2	2	25	14	10
November	1	1	2	21	10	12
December	2	1	2	22	19	11

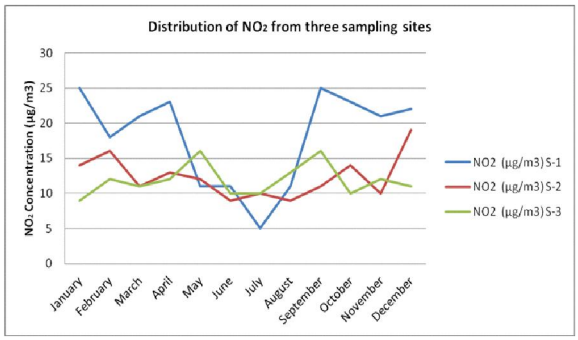
Table 2: Annual average concentration of RSPM and SPM from January- December, 2011

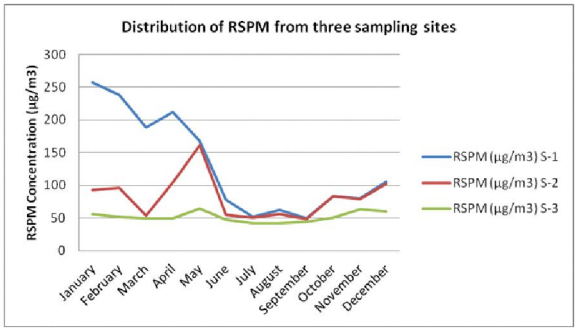
Month of 2011	RSPM (µg/m3)			SPM (µg/m3)		
	S-1	S-2	S-3	S-1	S-2	S-3
January	257	93	56	689	283	148
February	238	96	52	701	276	141
March	189	54	50	576	182	153
April	212	104	50	366	322	162
May	168	161	64	514	186	201
June	78	55	48	216	163	153
July	52	51	42	146	151	137
August	62	56	42	201	176	142
September	50	49	44	137	144	193
October	83	83	51	258	237	156
November	80	79	63	240	246	192
December	106	102	60	301	291	163

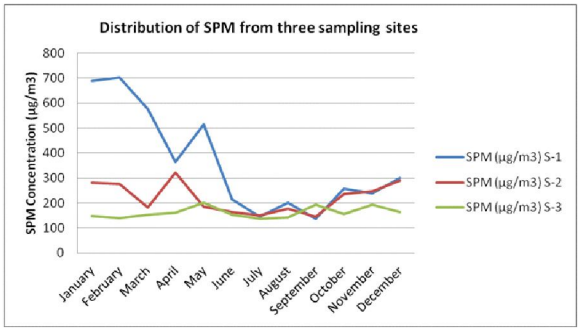
Station wise variations:

As compared within one year results, it is observed that SO2 and NO2 concentration are well below the prescribed limits, RSPM and SPM shows high concentration in the atmosphere of studied area.









Parameter	**SO2 (µg/m³)**			**NO2 (µg/m³)**			**RSPM (µg/m³)**			**SPM (µg/m³)**		
Location	**S-1**	**S-2**	**S-3**	**S-1**	**S-2**	**S-3**	**S-1**	**S-2**	**S-3**	**S-1**	**S-2**	**S-3**
A.Q. I.	7	3	4	45	30.8	29.6	219	137	86.39	905	554	404
Description	Clean air			Light Air pollution			Severe Pollution		Heavy pollution	Severe pollution		

CONCLUSIONS

It has been concluded form the present study that the SO_2 an NO_2 concentrations are well below the standards, while the SPM concentration is exceeding than the prescribed standards. As per the statistical data, during the one year all the parameter showed measuring trends, increased in the month of January, February, October, November and December. However the trend of RSPM and SPM were increased during the summer season.

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REVISIT THE SALBARDI AND ADJOINING REGION OF AMRAVATI DISTRICT MAHARASHTRA AND BETUL DISTRICT OF MADHYA PRADESH, INDIA

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ABSTRACT

The Deccan traps occupy an area of about 500,000 sq. kms in central, western and southern part of India. Deccan traps form flat topped ridges which are due to the presence of more resistant basaltic flow units forming a series of step like terraces. The lava flows are spread throughout the study area. The Salbardi and adjoining region is not only tectonically active but also geologically very attractive. The study area comprised the formation right from Archaean felspathic gneiss to Upper Gondwana formation including Lameta, igneous intrusion, Deccan trap and Quaternary sedimentation.

KEYWORDS: Salbardi fault, Geology, Central India

INTRODUCTION

Geologically the area mainly composed of Deccantrap the rocks belonging to other ages also form an important part of the geological sequence. They vary right from base with litho units like granites, gneisses, quartzite, and felspathic gneisses and are followed by Upper Gondwanas and Lametas belonging to Upper Cretaceous period. This formation is unconformably overlained by Deccan traps which in turn is overlained by the alluvium of Quaternary period. The rocks of Salbardi area belongs to Archaean and Upper Gondwana Super group. The Gondwana sediments of Salbardi and adjoining region are tectonically disturbed because of ENE-WSW trending fault. The Archaean quartzo-felspathic gneiss and granitic gneisses makes the basement while in the upper part Gondwana along with Lameta are exposed. The rock formation of the Salbardi and adjoining region is overlained by one another i.e. Archaeans overlained by younger formation Upper Gondwana and Gondwana overlained by Lameta of Upper cretaceous age with sedimentary rock such as sandstone, shale and limestone. Next to this, Lameta is overlained by Deccan trap of Upper Cretaceous to Eocene age and have basaltic rock with porphyritic to non porphyritic texture. The Deccan is then superimposed by Quaternary deposit i.e. soil and alluvium. A small patch of NE-SW trending Upper Gondwana succession along with the Lameta is exposed in Salbardi area (Lat. 21^0 25' 15" N and Long. 78^0 00' 00" E).Though, the succession showing good preservation of sedimentary structures, patchy lithological units and grain size variations have not received much attention for sedimentological investigations in the study area. However, field based preliminary sedimentological details were documented about one and a half centuries back (Blanford, 1869). Subsequently, specific work on the area is inadequate and mainly focused on regional geological set-up, of which the Salbardi area represents a small patch of Upper Gondwana in the vast Deccan trap province and it includes a hot spring near to the Salbardi village (Saxena, 1987 and Ravi Shankar, 1991). The intrusive and extrusive igneous activity in the area i.e. both basalt and doleritic dyke are common and brought attention to the study area.

STUDY AREA

The study area lies in the Survey of India toposheet No.55 k/2,55 /k3,55 G/14,55 G/15 and bounded by latitude and longitude $21^0$20'to $21^0$35' E and 77^0 45'to78^0 10' N respectively. The area from the present study divided in to two part i.e. one part comes under the state of Maharashtra and other falls under the state of Madhya Pradesh. This fault is probably the eastern continuation of well known Gavilgrah/Elichpur fault (Rajurkar, 1981; Umak,1994; Manjare, 2013) the southern contact of the Proterozoic rocks and Deccan trap is covered under alluvium and possibly is also faulted (Fig. 1).

GEOLOGY OF THE STUDY AREA

Due to the tectonic activity in the study area and adjoining region, stratigraphy and geology of the area is very complex. The Upper Gondwana sediments and Deccan trap of the Salbardi and adjoining region are tectonically exposed due to Salbardi strike slip fault trending roughly ENE-WSW (Ravi Shankar, 1994; Chatopadhya, 2008; Manjare, 2013). The entire area is criss-crossed by several minor faults, which makes the stratigraphy of the area complicated. However, Archaean quartzo-feldsphathic gneiss and granitic

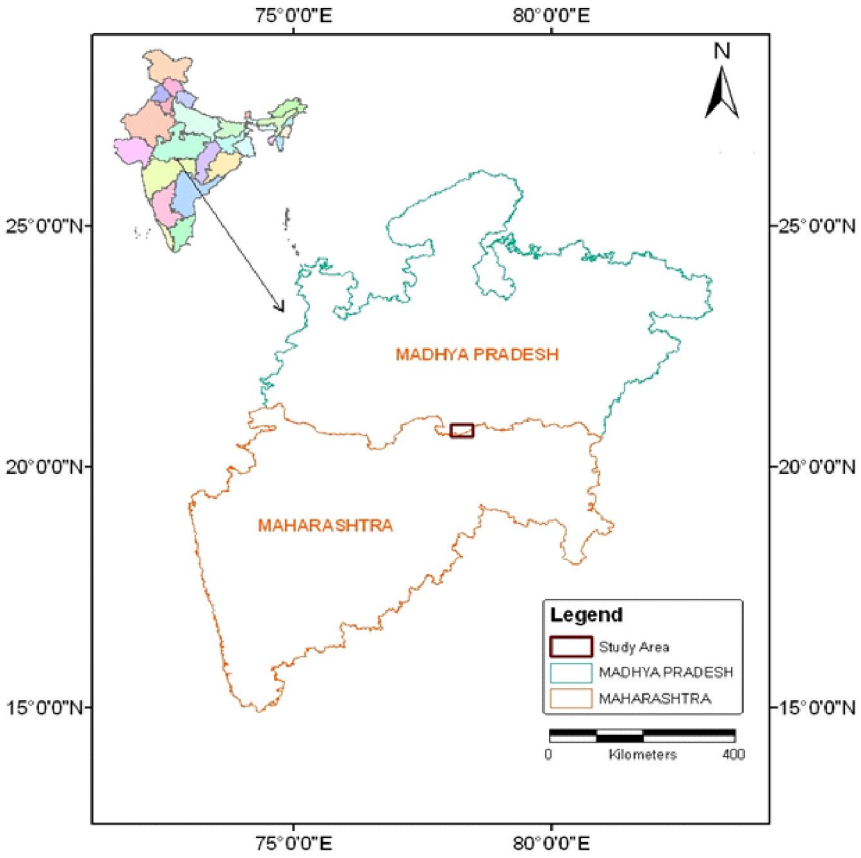

Fig. 1: Location map of the study area

gneisses make the basement, above which, the upper most part of Upper Gondwana along with the Lameta are tectonically exposed, surrounded by the widespread Deccan trap (Table 1 & Fig.2).The Upper Gondwana is mainly represented by medium to coarse grained arenaceous sedimentary unit with well developed sedimentary structures. Borehole data of the Salbardi area suggest that, the Upper Gondwana extend up to 288 m depth (Ravi Shankar, 1994). The Lameta is mostly represented by chertified limestone, medium to coarse grained sandstone and intra-formational breccia. It is unconformably overlained by basalts of the Deccan trap. The age of the Upper Gondwana succession is still a matter of discussion.

Table 1: The Stratigraphic Succession of Salbardi and Adjoining Region (Modified after Saxena, 1994 & GSI, 2000)

Age	Super group	Formation	Litho logy
Quaternary (Pleistocene-Recent)			Soil and river alluvium of Wardha and Purna rivers (clay, sand and gravel)
		Igneous intrusion	Dolertic dykes (cuts in Maru Riever Near Salbardi)
Upper Cretaceous - Palaeocene	Sahyadri group (Deccan Trap)	Karanja formation	-8-14 'Aa' and compound 'Pahoehoe' (6- Besaltic lava flows)-Non-porphyritic to porphyritic besalt on the north of the Salbardi fault
		Lameta formation (25 m)	-Mottled / buff coloured cherty limestone.
		Jabalpur formation	-Green nodular cherty limestone, white calcareous sandstone Disconfermity (?)-
Permian to Upper Cretaceous	Gondwana Supergroup (203 m)	Kamthi formation	Medium to coarse grained, grit, gritty, sandstone shows current bedding, cross bedding, --Sandstone, cross bedding sandstone, shale, conglomerate and clays in Maru River
Unconformity faulted in the Maru River			
Proterozoic pink/ buff coloured quartzo-felspathic Gneisses, at some places sheared / fractured			
Base not seen			

Deccan traps in the area represented by porphyritic to nonporphyritic texture overlained Upper Gondwana succession and doleritic dyke exposure in the study area. The structural disturbance represented by Gavilgrah /Salbardi fault along the foot hill of Satpura range between Narha in the west and Dhamndas in the east. It is well exposed at Salbardi and Jamkhari. The area is of special significance because of hot spring on the other side of the major fault namely Salbardi fault in the Maru River valley (Ravi Shankar, 1994).

The possibility of subsurface extension of Gondwana rocks below the trap has also been studied through borehole at 300 m NNE of Salbardi and Jamkhari village indicating the presence of Upper Gondwana sediments. These coarse grained, grey, pink, color foliated rocks showing alteration of white and dark color bands. The banding consists of schistose and granulose band. Mineralogically it consists of mica and amphibole in case of schistose band and quartz, feldspar in case of granulose band. The quartz and feldspar observed have developed a large clot or eye like coarse crystal i.e. which is called as 'Augen Structure' and hence the rock is commonly known as 'Augen Gneiss'.

MAJOR LITHOLOGICAL UNITS

Geology of the Salbardi and adjoining region is very complex due to presence of Salbardi fault in the study area and they comprises formation Archaean to Quaternary. The details of geological formation are given as below;

ARCHAEAN FORMATION

Archaean rocks are the oldest rock in peninsular India. It is Archaean rock separated from the other rocks by younger rocks by 'Eparchean unconformity'. In the study area these rocks are represented by granitic gneiss exposed along the Salbardi fault in to two patches at about 1000 m and 500 m strike length 100 to 200 m width at Salbardi and Jamkhari showing N 50^0 E and S 50^0 W trends with dip of foliation between 45^0 to 55^0 towards NW(Saxena, 1984). The faulting in the field recognized by the sharing and crushing of the rocks and closed spaced cross joints. The contact between alluvium and quartzo-felspathic gneiss are clearly seen in the field (Fig. 3). These rocks are highly sheared, fractured with well developed 'Augen structure' and exposed particularly on the left bank of Maru River. These formations are product of regional metamorphism. The rocks are essentially coarse grained with quartz and feldspars primary minerals (Plagioclase & microcline). The quartz shows undulose extinction, microcline shows cross hatch twinning while plagioclase is lath shaped. Other secondary minerals like hornblende and biotite are also observed.In the study area quartzo-felspathic gneiss extends over a strike length of about 700 m and has width of 150 to 200 m. It is lensoid body tapering at either end or exposed as a faulted thin wedge (Fig. 3).

In thin section it is coarse grained gneiss composed of quartz, microcline and plagioclase. Quartz grain shows undulose extinction and is stretched in the direction of foliation. Microcline occurs as thick laths in a strained condition with partial distortion of crossed hatch twinning. The strike varies between N 55^0 E, S 55^0 W and N 75^0 E, S 75^0 W with dip of foliation varying 40^0 to 70^0 towards North West. Pyrite is also seen disseminated in the quartzo-felspathic gneiss. At many places the area gets the fracture quartzo-felspathic gneiss (Fig. 4). The contacts between alluvium and quartzo-felspathic gneiss are seen west to Salbardi village.

IGNEOUS INTRUSION

The area experienced igneous intrusion activity mostly represented by the Doleritic dyke. In study area dykes are reported near hot spring i.e. on the left bank of the Maru River and cuts Archaean and Upper Gondwana sediments. Dykes are discordant or cross-cutting tabular intrusion into the country rock and most dykes are vertical or near vertical in orientation. In the study area the dyke is emplaced perpendicular to the Salbardi fault along Maru River section with NE- SW trends and crosscutting the country rocks and do not indicate any sharing or crushing (Fig. 6). The dyke prominently observed near Salbardi village (Fig. 5). Near Salbardi village and extends towards the south west direction and north east direction.

The dyke appears as dark toned feature on the satellite imagery and occurs having linear, narrow and low-lying relief. The thickness of dyke ranging from 6 m to17 m and is dark in appearance with medium grain size and mineralogical consist of plagioclase feldspar (anorthite & labradorite) and presence of other accessory minerals like olivine, augite and some ferruginous minerals depicts Ophitic to sub-Ophitic texture. Some more dykes exposure is also reported from west of Jamkhari village cutting the Gondwana sandstone along the Pak nala section, north of Pandharghat village. Microscopically the dyke shows medium to fine exhibits Ophitic to subophitic, Interseretal and Intergranular texture.

SAHYADRI GROUP (DECCAN TRAP)

The basaltic rock formation covers an area more than 500,000 sq. Kms in Maharashtra, Madhya Pradesh some part of Gujrat, southern part of the India and is the most extensive volcanic eruption in Indian geology. Deccan Traps in the area is represented by massive, coarse grained to fine grain, dark coloured formation with vesicular and amygdaloidal structure. They also show porphyritic to nonporphyritic texture. The Deccan traps overlained by Upper Gondwana succession and makes a regional exposure (Fig. 2).

KARANJA FORMATION

The Karanja formation recorded as 8 to 14 compounds 'Aa' and 'Pahoehoe' lava flows in the study area (8) which exhibits the rock dark, massive to fine grained and can be broken in to blocks road metals. This formation covers the most part study area. And all the lava flows here are dark, massive, fine grained with moderately to highly porphyritic showing columnar jointing and with vesicular and amygdaloidal structure (Saxena, 1984; GSI, 2000). The basaltic rocks of the study area are highly weathered and dark in nature (Fig. 10).The flow starting from the cretaceous period and continue up to Eocene. The thickness of basaltic rocks in the study area ranging from 300 to 400 m. The basaltic lava flow is hard compact and dark colored & both 'Aa' and 'Pahoehoe' type are reported. Deccan trap in the study area are unconformably overlies the Lameta sediments.

The litho unit is exposed in the form of flat top hill and shows the step like terraces due to variation in the hardness in different unit in lava flow. Several flow units have been identified in the traps exposed on the southern part of study area. The thickness of the trap recorded at Salbardi fault (Ravi Shankar, 1994) was about 603 m. The basalt is of medium to fine grain; grey black in colour hard and compact porphyritic texture having phenocrysts of plagioclase other minerals like hornblend, augite and olivine. The pillow and ropy lava structure are very common and these are seen north Ghorpend village. The other structure like columnar joints is also present in the study area. It forms due to contraction and cooling effect of magma and is seen near Jamkhari village. The basalt of the study area consists of highly weathered top with exhibiting spheroidal weathering (Fig. 10). In the study area few cavity filling deposit of siliceous quartz and zeolitic material are observed as secondary crystallization in the basaltic rock (Fig. 9).

UPPER GONDWANA FORMATION

The uppermost Gondwana succession of early Cretaceous period is well exposed in Salbardi area (latitude 21^0 25' 15" N and longitude 78^0 00' 00" E). The succession is represented by 128 m thick pile of medium to coarse-grained and very coarse grained sandstones ferruginous sandstone clay and pebble horizons. So far the litho units received a very casual attention for its sedimentological details, despite frequent lithological variations, good preservation of sedimentary structures and grain-size variation in vertical column (Fig. 11).The Upper Gondwana succession in the study area is represent as Jabalpur and Kamthi formation of arenaceous to argillaceous sediments rests unconformably on Archaean rocks. It is dis-conformably overlain by the calc-marl-arenaceous sediments of the Lameta formation (Fig. 2). The Jabalpur formation lies along the Maru River which exposed near Pachmari village and some exposure present north towards Salbardi village. The rock is in the form of narrow vertical strip. The Kamthi formation is present in the form of narrow parallel strip with the Salbardi fault lying below the Lameta formation in the study area.

The Upper Gondwana succession of Salbardi area is an isolated patch exposed due to roughly E-W trending Salbardi fault (Ravi Shankar, 1994) which is a part of the major tectonic feature namely Satpura fault and because of the Satpura fault two other isolated patches of Upper Gondwana are also exposed at Bairam-Belkher area (latitude 21° 16' to 21° 22' N and longitude 77° 31' to 78° 37' E) lying at a distance of about 60 kms west of Salbardi area. These isolated exposures of Upper Gondwana were a matter of debate for their controversial stratigraphy (Fig. 2). In the study area sandstone is variable colour showing whitish, yellowish-brown to brown, compact to friable in nature. The friable nature of brownish and yellowish sandstone is because of ferruginous cement whereas whitish sandstone shows silica cementation due to which it is comparatively hard and compact sand and quartz grains are mostly angular to sub-angular.

The sandstone lithounit shows good preservation of simple, cross and parallel beddings, ripple beddings, mud cracks and ferruginous concretions (Fig. 12). The lower 55 m. succession is thickly bedded whereas the middle 30 m unit is mainly thinly-bedded and cross stratified lithounit having clay pockets and clay occurs as patches in sandstone horizon. It is mostly represented by soft, flat-bedded, yellowish-pink, and

grey to brown lithounit with a tendency to break in elongated fashion. The ferruginous concretion in entire sandy horizon is comparatively more in the upper part which is distinctly differentiated in field forming a column of 25 m thick concretionary sandstone lithounit (Fig.13). At few places surfaces climbing ripple laminations have also been recorded (Fig.14). The pebbly horizons are brownish to reddish and hard conglomeratic beds forming 25 m uppermost part of the succession and it is matrix-supported unit containing subrounded to rounded pebbles of quartz and feldspar.

LAMETA FORMATION

The Lameta name is derived from the Lameta ghat near Jabalpur (Madhya Pradesh) where they first noticed. In the study area the Lameta formation consist of grayish or brownish poorly compacted sandstone and it is exposed near Ghorpend village. It also recorded in adjoining area of east of Belkher and north of Pandhari and north of Kalbhara and Narha village. The succession shows a confirmable relationship with Gondwana sediments. It has dip of about 16^0 to 22^0 to N and E to W strike. The thickness of Lameta sediments is varying from 5 to 6 m however some places the thickness is more than 8 to 9 m thick are recorded. Lameta sediments along with the Upper Gondwana formation are exposed as tectonic inliers in the widespread Deccan trap country due to the E–W trending Satpura fault (Fig. 2). Two such inliers are located at Salbardi and Belkher area of which the previous lies at about 60 kms east of later. Quartz-feldsphathic gneiss of Archaean age forms the basement and is well exposed at Salbardi area. Lithosections of the Lameta succession exposed at Salbardi (34 m) and Belkher (47 m) area are more or less similar. The contact of the Upper Gondwana and the Lameta rocks is sharp and well exposed in Salbardi area represented by coarse grained, pebbly sandstones of Upper Gondwana, underlying the reddish brown, medium grained, poorly cemented sandstones of the Lameta formation (Fig. 15).

The lithosections is occupied by 1 to 5 m of moderately reddish brown, grayish to brownish black and medium to coarse grained dominantly thinly bedded sandstone units at the base. These are poorly cemented and friable units. Sedimentary structures are represented by poorly preserved plane beddings and small scale cross beddings (Fig.16). The clay rich units of both the successions are grayish green, reddish brown and yellowish in colors with increasing quantity of siliceous and calcareous contents and it grades to siltstone and marl.Sedimentary structures are showing soft horizontal laminations at a few places and clay is mixed with whitish thin film of gypsum and the yellowish clay shows sub spherical nodules of 10 to15 cm diameters. The upper part of both the lithosections are almost similar and represented by nodular certified and brecciated limestone. The nodular limestone is bluish gray micritic with varying proportions of chert clasts (Fig. 17). The brecciated limestone is well exposed at Salbardi area in which angular fragments of nodular cherty limestone and dark coloured rock are embedded in fine grained micritic carbonaceous cementing materials. The two calcrete horizons are recorded in Salbardi area. The lower horizon is about 2 m thick and compact brecciated and micritic in nature (Srivastava et al., 1995).

Characteristics of the Lameta in the study area are as fallows;

i) It is a hard and compact, medium grain sandstone.
ii) Calcareous silt with thin bed and presence of ferruginous nodules.
iii) Fine grain green certified limestone with ferruginous concretion. The contact of upper most horizon and Deccan trap is expressed at the base of 606 trap hill (Fig. 18).

ALLUVIUM

In the study area the black cotton soil and yellowish soil are common and these are product of basaltic rock, sandstone, metamorphic gneiss. Alluvium is the transported material due to action of running water which is later on deposited. The beds of alluvium are varying in the thickness and having the age from Paleocene to recent which covers large part of the study area. The gravel and boulder are also common in the study area which derived from debris of the trap rock from adjoining Purna valley catchment area (Fig. 2). The younger alluvium occurs along Wardha, Purna and Maru River while older alluvial plains are seen along Purna River. This alluvial plain is a flat surface of large aerial extent and gently sloping towards Purna Rivers. It represents earlier cycle of deposition and the basement rocks beneath this plain are the Deccan traps with uneven basement topography. The alluvial material consists of clays, sand and gravels. Maru River flowing across the Salbardi area also shows the small patches of the lose sand and gravel, Neogene boulder bed (Fig. 19) and gravel extensively cover the base of Satpura deposited by stream flowing downwards from the mountain hill and makes contacts to the Quaternary and quartzo-felspathic gneiss near Salbardi village (Fig. 20).

FIELD STUDIES

The geological field studies in the study area were carried out in different phases. The preliminary phase was done to understand the area on the whole and then the other phases were planned along different tracks based on the image interpretation done for this purpose.The detailed geological mapping was taken up during the fields, the focus was on morphotectonic studies but a short comprehensive explanation of the geological succession is incorporated fallowing GSI field report and other workers as mentioned in text.

The tracks planned are as follows;

i) First field track was planned along the Maru River towards Ghorpend, Dhamandas, and Jamkhari in the north direction and section shows the good exposure of Archaean gneiss. The contact of gneiss and Upper Gondwana sediments both found in the south direction. The Upper Gondwana sediments extend 125 m all along the Maru River and continued up to Ghorpend and Dhamandas village where the Lameta is shown in the form of narrow strip. The contact of Lameta and Deccan trap is exposed in the adjacent area of Ghorpend near 660 trap hill.

ii) The second field track was planned towards north of Jamkhari village along the Mahdeva cave. This section is basically an extrusion of previous one but shale pockets are present and well preserved in the upper 58 m thick horizon. The Upper Gondwana rocks are dominantly by sandstone conglomerate and shale. The sandstone shows large variation in colour, grain size and cementing materials. The sedimentary structure are well preserved in the horizon gives the cross bedding parallel bedding ripple marks and argillaceous band exhibits parallel lamination. The sedimentary rocks shows reddish brown colour and rounded to sub rounded ferruginous nodules. The conglomerate beds are well exposed in upper part of Ghorpend and Mahadeva cave. The conglomerate is of matrix supported pinkish to brownish in colour having a thickness of 10 to 30 cm. The shale pockets are well exposed in the Mahadeva cave the pockets are rounded in shape having 4 to 6 m in length and 1 to 2 m in thickness and exhibits good lamination.

iii) Third field was planned along the Maru River. During this a palaeosole unit was observed at eastern bank of the Maru River towards north of Salbardi village. Some crush breccias have also been noticed in the field which represents one the fault evidences fault in the field (Fig. 19 & 20).

GEOLOGICAL ANALYSIS

To evaluate the potential geological and structural controls on the evolution of the Maru River, and Salbardi fault (Ravi Shankar, 1994). The geological contacts between these formations are assumed to be dominantly horizontal and change in the structural position of any formation is interpreted as due to faulting and analysis of the geological cross-section suggests the following;

The Maru River incises through progressively Deccan trap formations from its upper reaches in the west to its lower reaches in the south. From its source in the west the River carves its way to northeast and eastward through basaltic lava flow before exposing the Gondwana and Lameta formation (Upper Gondwana).The Maru River carves its channel through the all formation and then meets Wardha River in the alluvium formation.The very different narrow shape strips of Lameta and Gondwana formation on the north east side of the Salbardi fault is clear indication of the geological and tectonically disturbances in the study area. The Maru River cuts all the formation and downstream reaches the south of Salbardi fault (Ravi Shankar, 1994) on Deccan trap and meeting Wardha River at Thana and Thuni village near Morshi district Amravati (Fig.2). Based on the above criteria the study area and adjoining region is tectonically active and stratigraphycally, geologically very complex in nature. The Proterozoic rocks, Gondwana sediments and Deccan trap rocks of the Salbardi and adjoining area are tectonically exposed due to Salbardi strike slip fault (Ravi Shankar, 1994) trending roughly ENE-WSW.

AGE OF THE SUCCESSION

The age of the Salbardi and adjoining region was matter of debate for long time. (1) Considered the age equivalent to Kamthi and same age (Pascoe, 1959). This correlation is based on lithological characteristic by following facts;

i) The contact of Upper Gondwana and Lameta are exposed in the area at the base of trap hill.

ii) On the basis of borehole data interpretation the inliers of Upper Gondwanas along Bahiram-Belkher section are exposed having an aerial distance of 20 kms (Saxena, 1984).

iii) The Upper Gondwanas of Bahiram-Belkher area is different from Salbardi Upper Gondwana

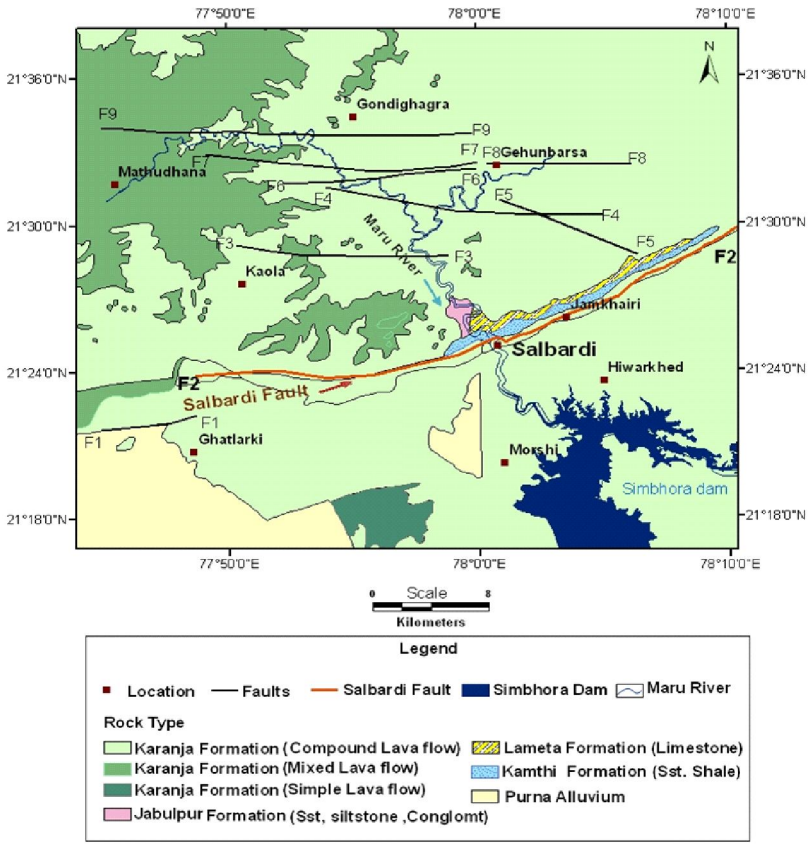

Fig. 2: Geological Map of Salbardi and Adjoining Region (modified after GSI, 2000)

succession because of its rich mega-floral assemblages but has the similar lithological character. This succession was also considered equivalent to Kamthi-Mahadeva-Pachmari-Malleri by different workers (Blanford, 1869 and Pascoe, 1959). However, later confirmed to be early Cretaceous on the basis of pollen and spore and megafloral remains (Srivastava et al., 1995).

iv) As such there is no coliferous horizon noticed neither in Salbardi nor Upper Gondwana Bahiram-Belkher area. Hence it is inferred that the Upper Gondwana sediments from the Salbardi and adjoining region belongs to the early Cretaceous age and any possibility to correlate to the Kamthi formation is ruled out.

v) On the basis of rich and diversified assemblage of 'Pteridophytic' and 'Gymnospermous' leaves of the Upper Gondwana succession of Belkher area is assigned an early Cretaceous age (Srivastava AK, ;Mankar, 2008). The same age has also been assigned to coeval Upper Gondwana exposure of Salbardi area, which is based on its lithological correlatebility and similarity of lithofacies architecture with those of Belkher area (Srivastava AK,; Mankar, 2008)

CONCLUSION

To evaluate the potential geological and structural controls on the evolution of the Maru River, and Salbardi fault. The geological contacts between these formations are assumed to be dominantly horizontal and change in the structural position of any formation is interpreted as due to faulting and analysis of the geological cross-section suggests the Maru River incises through progressively. Deccan trap formations from its upper reaches in the west to its lower reaches in the south. From its source in the west the River carves its way to northeast and eastward through basaltic lava flow before exposing the Gondwana and Lameta formation.The Maru River carves its channel through the all formation and then meets Wardha River in the alluvium formation.The very different narrow shape strips of Lameta and Gondwana formation on the north east side of the Salbardi fault is clear indication of the geological and tectonically disturbances in the study area. The Maru River cuts all the formation and downstream reaches the south of Salbardi fault and meeting Wardha River at Thana and Thuni village near Morshi district Amravati (Fig. 2). Based on the above criteria the study area and adjoining region is tectonically active and stratigraphycally, geologically very complex in nature. The Proterozoic

Fig. 3: Quartzo-felspathic gneiss exposed near Salbardi village

Fig. 4: Another fractured quartzo-felspathic gneiss observed near Salbardi village

Fig. 5: Exposure of Dolerite dyke observed near Salbardi village

Fig. 6: Doleritic dyke cuts the Maru River near Salbardi village

Fig. 7: Massive basalt shows highly vesicular and amygdaloidal structure observed near Pala village

Fig. 8: The fine grain basaltic lava flow showing vesicular and amygdaloidal structure along two directional minor joints observed west of Salbardi village

Fig. 9: Cavity filling silica in the weathered basaltic lava flow observed west of Salbardi village

Fig. 10: Highly weathered basalt and exhibiting spheroidal weathering in basaltic rock observed near Jamkhari village

Fig. 11: Coarse grained Upper Gondwana ferruginous sandstone observed near Shiv temple Salbardi village

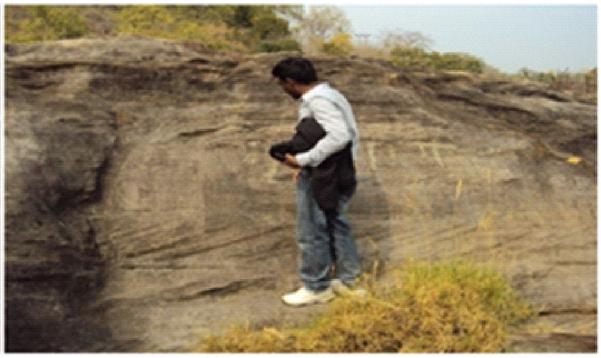

Fig. 12: Author standing next to sedimentary formation indicating at cross bedding in ferruginous sandstone near observed Salbardi village

Fig. 13: Ferruginous concretionary sandstone seen near Salbardi village

Fig. 14: Ripple laminated surface in sandstone observed near Shiv temple Salbardi

Fig. 15: Ferruginous sandstone seen on the bank of Maru River near Salbardi village

Fig. 16: Cross bedding in sandstone observed on the bank of Maru River near Salbardi village

Fig. 17: Exposure of grayish white, hard and compact, micritic calcrete seen near Salbardi village

Fig. 18: Alternations of medium to dark brown, hard and compact chertified limestone seen near Jamkhari village

Fig. 19: Pebble and Neogene boulder bed observed near Salbardi village indicating recent tectonic uplift of the river bed

Fig. 20: Contact between Quaternary and quartzo-felspathic gneiss observed near Salbardi village

rocks, Gondwana sediments and Deccan trap rocks of the Salbardi and adjoining area are tectonically exposed due to Salbardi strike slip fault trending roughly ENE-WSW.

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PHYSICO-CHEMICAL ANALYSIS OF DRINKING WATER FROM SHIRPUR, DIST. WASHIM (MS)

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ABSTRACT

Water is one of the most important natural resources known on earth and it is important to allliving organisms, most ecological systems, human health, food production and economic development. The safety of drinking water is important for the health. The safety of drinking water is affected by various contaminants which included chemical and microbiological. Such contaminants cause serious health problems. Contaminants make water unsuitable for drinking. Such contaminated water causes many diseases to humans so that quality of the water must be tested for both the chemical as well as for the microbial contaminants. The physico-chemical analysis of drinking water quality from in Shirpur were studied. Temperature, pH, electrical conductivity, TDS, Total hardness have been determined along various water quality profiles. The experimental procedures were set according to the international drinking water standards set by WHO (1999). Average temperature, pH, electrical conductivity, total dissolved solids and total hardness values are 14.4^{0}C, 7.4, 1.18 S/m, 586.67 mg/l and 361.67 mg/l in $CaCO_3$ respectively. The result shows that, except the total hardness and electrical conductivity all the parameters fulfill the minimum and maximum permissible limit for drinking water guidelines.

Keywords: Physico-Chemical Parameters, Potable Water, Groundwater, Water Quality.

INTRODUCTION

Water is one of the most important and abundant compound of the ecosystem. All living organisms on the earth need water for their survival and growth. *"Without water no life"* is a common saying depending upon the fact that water is the one of the naturally occurring essential requirement of all life supporting activities. World Health Organization (WHO) survey has revealed that 1.2 billion people all over the world do not have access to pure and safe drinking water. According to WHO biological contamination of water is responsible for 80% of all human illness in the developing world [1]. The functioning of an aquatic ecosystem and its stability to support life forms depend to a great extent, on the physico-chemical characteristics of its water. Physico-chemical parameters are highly important with respect to the occurrence and abundance of species. Ground water is by far more abundant than surface water and its quality is as important quantity. Water meant for drinking must therefore meet quality standards. Water quality is essentially determined by its physical and chemical characteristics [2].

Good quality of water resources depends on a large number of physico-chemical parameters and biological characteristics. To asses that monitoring of these parameters is essential to identify magnitude and source of any pollution load [3]. A wide range of pathogenic microorganisms can be transmitted to humans via water contaminated with fecal material. Bacteriological quality of drinking water is primarily determined by using "indicator organisms" whose presence indicates fecalcontamination [4]. Higher level of indicator bacteria, higher the level of fecal contamination and greater risk of contracting disease [5].

MATERIALS AND METHODS

Sampling points which are representative of the different sources from which water is supplied to the public are selected. Drinking water samples from different sources from Shirpur, District Washim were collected.The collected samples were analyzed for different physico-chemical parameters such as temperature, pH, electrical conductivity, TDS, Total Hardness ($CaCO_3$) as per the standard methods and the results were compared with the Indian standard for potable water [6] [7]. Random sampling was adopted for the study.

RESULTS AND DISCUSSIONS

The mean values of different selected physico-chemical parameters have been tabulated below in the table.

Table 1:Physico-chemical parameters for drinking water collected from study sites of Shirpur

S. N.	Parameter	Obtained values			WHO values
		S 1	S 2	S 3	
1	Temperature	14.7^{0}C	14.3^{0}C	14.2^{0}C	Not exceed 15^{0}C
2	pH	7.3	7.5	7.4	6.5 to 8.5
3	Total dissolved Solids	590 mg/l	575 mg/l	595 mg/l	500/1000 mg/l
4	Total hardness	360 mg/l $CaCO_3$	350 mg/l $CaCO_3$	375 mg/l $CaCO_3$	500 mg/l
5	Electrical conductivity	1.15 S/m	1.19 S/m	1.20 S/m	3S/m

S-Sample

Temperature:

The temperatures of the samples were noted at the sampling point itself. The temperature was found to be 14.7, 14.3 and 14.2^{0}C in the three sites (Fig.1). During the present investigation, there was no great difference between the temperatures of the tap water from different sources of ground water and it is related to the WHO standards i.e. 15 ^{0}c [2].

Hydrogen Ion concentration (pH):

It is an important parameter in evaluating the acid-base balance of water. Also it is the indicator of acidic or alkaline condition of water status. WHO has recommended maximum permissible limit of pH from 6.5 to 8.5. Current investigations were 7.3, 7.5 and 7.4 and are in the range of WHO standards (Fig.2). The overall result indicates that the water sources are within the desirable and suitable range [2].

Total Dissolved Solids (TDS):

The water with high TDS value indicates that water is highly mineralized. Desirable limit for TDS is 500 mg/l and maximum limit is 1000 mg/l prescribed for drinking purpose. In present study the concentration of TDS is observed in the range of 575 and 595 mg/l (Fig. 3). The mean total dissolved solids concentration in Shirpur tap water was found to be 586.67 mg/L and it is within the limit. High values of TDS in ground water are generally not harmful to human beings but high concentration of these may affect persons, who are suffering from kidney and heart diseases. Water containing high solid may cause laxative or constipation effects. Potable water should not contain more than 1000 mg/l of total dissolved solids (TDS) [8].

Total Hardness:

The present investigation shows the average value of hardness361.67 mg/l in $CaCO_3$with in all the sampling sites (Fig. 4). All of the samples within the maximum permissible limits of WHO and standards [9].

Electrical Conductivity (EC):

Electrical conductivity (EC) is a measure of water capacity to convey electric current and depends on the concentration of ions and load of nutrients. As most of the salts in water are present in ionic forms, they make water capable for conducting current. It is also an excellent indicator of TDS, which is a measure of salinity that affects the taste of potable water.The conductivity, thus serves as a good and rapid measure of the total dissolved solids in water (Fig. 5). The electrical conductivity (EC) of the tap water samples are 1.15, 1.19 and 1.20 respectively.

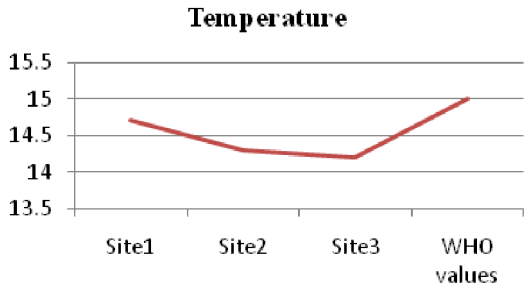

Fig. 1: Temperature (^{0}c) values of water sample

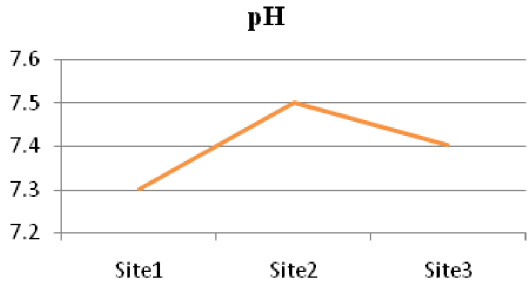

Fig. 2: pH values of water samples

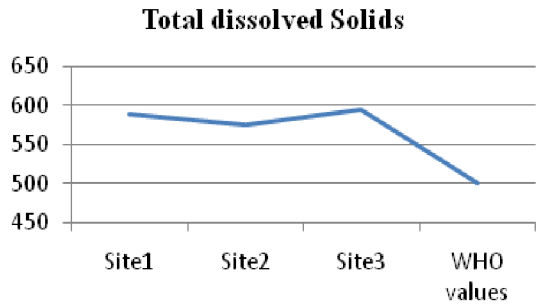

Fig. 3: Total dissolved solids (mg/l) values of water samples

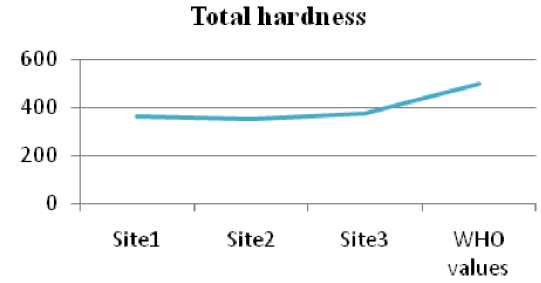

Fig.4: Total hardness (mg/l in $CaCO_3$) values of water samples

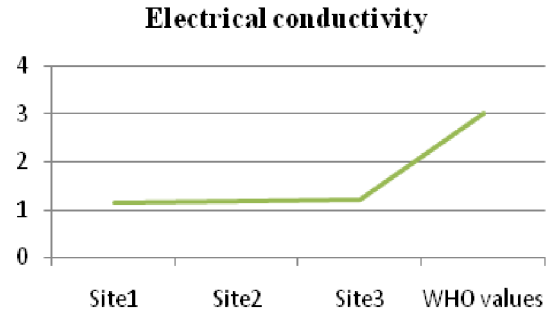

Fig .5 : Electrical conductivity (S/m) values of water samples

CONCLUSIONS

A comparative study of both type of open well water was carried out by taking certain important parameters like temperature, pH, total dissolved solid, conductivity and total hardness. The result obtained during study was compared with ISI standards. Potable water is water safe enough to be consumed by humans or used with low risk of immediate or long term harm. The study assessed the evolution of water quality in tap water from a groundwater source of Shirpur. In this present investigation it was found that the maximum parameters were not at a level of pollution and water quality of Shirpur region in rural area of well water is not harmful to human being.

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SYNTHESIS OF RHA MESOPOROUS MATERIAL BY HYDROTHERMAL AND ULTRASONIC TREATMENT

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ABSTRACT

Mesoporous molecular sieves in the hexagonal phase (SBA16) are synthesized from rice husk ash (R.H.A.) solutions using Pluronic F127 as template and R.H.A as silica source. It is found that R.H.A. effectively transformed into mesoporous materials depending upon the hydrothermal conditions. It is also found that a high concentration of Na^+ ions is not critical in the formation of SBA - 16 when prepared under controlled pH of gel, calcinations temperature and calcinations duration conditions. We provide direct evidence of SBA-16. Our results resembles that coal combustion byproducts can be utilized for producing mesoporous molecular sieves even if containing significant amounts of impurities. The highest crystalline and well defined phase purity SBA16 is obtained without hydrothermal treatment in short interval of time. X-ray diffraction (XRD) shows that the highly ordered mesostructured was maintained even at the high loading of titanium up to5.5 (bulk molar ratio SiO2/TiO2). The synthesis of Mesoporous TiO2-containing SBA-16 composite with a cubicIm3m structure will open new applications for catalysts.

Keywords: Hydrothermal synthesis, Pluronic127, Rice husk ash (RHA), SBA-16, Si/Ti ratio.

INTRODUCTION

Rice milling generates a byproduct know as husk. This surrounds the paddy grain. During milling of paddy about 78 % of weight is received as rice, broken rice and burn .Rest 22 % of the weight of paddy is received as husk. This husk is used as fuel in the rice mills to generate steam for the parboiling process. This husk contains about 75 % organic volatile matter and the balance 25 % of the weight of this husk is converted into ash during the firing process, is known as rice husk ash (RHA). This RHA in turn contains around 85 % - 90 % amorphous silica. India is a major rice producing country, and the husk generated during milling is mostly used as a fuel in the boilers for processing paddy, producing energy through direct combustion and / or by gasification. This RHA is a great environment threat causing damage to the land and the surrounding area in which it is dumped. Lots of ways are being thought of for disposing them by making commercial use of this RHA. The synthesis of mesoporous materials by a hydrothermal treatment [1,2,5] The properties of these materials make them attractive for adsorption, catalysis, separation, chemical sensing, optical coating, drug delivery and electronic applications. For practical purposes, the overall morphology of a mesoporous material is a necessary requirement in combination with their internal structure. For instance, in application such as high performance liquid chromatography isometric particles are required and spherical particles are preferably used in chromatography for column packing as irregular particles tend to break[3] down. In this body-centered-cubic structure each mesoporous is connected with its eight nearest neighbors to form a multidirectional system of mesoporous network[4] . Due to its large cage, high surface area and high thermal stability, this material appears to be one of the best candidates for catalytic support and packing materials for separation. Using F 127 as a surfactant is the common way of synthesizing SBA-16 .However; there are also reports on alternative surfactants such as F 108 a blend of P 123 and F 127, and other nonionic surfactants[5]. Several studies have been carried out to understand the formation mechanism[6-8]of this material, for instance, in the framework of the colloidal phase separation mechanism (CPSM) Yu et al. suggested that, the formation process of mesoporous materials involves three stages: (1) operative self-assembly of inorganic/organic composites, (2) Spherical particles of mesoporous silica SBA-16 structure were synthesized at low pH using Pluronic F127 as template and RHA as silica source[9-11].

EXPERIMENTAL DETAILS:

MATERIAL SYNTHESIS:

Ti containing **SBA-16** composite with different concentrations have been prepared under acidic conditions in the presence of triblock copolymer F127 by using RHA as silica source and Tio_2 as Titanium source.1.6 gm of F127 was dissolved in 2.5 gm of HCL under magnetic stirring to obtain homogeneous

solution at 30^0c to this solution was added Si/Ti molar ratio of 10 after the mixed solution was further vigorously stirred for 30 min. The mixture solution was further stirred for another 24 hours .Ultrasonic treatment is given at power 70 for 30 min.Then the solution is taken Teflon coated autoclave and heated at 80^0c for 24h .The synthesized Sio_2/ Tio_2 mesoporous composite was filtered and dried in air .The sample is calcined at 1.5°c/ min.at 550^0c for 6h.

RESULTS AND DISCUSSION

The XRD pattern of rice husk Ash (RHA) shown in Fig.1.The different minerals have different unit cell composition, therefore XRD technique allows for qualitative identification of the phases present in the collected mineral. The XRD peak information is important to quantity changes in the composition of Quartz and Mullite reactants that affecting reaction conditions of hydrothermal synthesis of materials and reaction products[12-15].

The X-ray pattern of the synthesized mesoporous silica material is highly periodic silica phases which are normally reflected by the distinct X-RD signatures at low angles from 1^0 to 30^0 as shown in Fig 1. Sharp signal in XRD spectra indicates the presence of long range order of uniform hexagonal phase in the mesoporous materials. The well defined reflections from plane are a prime characteristics of the hexagonal lattice symmetry of the SBA16 structure.

The observation of three higher angle reflections other than d_{110} indicates that the product is likely to possess the symmetrical hexagonal pore structure typical of SBA16. X-ray diffraction data therefore indicates that the supernatant of the fly ash can be successfully used in the synthesis gel to prepare mesoporous materials[16-18].

CONCLUSIONS

The experimental study it was concluded that pure and ordered SBA16 material could be successfully synthesized from Rice husk ash at room temperature during 24 hrs of reaction[19,20]. The parametric variations such as change of calcination temperature, the change of calcination time duration and the change of initial pH value of gel suggested that from RHA the well ordered mesoporous material SBA16 can be synthesized at 550^0C for 4 hrs. The maximum calculated BET surface area amounts is779.70 m^2/g for the SBA16 materials keeping pH of gel 6.91, calcination time about 4 h. at 550^0C.

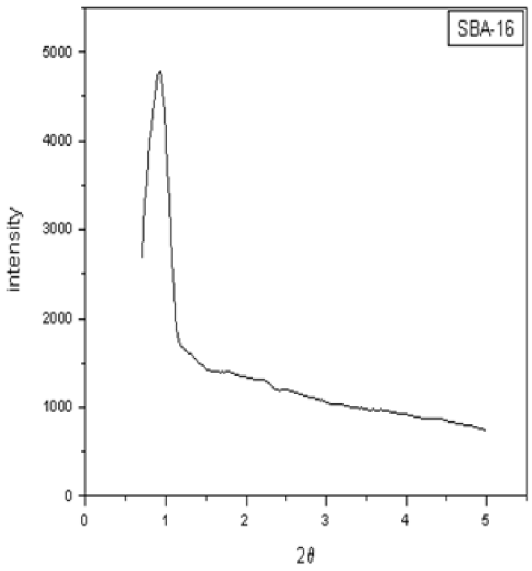

Fig.1 XRD of RHA-SBA-16

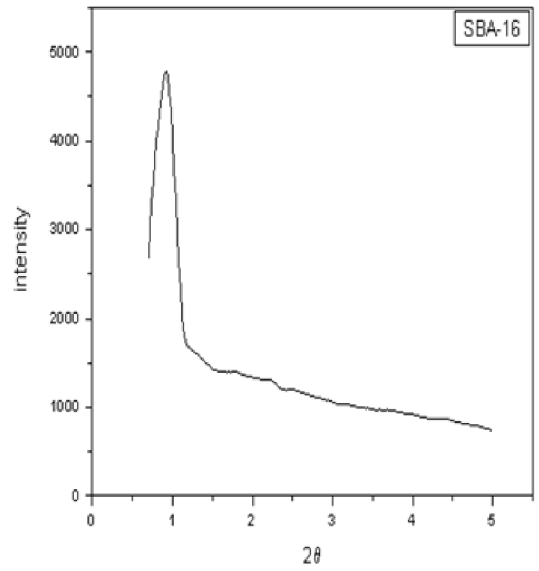

Fig.2 The FT-IR spectra of as synthesized SBA16 from Rice husk ash

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MORPHOMETRIC ANALYSISOF BILDI RIVER SUB CATCHMENT OF PURNA RIVER SUB BASIN MAHARASHTRA,INDIA USING REMOTE SENSING AND GIS TECHNIQUES

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ABSTRACT

Geographic information system (GIS) and IRSLISS III satellite image of 23.5 mt. spatial resolutionswith digital image processing techniques were used to study the Bildi sub catchment which is tributary of Purna River Basin. The study area covers an area of 119.91 km ^{2}and Bildi River draining in to Purna River basin in Buldhana District of Maharashtra state. Various morphometric parameters such as areal aspects of the drainage basin: drainage density (D), stream frequency (Fs), texture ratio (T), elongation ratio (Re), circularity ratio (Rc), form factor ratio (Rf) of the basin and linear aspects of the drainage network: stream order (Nu), bifurcation ratio (Rb), stream length (Lu) were computed. The morphometric analysis carried out and result shows that the basin is having low relief of the terrain and elongated in shape. Drainage network of the basin exhibits as mainly dendritic type which indicates the homogeneity in texture and lack of structural control.Bildi River is 2.44 while stream frequency was found to be 3.01, length of overland flow is 0.20. The shape factors like elongation ration, circularity ratio and form factor were found to be 1.47, 0.21 and 0.71 respectively.

Keywords: Morphometry, GIS techniques, Bildi River sub catchment

INTRODUCTION

Morphometry is the measurements and mathematical analysis of configuration of the earth's surface, shape and dimension of its landforms (Horton 1945; Strahler 1964). Quantitative measurements on drainages and relief features for morphometric studies have been done using the techniques of remote sensing and GIS in different drainage basins by many workers like Krishnamurthy et al. (1996); Singh and Singh (1997); Nag and Chakraborty (2003).Measurement and quantitative expression of drainage basin began with the work of James Hutton in 1775. Subsequently enormous step forward was made by Horton (1932) when he crystallized previous works added new measures and proposed general methods for the description of drainage basins characteristic. Since then, mathematical analysis of drainage basin has been a subject of considerable analysis, both in temperate region (Schumm, 1954; Morisawa, 1959). However, morphometric characteristics of drainage basin exhibit spatial temporal variation, hence the need for detail investigation of basin characteristics, not only from one area to another, but also from time to time. This is because, the form of a basin in terms of its morphometric characteristics determine the processes operating in such a basin.

Area of Study

Bildi catchment is located in the south eastern part of the Purna alluvium and extends from the ridges and meets to the Mun River. Bildi catchment overlies two districts of the Maharashtra; i.e. Akola and Buldhana. It has an area of approximately 119.91 km ^{2}. The Bildi river basin covers an area of 140 sq.km km^2 in the Shegaon Taluka of Buldana District, Maharashtra. It is bounded by longititude76°33'00" E to 79°46'00" E and latitudes 20°33'00" N to 20°46030" N falling in the Survey of India toposheets No. 55 D/10 and 55 D/14 on 1:50,000 scale. The basin is included in Survey of India topographical Maps (Fig. 1).

MATERIALS AND METHODS

Geomorphology and Geology

The study area is dominated by plains of Deccan trap. Physiographically the district falls under three structural cum physical units. In the north is a hilly strip of the Satpudas, Purna plains in the middle and the Ajanta range comprising Buldhana plateau in the south. The northern region forms a part of Satpura or Gawilgarh hills, which rise to general elevations of 600 to 700 m above mean sea level above MSL (mean sea level) with occasional peaks rising up to 1000 m above MSL or more. Purna plain is the main lowland region of

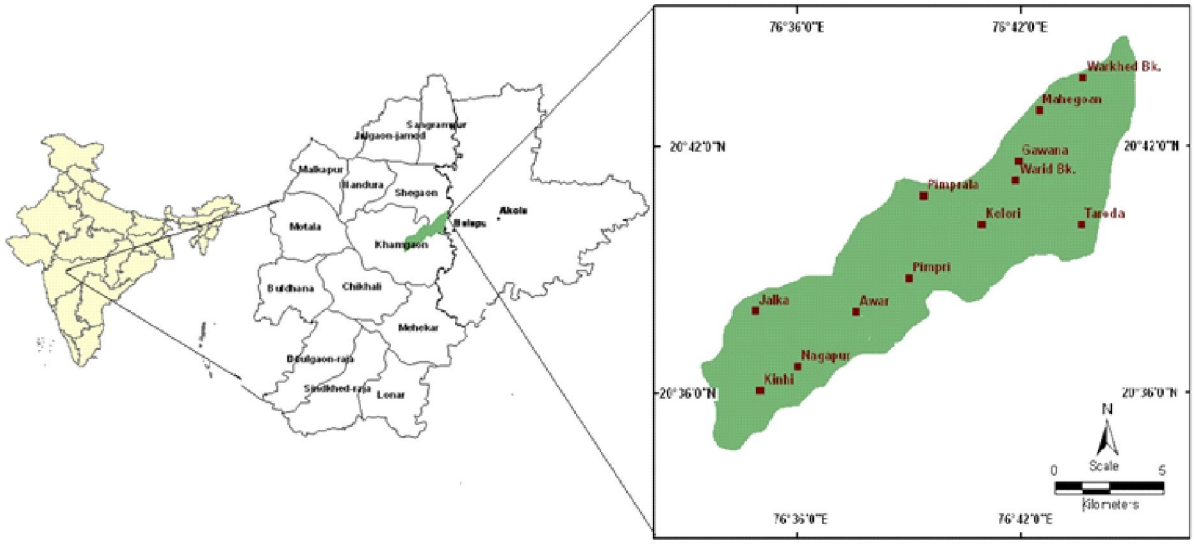

Fig. 1: Location map of Bildi catchment

the district, with average elevation ranging between 250 and 270 m above MSL. The Ajanta range carrying on its flat top high level mesa of Buldhana plateau covers the southern part of the district. The edge of this plateau, overlooking the Purna plains to its north, is a hilly ghat with average elevations of 500 to 600 m above MSL. Topographic relief in the Bildi catchment not changes significantly throughout the area. The elevation varies from 256 to 436 mt above MSL.

Methods of investigation

The drainage map of the study area has been prepared from digital data of IRS LISS-III. The satellite imageries have geo-referenced and merged using image processing software ERDAS IMAGINE data processing software (Version 8.3 and Arc GIS 10.1 Ver.). The drainage systems have been delineated using toposheets No. 55 G/10 and 55 G/14 on 1:50,000 scales (SOI, 1972) as reference and then superimposed and merged IRS LISS III of March 2012 satellite data of geo-coded FCC of bands 2, 3, 4.

Geomorphometric analysis

According to Clarke (1966) morphometry is the measurement and mathematical analysis of the configuration of the earth surface, shape and dimensions of its landforms. The morphometric analysis is carried out through measurement of linear, areal and relief aspects of the basin and slope contribution (Nag and Chakraborty, 2003). The measurement of various morphometric parameters namely- stream order, stream length (Lu), mean stream length (Lsm), stream length ratio (RL), bifurcation ratio (Rb), mean bifurcation ratio(Rbm), relief ratio (Rh) drainage density

Table 1: Computed morphometric parameters for linear aspects of the Bildi River sub basin

S. N.	Morphometric Parameters	Formula	Reference
1	Stream Order	Heirachial rank	Strahler (1964)
2	Stream Length (Lu)	Length of the Stream	Horton (1945)
3	Mean Stream Length (Lsm)	Lsm = Lu/Nu where, Lsm= Mean Stream Length Lu=Total Stream Length of order 'u' , Nu= Total no. of stream segments of order 'u'	Schumn (1956)
4	Stream Length ratio (RL)	RL=Lu/Lu-1 where,RL=Stream Length ratio, Lu=The total stream length of the order 'u' Lu-1=The total stream length of its next order	Horton (1945)
5	Bifurcation ratio (Rb)	Rb=Nu/Nu+1 where, Rb= Bifurcation ratio, Nu=Total no. of stream segments of order 'u' Nu+1=Number of segments of the next higher order	Schumn (1956)
6	Mean Bifurcation ratio	Rbm=Average of Bifurcation ratios of all orders	Strahler (1957)

(D), stream frequency (Fs) drainage fexture (Rt), from factor (Rf), circulatory ratio (Rc), elongation ratio (Re) length of overland flow (Lg) has been carried out and the data are presented in Table 1.

Linear aspects

The linear aspects include the stream order, stream length, mean stream length, stream length ratio and bifurcation, which were determined and results have been presented in Table 1.

Stream order

The first step in the drainage basin analysis is designation of stream orders which is not only the index, the size and scale, but also to afford and approximate index of the amount of stream flow, which can be produced by a particular network, stream order, number. The stream order is a measure of the degree of stream branching within a basin. The study area has dendritic to sub dendritic drainage type pattern. It is characterized by a tree like branching system in which tributaries join the gently curving main stream at acute angles (Fig. 2). After delineating drainage pattern from the survey of India toposheets then it is super imposed on the IRS LISS III satellite image of 23.5. mt spatial resolution (Fig.3).

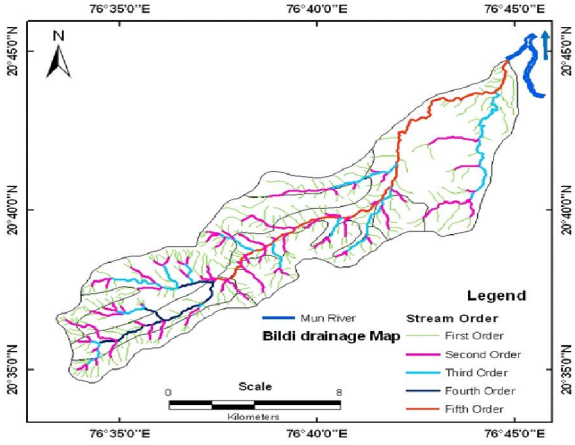

Fig.2: Stream ordering of the Bildi River sub basin

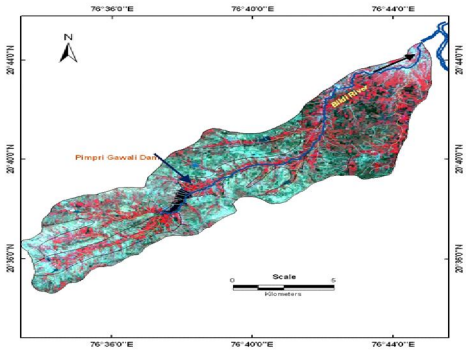

Fig.3: IRS LISS III False colour composite of the study area

Stream number

The count of stream channel in its order is known as stream number. The number ofstream segments decreases as the order increases. The higher amount stream order indicates lesser permeability and infiltration. Stream number is directly proportional to size of contributing watershed**,** to channel dimensions. It is obvious that the number of streams of any given order will be fewer than for the next lower order but more numerous than for the next higher order. The number of streams decreases as the stream order increases (Table 2).

Stream length

The length of a stream is a measure of the hydrological characteristics of the underlying rock surface and the degree of drainage. Wherever the formation is permeable, only a small number of relatively longer streams are formed in a well drained watershed, a large number of streams of smaller length are developed where the formations are less permeable. Generally, the total length of stream segment is the maximum in the first order stream and decreases as the stream order increases **(**Table 2). However, in case of Bildi river the stream length decreases as stream order increases and the stream segments length for third, fourth and fifth orders are varies at smaller extent. This change may indicate flowing of streams from high altitude, lithological variation and moderately steep slope (Singh and Singh, 1997).

Stream length ratio

Horton (1945), proposed the factor length ratio, which is the ratio of the mean length of a stream if any given order to the mean length of a stream of the next lower order, based on the fact that mean length of a stream of any given order is always greater than the mean length of a stream of the next lower order **(**Table 3). The length ratio RL (which is ratio of mean length Lu of segments of order u to meanlength of segments of the next lower order LU/(LU-1) tends to be constant through the successive orders of basin. It indicates that the stream lengths are decreasing with increasing the order of stream texture. The high value of drainage texture and lower value of drainage density indicates the presence of highly resistant permeable material with moderate to high relief. In the study area the stream length ratio is varies from 2.93 to 2.30 (Table 3.4). It indicates that the stream lengths are decreasing with increasing the order of stream.

Mean stream length

Mean stream length (Lsm) is a characteristic properly

related to the drainage network components and its associated basin surfaces (Strahler, 1964). This has been calculated by dividing the total stream length of order (u) by the number of streams of segments in the order. The mean stream length is presented in Table 2. It is seen that Lsm values exhibit variation from 0.62-22.47. It is observed that Lsm values of sub basins indicate that Lsm of the given order is greater than that of the lower order and less than that of its next order. This deviation might be due to change in tophographic elevation and slope of the area (Table 3).

Bifurcation ratio

Bifurcation ratio is defined as number of streams of one order to the next higher order. The bifurcation ratio, for a given density of drainage lines, is very much controlled by basin shape and shows a very little variation (ranging between 3 and 5) in homogeneous bedrock from one area to another (Chorley, 1984). The bifurcation ratio will not be precisely the same from one order to the next because of the possibility of variations in basin geometry and the lithology, but tends to be a constant throughout the series. When algorithm of number of streams is plotted against order, most drainage networks show a liner relationship, with small deviation from straight line. Bifurcation ratios characteristically range between 3 and 5 for the basin (Gokhale, 2005) in which geologic structures do not distort the drainage pattern (Table 3.2). The bifurcation ratio calculated is 4.14. The direct relationship of bifurcation ratio to stream order is attributed to the semi arid climate characterized by short- duration flash floods (Table 4).

Relief aspects

Relief is the elevation difference between the highest and, lowest point on the valley floor of the region. The relief measurements like relief ratio, basin length and total relief have been carried out.

Relief ratio

The relief ratio may be defined as the ratio between the total relief of a basin and the longest dimension of the basin parallel to the main drainage line (Schumm, 1956). The maximum relief to horizontal distance along the longest dimension of the basin parallel to the principal drainage line is termed as relief ratio (Schumn, 1956). The relief ratio is obtained when basin relief "H" is divided by the maximum basin length (Lb) which results in a dimensionless ratio which is equal to the tangent of the angle formed by two planes intersecting at the mouth of the basin called relief ratio which measures the overall steepness of a drainage basin and is an indicator of the intensity of erosional process

Table 2: Calculation of different morphometric parameter values in study area.

Riverbasin	Basin Area (Km^2)	Stream order (u)	Number of Streams(Nu)	Total length of streams in km
Bildi River sub- basin	119.94	1	275	171.61
		2	69	58.19
		3	14	31.63
		4	3	9.73
		5	1	22.47
			TOTAL=362	TOTAL=293.63

Table 3: Mean stream length and Stream length ratiovalues in study area.

Sub basin	Mean stream length in km(Lsm)					Stream length ratio(Rl)			
	I	II	III	IV	V	II/I	III/II	IV/III	V/IV
Bildi River	0.62	0.84	2.25	3.24	22.47	2.93	1.83	0.30	2.30

Table 4: Calculated Bifurcation ratio of the study area.

Sub basin	Stream order(u)	Bifurcation ratio				Mean Bifurcation ratio
		I/II	II/III	III/IV	VI/V	
Bildi River	Rb = Nu/ Nu+1	3.98	4.92	4.66	3	4.14

operating on slope of the basin (Schumn, 1956). Relief ratio has direct relationship between the relief and channel gradient. The relief ratio normally increases with decreasing drainage area and size of the watersheds of a given drainage basin (Gottaschalk, 1964). Difference in the elevation between the highest point of a basin (on the main divide) and the lowest point on the valley floor is known as the total relief of the river basin. The possibility of a close correlation between relief ratio and hydrologic characteristics of a basin suggested by scheme who found that sediments loose per unit area is closely correlated with relief ratios . In the study area, the values of relief ratio is 5.26. It is noticed that the high values of Rh indicate steep slope and high relief (250 m).

Aerial aspects (Basin geometry)

Aerial aspects include different morphometric parameters, like drainage density, texture ratio,stream frequency, form factor, circulatory ratio, elongation ratio and length of the overland flow. The values of these parameters are presented in table 5 and discussed and interpreted.

Drainage density

It is measured as a sum of the channel lengths per unit area and obtained by dividing the total stream length by total area of the basin (Table 5) and given by;

$D d = \sum Lu / Au$

Where $\sum$ LU = Mean channel length and Au = Basin area

Drainage density is controlled by the type of formations in the basin areas with impervious formations will have higher drainage density than those with pervious formations (Gokhale, 2005). In the Study area drainage density is 2.44. In general low drainage density is favored in regions of high resistant or highly permeable sub soil materials, under dense vegetation cover and where relief is low. High drainage density is favored in regions of weak or impermeable surface materials, sparse vegetation, and mountainous relief. The drainage density is governed by the factors like rock type, run off intensity, soil type, infiltration capacity and percentage of rocky area (Table 6).

Drainage frequency

It is a measure of number of stream segments per unit area and is therefore depend on the stream order, where as drainage density is independent of stream order**.** It is obtained by dividing the total number of stream to the total drainage basin area (Table 5) and given by;

$Fs = Nu/A$

Where A = Area of the basin, Nu = Stream number

Drainage frequency of the study area is found to be 3.01. It is also seen that the drainage density values of the sub-basins exhibits +ve correlation with the stream frequency suggesting that there is an increase in stream

Table 5: Computed morphometric parameters and their respective formulae foraerial aspects of the Bildi River sub basin (Basin geometry)

S. N.	Morphometric Parameters	Formula	Reference
1	Drainage Density (D)	D= Lu/A where, D= Drainage Density, Lu=Total stream length of all orders, A= Area of the basin (km2)	Horton (1945)
2	Stream Frequency (Fs)	Fs= Nu/A where, Fs= Stream Frequency, Nu=Total no. of streams of all orders,A= Area of the basin (km^2)	Horton (1932)
3	Drainage Texture (Rt)	Rt=Nu/P where, Rt=Drainage Texture,Nu=Total no. of streams of all orders, P=Perimeter (Km)	Horton (1945)
4	Form Factor (Rf)	$Rf= A/Lb^2$ where, Rf=Form Factor, A=Area of the basin (km^2), Lb^2= Square of Basin length	Horton (1932)
5	Circulatory Ratio (Rc)	$Rc=4*Pi*A/P^2$ where , Rc=Circulatory ratio, Pi = 3.14, A= Area of the basin (km^2), P^2=Square of the perimeter (km)	Miller (1953)
6	Elongation ratio (Re)	$Re=2\sqrt{(A/\pi)}/Lb$ Where.Re=Elongation ratio, A=Area of the basin (km^2), Pi= 3.14, Lb= Basin length	Schumn (1956)
7	Length of overland flow (Lg)	Lg=1/D*2 where, Lg=Length of overland flow D= Drainage Density	Horton (1945)

population with respect to increasing drainage density (Table 6).

Drainage pattern

It refers to the orderly spatial arrangement of geologic, topographic or vegetation features. Drainage pattern is an important element in geologic interpretation of aerial photographs. The study area has dendritic to sub dendritic drainage type pattern. It is characterized by a treelike branching system in which tributaries join the gently curving main stream at acute angles.The occurrence of this drainage system indicates homogeneous, uniform soil and rock material (Fig. 2 & 3).

Drainage texture

Drainage texture is the total number of stream segments of all orders per perimeter of that area (Horton, 1945). Horton (1945) recognized infiltration capacity as the single important factor which influences drainage texture and considered drainage texture which includes drainage density and stream frequency **(**Table 5). The drainage texture depends upon a number of natural factors such as climate, rainfall, vegetation, rock and soil type, infiltration capacity, relief and stage of development (Smith, 1950). The soft or weak rocks unprotected by vegetation produce a fine texture, whereas massive and resistant rocks cause coarse texture. Sparse vegetation of arid climate causes finer textures than those developed on similar rocks in a humid climate. The texture of a rock is commonly dependent upon vegetation type and climate (Dornkamp and King, 1971). Drainage texture is the product of drainage density and stream frequency. It is expressed the same as the drainage and classification is given below. High relief ratio brings high discharge of surface water in a short duration. Small relief ratio indicates the erosional development of the drainage basin. Drainage Texture 1 < 2 Very coarse 2, 2 - 4 Coarse , 3 4 - 6 Moderate ,4 6 - 8 Fine, 5 > 8 Very fine in the study area the value is 5.70 shows a very coarse texture (Table 6).

Basin area

The drainage basin area is one of the important parameters like that of the length of draining – the basin. The area of a given order is defined as the total area projected on a horizontal plane contribution overland flow to the channel segments of the given order, which includes all tributaries of the lower order. The Bildi Sub basin drainage basin area is 119.94 sq. Km. (Table.6).

Form factor

Form factor may be defined as the ratio of the area of the basin and square of basin length (Horton, 1932). It is a less property and is used as a quantitative expression of the shape of basin form. <5 low values- have flattered and flow for longer durations >5 high values – have high peaks and flows shorter duration (Table 5) and given by; **(**Table 3.5).

$R f = A/Lb^2$

Where; A = Area of the basin L b^2 = square of Basin length

The value of form factor would always be greater than 0.71 (Table 6) for a perfectly circular basin. Smaller the value of form factor, more elongated will be the basin. Rf values of in the study area 0.44 .It is noted that the Rf values of the study area suggesting that Bildi River basin elongated in shape (Table 6).

Circulatory ratio

The circulatory ratio is mainly concerned with the length and frequency of streams, geological structures, land use/land cover, climate, relief and slope of the basin. It is the ratio of the area of the basins to the area of circle having the same circumference as the perimeter of the basin **(**Table 5).

Circulatory ratio (RC**)** is the ratio of basin area Au, the area of circle having the same perimeter as the basin and given by;

$RC= 4 A/P^2$

Where; Au = Total basin area and P^2 = perimeter

As the basin circulatory ratio reaches unity (one) the basin attains a fan shape and is prone for high floods.Circulatory ratio is the ratio of basin area Au, the area of circle Ac having the sameperimeter as the basin.The Bildi River basin sub-basin has value of Re less than 0.5 indicating that it is elongated, while greater value than 0.5 values suggesting that they are more or less circular in shape and are characterised by the high to moderate relief and the drainage system were structurally controlled.The circulatory ratio of the study area is 0.39 (Table 6).

Elongation ratio

Elongation ratio is the ratio between the diameter of the circle of the same area as the drainage basin arid the maximum length of the basin (Table 5). It is expressed by following equation;

$Re=2\sqrt{(A/\pi)/Lb}$

where, Rf=Form Factor, A=Area of the basin (km^2) Lb= Square of basin length

Elongation ratio is the ratio of diameter of the circle of the same area in the basin to the maximum basin length. The high values circularity ratio and the elongated ratio suggest that the basins are more elongated. Low form factor and high circulatory ratio suggest that the basin is prone for high floods. Higher the ratio lesser will be flood peak. The values of Re generally vary from 0.6 to 1.0 over a wide variety of climatic and geologic conditions. Values close to 1.0 are typical of regions of very low relief, where as values in the range 0.6–0.8 are usually associated with high relief. These values can be grouped into three categories namely (a) circular (0.9), (b) oval (0.9–0.8), (c) elongated (0.7). The elongation ratio in the study area is 1.47 which suggests that the basin belongs to the elongated shape basin and moderate relief (Table 6).

Length of the basin and basin width

Several people defined basin length in different ways, such as Schumm (1956), defined the basin length as the longest dimension of the basin parallel to the principal drainage line. In the study area length of the Bildi River sub basin in accordance with the definition of Schumm (1956) that is 26.40 Kms, (Table 6).The width of the basin is also important factor to understanding the geometry of the drainage basin. The basin width of Bildi River drainage is 6.59 Km.

Basin area

The area of the basin or watershed is another important parameter like the length of the stream drainage. Schumm (1956) established an interesting relation between the total watershed areas and the total stream lengths, which are supported by the contributing areas. The drainage basin area is one of the important parameters like that of the length of draining the basin. The area of a given order is defined as the total area projected on a horizontal plane contribution overland flow to the channel segments of the given order, which includes all tributaries of the lower order. The author has computed the basin area by using Arc GIS-10.1 software which is 119.94 Sq Kms (Table 6).

Basin perimeter

Basin perimeter is the outer boundary of the watershed that enclosed its area. It is measured along the divides between watersheds and may be used as an indicator of watershed size andshape. The author has computed the basin perimeter by using ArcGIS-9.3 software, which is 63.47 Kms (Table 6).

Length overland flow

It is the length of water over the ground before it gets concentrated in to definite streams channels (Horton, 1945). This factor depends on the rock type, permeability, climatic regime, vegetation cover and relief as well as duration of erosion (Schumn, 1956).The length of overland flow (Lg) approximately equals to half of reciprocal of drainage density (Horton, 1945). It is the length of water over the ground before it gets concentrated into definite stream channels (Table 5). This factor basically relates inversely to the average slope of the channel and is quite synonymous with the length of the sheet flow to the large degree. The Lg values of in the study area is 0.20 indicating high relief of the area (Table 6).

CONCLUSIONS

The Bildi river is a fifth order river with three fourth order streams, fourteen third order streams, sixty nine

Table 6: Aerial aspects values of Bildi River sub basin

Morphometric parameters	Symbol/formula	Result in the study area
Basin Area (sq. km)	A	119.94
Perimeter (km)	P	63.47
Basin Length	Lb	26.40
Drainage density (km/sq. km)	Dd = Lu/A	2.44
Stream frequency	Fs = Nu/A	3.01
Texture ratio	T = Nu/P	5.70
Elongation ratio	$Re=2\sqrt{(A/\pi)}/Lb$	1.47
Circularity ratio	$Rc=4\pi A/P^2$	0.21
Form factor ratio	$Rf=A/(Lb)^2$	0.71
Length of Overland Flow	Lg=1/D*2	0.20

Where; Lu = Total stream length of all orders, Nu = Total no. of streams of all orders, N1= Total no. of 1st order streams, $\pi = 3.14$

second order and two hundreed seventy five first order streams. The total stream length was found to be 293.63 km with mean stream length of 0.811 km. The average bifurcation ratio is 4.14. Drainage density is 2.44; length of overland flow is 0.20. The total stream length among third order stream varies from 9.73 to 171.61 km. The average bifurcation ratio for third order basins is 3.98. Drainage density for ranges from 1.02 to 3.38, length of overland flow ranges from 0.15 to 0.49, while slope varies from 2.69 to 56.73 m/km for third order basins. In fourth order basins average bifurcation ratio is 4.92. The length of fourth order stream is 9.73 km. Drainage density for Bildi River is 2.44 while stream frequency was found to be 3.01, length of overland flow is 0.20. The shape factors like elongation ration, circularity ratio and form factor were found to be 1.47, 0.21 and 0.71 respectively.

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STUDIES IN THE PROXIMATE ANALYSIS OF LEAVES OF *Ricinus communis* FROM BARSHITAKLI IN AKOLA DISTRICT

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ABSTRACT

Plants kingdom is the very potent kingdom on earth containing bioactive molecules. Different parts of plant are employed for the different purposes. Medicines derived from the plants may be used to treat the diseases directly on target organ as well as orally. Some of the medicines are derived from the plans leaves by various chemical processes. Hence it is necessary and essential to study the proximate analysis of various parts of the plants. Ricinus communis leaves possess various curative properties. Keeping in consideration all the medicinal properties, present research explores the study of proximate analysis of leaves of Ricinus communis from Barshitakli region in Akola District..

Key words : Barshitakli in Akola, *Ricinus communis*, Proximate analysis.

INTRODUCTION

Akola District is located in the Maharashtra state on the way of Mumbai to Nagpur expressway NH-6. Barshitakli is largest taheshil place in the Akola district having big forest area named KATEPURNA. Plants found in the region are having various medicinal applications. Latitude (in Degree) of Barshitakli is 20.587137 longitude (in Degree) is 77.06123.

Ricinus communis is a plant of very superior class used for the treatments of various diseases. It is used in medicinal, pharmaceutical and chemical sciences due to anti-oxidant, anti-microbial, anti-diarrhea, anti-diabetic, anti-inflammatory, hepatoprotective, hypercholesterolemic, antiviral, diuretic, carminative properties. Similar work especially on proximate was found in the research team of D.T. Tayade in the Amravati District, Morshi and Chandur Rly. Region.

Present research work includes the determination of moisture content, Ash content, cold water solubility, Hot water solubility, 1% NaOH solubility, 1% HCl solubility ethanol Solubility, Benzene solubility, Dioxane solubility and Ether solubility. Moisture and ash content in the sample is dependent on the season and situation of the plant. But, Solubility is not affected by any adverse factors.

The results are helpful to decide the amount of dose for particular disease. These results are also useful for predicting drug activity as well as drug effects. Hence cold water, hot water, 1%NaOH, and 1%HCl, ethanol, methanol, benzene, dioxane, petroleum ether, solubility as well as moisture and ash content of *Ricinus communis* leaves sample have been investigated.

MATERIALS AND METHODS

Preparation of Sample:

1. Initially site is decided.
2. The total five leaves were collected from same region.
3. The collection of sample was done in between 15th December 2015 to 20th December 2015.
4. Only leaves of *Ricinus communis* were taken and shed dried at room temperature.
5. The leaves were pulverized in grinding mill having a screen of 5 mm diameter hole to achieve particle size 40-50 mesh. This fine powder was treated as a sample powder for various analyses.
6. All chemicals used are of Mercks chemical Pvt Ltd. manufactured.

OBESERVATIONS AND CALCULATIONS

Moisture content and ash content:

Ash is prepared with the help of Silica crucible and it was weighed and kept in oven till it showed constant weight. The leaves sample was analyzed for moisture and ash content by literature method and the percentage of the moisture and ash of sample is calculated by applying the following formula,

$$\% \text{ of Moisture and Ash} = \frac{\text{Loss of weight of sample}}{\text{Weight of sample taken}} \times 100$$

Solubility's in cold water , hot water, 1% NaOH, 1% HCl, ethanol, methanol, benzene, dioxane, ether:

The cold water, hot water, 1%NaOH and 1%HCl solubility of leaves sample was analyzed and

percentage of solubility of each sample is calculated by applying the following formula

$$\% \text{ Solubility} = \frac{\text{Loss weight of sample}}{\text{Weight of sample taken}} \times 100$$

RESULT

The results obtained are depicted in Table No 1,

Table No 1

S. N.	Parameters	Percentage (%)
1	Moisture Content	6.1
2	Ash Content	10.12
3	Cold water Solubility	53
4	Hot Water Solubility	65
5	1% NaOH solubility	32
6	1% HCl solubility	46
7	Ethanol Solubility	70
8	Methanol Solubility	52
9	Benzene solubility	35
10	Dioxane solubility	27
11	Ether solubility	72

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ASSESSMENT OF WATER QUALITY OF NALGANGA DAM, DIST- BULDANA OF MAHARASHTRA

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ABSTRACT

Water quality of Nalganga dam assessed during Jan.12 to Dec.12 .Important parameters ie. Temperature, P^H, Free CO_2, D.O, Total hardness (Ca + Mg hardness was studied. There are some correlations between some parameters in accordance with the season, so in present study the seasonal variations of the Nalganga dam was studied.

Key words: Water quality, Nalganga dam

INTRODUCTION

Water quality assessment of Nalganga dam is made during Jan. 2012 to Dec. 2012. The main purpose of this study is to detect the seasonal variations in the water quality of Nalganga dam. The physicochemical method give information about the type of substances of pollutants & its concentration while biological methods indicates the general effects & gives clue to nature & quality of substances.

MATERIALS AND METHODS

The water samples are collected from Nalganga dam and water quality assessed after every 3 months ie. Jan, Apr, July & Oct 2012. Temperature measured with the help of thermometer, P^H measured with the help of digital P^H meter. Ca & Mg hardness measured by the methods of Trivedi & Goel (1986), & Trivedi *et al* (1987). Total hardness is calculated by the sum of Ca & Mg hardness.

RESULTS AND DISCUSSIONS

Temperature is remain highest during Apr12 due to hot summer & lowest during Jan12. PH nearly remain equal in all seasons. The important parameters ie.Ca & Mg hardness in which Ca hardness remain highest during July12 & lowest in Jan 12. Mg hardness highestly recorded in July 12 while lowest in Jan 12. The D.O. maximum at Oct 12 , Free CO_2 recorded highest in Jan12 & lowest in July 12.

Determination of P^H is a valuable guide to show acid, alkali balance of water. Saxena *et al* (1988), reported inverse type of correlation between temperature & P^H of a water. Odum (1977), Perkin (1976), reported the photosynthetic activites increases the P^H.

Observation table:

Parameters	Jan12	Apr12	July12	Oct12
Temperature	24 ±0.41	30 ± 0.29	26 ±0.5	27 ±0.71
P^H	7.1 ±0.12	7.4 ±0.7	7.0 ±0.2	6.9 ±0.25
Ca hardness	110 ±0.32	123.1 ±0.21	163.7 ±0.7	147.2 ±0.22
Mg hardness	36 .1±0.22	41.4 ±2.1	61.2 ±0.31	42.0 ±0.18
Total hardness	146.1 ±0.12	164.5 ±1.1	223.9 ±1.7	189.2 ±0.75
D.O.	22.2 ±0.71	18.4 ±0.3	27.2 ±0.22	32.2 ±0.21
Free CO_2	48.2 ±0.13	37.2 ±0.31	24.1 ±0.2	32.1 ±0.27

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ENANTIOSELECTIVE SYNTHESIS OF (*S*)-ENCIPRAZINE

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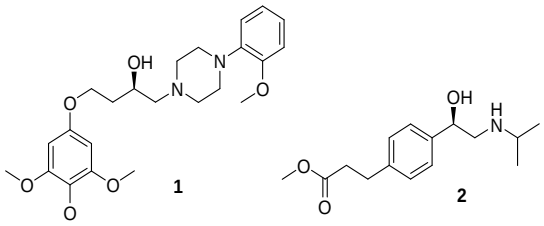
ABATRACT

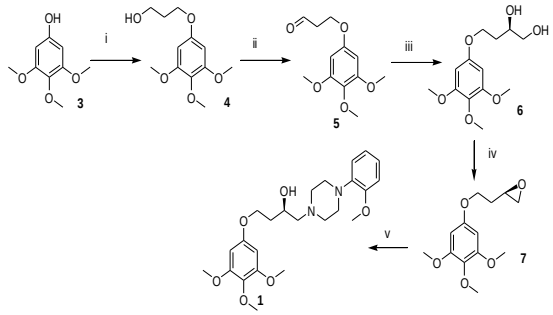
A synthetic strategy involve towards the synthesis of (s)-Enciprazine. The asymmetric α- aminoxylation with nitrosobenzene in an acetonitrile by using proline catalyzed is an key step for the synthesis. This synthesis involves five steps having 38% overall yield with 95 % ee.

Keywords: Stereoselective, α-aminoxylation, nitrosobenzene.

The propranolol**,** the first clinically useful β-blocker, which was invented by Scottish pharmacologist Sir James W. Black in early 1950s in Eli Lilly Laboratories.[1] This invention revolutionalized the medical management of angina pectoris and is considered to be one of the most important contributions to clinical medicine and pharmacology of 20th century.[2] For this invention, in 1988, Sir James W. Black was awarded Nobel Prize in Medicine. The some of representative β-blockers are shown in **Fig.** The main three actions of β-adrenergic blocking agents and/or drugs are; lowering of blood pressure (antihypertensive), return of the heart to rhythmic beating (antiarrhythmics) and the improvement of the heart muscle tone (cardiotonics).[3] Also the mechanism of action involves the adrenergic system in which the hormonal system provides the communication link between the sympathetic nervous system and involuntary muscle.[4] The β-blockers are play key role to block only catecholamines hormones in brain, heart, and blood vessels that results the heart beats more slowly with less force. In addition, blood vessels relax and widen so that blood flows through them more easily. Both of these actions are most important to reduce the blood pressure during heart-attack. The racemic as well as enantioselective synthesis for the β-blockers have been reported in literature. However, the reported methods described above for the synthesis of (*S*)- Enciprazine**1**, (*S*)-Esmolol**2**, were based on classical resolution *via* diastereomers, chromatographic separation of enantiomers, enzymatic resolution, kinetic resolution and asymmetric synthesis *via* chiral pool strategy.[5] The main drawback of the hydrolytic kinetic resolution is use of expensive and inaccessible.



RESULTS AND DISCUSSION



Scheme : *Reagents and reaction conditions***:** ((i) 3-bromopropanol, K2CO3, Acetone, Reflux, 14 h, 94 %; (ii) IBX, DMSO, RT, 3 h, 90 %; (iii) (a) PhNO, L-proline, MeCN, -20 °C 20 h, then NaBH4, MeOH, 1 h; (b) 10 % Pd/C, MeOH, H2, RT, 14 h, over two step, 73 %; (iv) PPh3, DEAD, 1, 4 Dioxan, reflux, 4 h, 80 %; (v) 1-(2-methoxyphenyl)piperazine**1**, i- PrOH, reflux, 18 h, 95 %.

The β-adrenergic blocking agents are known as β-blockers, which belong to a larger class of medicines and also called as adrenergic inhibitors. The spectroscopic characterization of starting compound by the ^{13}C NMR spectrum showed signals at δ 55.97 for two $-OCH_3$, attached to the aromatic ring at meta

position and signal at δ 61.10 for one –OCH_3 attached to the aromatic ring at para position. The signal at δ 92.90 represents the aromatic ring carbon**.** The O-alkylation of 3, 4, 5- trimethoxy phenol **3** with 3-bromo-1-propanol using K_2CO_3 as a base in an acetone solvent at reflux condition, affording the primary alcohol **4** in a 94 % yield. The primary alcohol **4** was then subjected to the oxidation using 2-iodoxy benzoic acid (IBX) in a DMSO solvent at room temperature for 3 h, afforded the aldehyde **7** in a 90 % yield. Aldehyde **5** was then subjected to L-proline (20 mol %) catalyzed asymmetric α- aminoxylation with nitrosobenzene in an acetonitrile solvent at -20 °C for 24 h and subsequently reduction was carried out with $NaBH_4$ in a methanol solvent.[6-8] The crude aminoxy intermediates without purification was subjected to 10 % Pd/C catalyzed hydrogenolysis to obtain chiral 1, 2-diol **6**in a 73 % yields over two steps. The chiral diol **6** was then converted to chiral epoxide **7** under Mitsunobu reaction conditions using triphenylphosphine (PPh_3) and diethyl azodicarboxylate (DEAD) using 1, 4-dioxane as a solvent at reflux condition for 4 h, afforded chiral epoxide **7** in one step with a 80 % yield. Finally, the chiral epoxide **7** was subjected to the reaction with 1-(2- methoxyphenyl) piperazine in an isopropanol solvent at reflux condition for 18 h to furnish the desired target molecule (*S*)-Enciprazine**1** in a 95 % yield.[9-11]

(*S*)-Enciprazine 1

Yield: 1.23 g (95 %); semi solid; $[á]^{D}_{25}$= +32.16 (c 0.5, EtOH) (lit.[6] $[á]^{D}_{25}$= +29 (c 05, EtOH for 95 % ee); **^{1}H NMR** (200 MHz, $CDCl_3$): **ä** 2.74-2.86 (m, 4H), 2.97-3.05 (m,2H), 3.17 (t, *J*=4 Hz, 4H), 3.78 (s, 3H), 3.82 (s, 6H), 3.87 (s, 3H), 3.95 (t, *J*=5 Hz, 2H), 4.10-4.23 (m, 1H), 6.17 (s, 2H), 6.83-6.99 (m, 4H); **^{13}C NMR** (50 MHz, $CDCl_3$): **ä**50.04, 53.69, 55.35, 56.04, 60.92, 65.17, 70.43, 92.43, 111.26, 118.35, 121.12, 123.36,140.63, 152.20, 153.72, 155.20; Anal. Calcd for $C_{23}H_{32}N_2O_6$: C, 63.87; H, 7.46; N, 6.48.Found: C, 63.84; H, 7.42; N, 6.51 %.

CONCLUSIONS

In conclusion, we have developed highly efficient, versatile, cofreindly, inexpensive, nontoxic, synthetic route for an enantioselective synthesis of the β-adrenergic blockers: (*S*)-Enciprazine

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PRELIMINARY PHYTO-CHEMICAL INVESTIGATION OF *COMBRETUM ALBIDUM G.* DON: AS MEDICINALLY IMPORTANT PLANT

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ABSTRACT

Various solvent like ethanol, ethyl acetate and hexane used for stem and leaves extracts of medicinal plant *Combretum albidum a* member of *Combretaceae* family were analyzed for phyto-chemical investigation by using standard qualitative method protocol and its shows secondary metabolites such as saponins, flavonoids, alkaloids, phenolics, terpenes etc. and chromatographic and spectroscopic TLC, IR investigation all extracts shows various bands and peaks were observed among all extracts ethyl acetate extract shows better resolution and obtained fluorescence band and various functional group respectively. In the presence these secondary metabolites applications in as alternative medicines, in agriculture field in pest control management and also used in killing of pathogenic microorganisms.

Key word: *Combretum albidum*, secondary metabolites, Thin layer chromatography, IR.

INTRODUCTION

The WHO estimate now a day's near about 80% peoples from all over of the world mostly used plant origin medicine for their health care (Batugal *et al.* 2004). In India rural and tribals peoples used traditional plants for physical and mental fitness without side effect and due to this security and cost efficacy day by day increase the demand of traditional medicinal plants in modern medicine (Koche et al., 2011), while in case of the synthetic drugs used as medicine, which having more side effect on human beings and environment (Chanda, 2014) due to which decrease the demand of these synthetic drugs and urgent need alternative medicines without detrimental effect. The *Combretum albidum* G. Don is a wild medicinal plant and it's belonging to the family Combretaceae, generally renowned as Buffalo calf in English (Kumar et al., 2015) and in Marathi piluki. Its distribution in India and Sri Lanka particularly in semi evergreen, deciduous forests (Sreedhar et al., 2012). Diversity of secondary metabolites obtained from *C. albidum* like alkaloids, saponin, Coumarines, tannins, terpenoids, flavonoids etc. (Bruneton, 1999; Trease and Evnas 2002; Sreedhar et al., 2013a).Which play a vital role in healing jaundice (Sreedhar et al., 2012), diarrhea, dysentery (Karupusamy et al., 2007) cough (Punjaji et al., 2012), in malarial fever and eye troubles (Kadavul et al., 2009), skin diseases (Ganesan et al., 2009) etc. In developing countries many types of herbal drugs containing formulation used in health care agenda. Yet difficulty behind the acceptance of substitute medicines in developed countries is the lack of documentation and strict quality control. So, the documentation of chemical constituents of the raw materials used in herbal medicine is very essential for the international acceptance of this system of medicine (Kumar et al., 2015). Limited work has been reported as detection of chemical constituents like (alpha)–sitosterol, ursolic, gallic acids only by using qualitative assay and TLC on this plant (Sreedhar et al., 2013b) In this context, we have chosen one plant for investigate of bioactive constituents.

MATERIALS AND METHODS

Materials

The stem and Leaves parts of *Combretum albidum* was collected from Barshitakli campus Akola and identified by an expert botanist. The plant parts used for studies were washed thoroughly in running tap water, shade dried and pulverized to give a fine powder. The chemical used were of AR grades.

Methods

Extraction of secondary metabolites : stem and leaves of *C. albidum* in powdered form are Soxhlet extracted in three different solvents. The15 g powder was extracted in 250 ml each of ethanol, ethyl acetate and hexane at 78°C 48°C and 69°C, respectively for 6 hours. The resulted extract was vacuum evaporated (Rotavapour R 24, Buchi, Switzerland). The residue obtained after vacuum evaporation was redissolved in ethanol, ethyl acetate and hexane. This solution is used

for further studies. Store in brown umber coloured bottle and keep it in refrigerator for further use.

Qualitative Phytochemical Test (Kokate, 1997)

A) Tests for Alkaloids

1) Hager's Test

To the 2-3 ml of filtrate, 1ml of dil. HCl and Hager's reagent was added and shake well. Yellow precipitate was formed showing the presence of alkaloids.

2) Mayer's Test

To the 2-3 ml of filtrate, 1ml of dil. HCl and Mayer's reagent was added and shake well. Formation of yellow precipitate showed the presence of alkaloids.

3) Wagner's Reagent Test

To the 2-3 ml of filtrate, 1ml of dil. HCl and Wagner's reagent was added and shake well. Formation of redish-brown precipitate showed the presence of alkaloids.

B) Tests for Tannins and Phenolic Compounds

1) $FeCl_3$ Solution Test

On addition of 5% FeCl3 solution to the extract, deep blue black colour appeared.

2) Lead Acetate Test

On addition of lead acetate solution to the extract white precipitate appeared.

3) Potassium Dichromate Test:

To a few drops of sample, strong Potassium dichromate solution is added. Yellow colour precipitate indicates presence of tannins and phenolic compounds.

C) Tests for Flavonoids

1) With Lead Acetate

To the small quantity of extract lead acetate solution was added. Formation of yellow precipitate showed the presence of flavonoids.

D) Test for Steroids

1) Salkowski Test

To 2 ml of extract, 2 ml of chloroform and 2 ml of conc. H2SO4 was added. The solution was shaken well. As a result chloroform layer turned red and acid layer showed greenish yellow fluorescence.

E) Test for Saponins

1) Foam Test

To 1ml extract 20 ml distilled water was added and shakes well in measuring cylinder for 15 min. Then 1 cm layer of foam was formed.

Chemical characterization

Thin Layer Chromatography (TLC):

Thin layer chromatography (TLC) was carried out for the qualitative determination of active secondary metabolites in the plant extracts. TLC was performed with standard silica gel 60 F_{254} plates (10 cm x 10 cm) (Merck, Germany). The extracts were applied with the help of a thin capillary in order to concentrate the test sample on plates. The plates were air dried and developed in ascending manner in chromatography twin trough chamber (CAMAG, Switzerland) pre-saturated for 30 min with the respective mobile phase. The plates were developed using different mobile phases of varying compositions to obtain the best resolution. After the development, the plates were observed either under UV light of short wave length (254 nm) or in visible light after derivatization. The mobile phase giving the best resolution in each ethanolic, ethyl acetate and hexane extracts.

Spectrophotomertic analyses:

For UV visible spectroscopy, the TLC crude leaf extracts bands were dissolved in ethyl acetate and scanned between 200 – 800 nm in a single beam scanning spectrophotometer using appropriate control (Shimadzu model 1601, Japan). The FT-IR spectra of the dried TLC better resolved crude leaf extract bands of extracts were recorded between 4000 – 400 cm^{-1} by a FT-IR spectrophotometer (perkin Elmer, Japan) using KBr as a matrix.

RESULTS AND DISCUSSION

Chemical characterization:

The preliminary phytochemical and chromatographic analyses of C. *albidum* Leaf and Stem extracts showed presence of alkaloids, tannins, Flavonoids, saponins and steroids **(Table 1).** In TLC studies, the extracts showed presence of fluorescent bands with R_f values ranging between 0.39-0.59. The TLC Chromatogram of *C. albidum* is shown in **(Figure 1),** of the various mobile phases tried, the best resolution was obtained with toluene: ether (1:1, v/v) saturated with 10% acetic acid in our studies there is no different in the band pattern in thin layer chromatography**.** The chromatogram of ethyl acetate extract showed nearly identical spectra when scanned in the spectrophotometer not shown. The FT-IR spectra of *C. albidum* leaf ethyl acetate extract showed consistent peak obtained from each extracts indicating presence of common identical compounds (Figure- 2).

Table 1: Preliminary phytochemical analysis of the C. *albidum* Leaf and stem extracts.

Name of the test		ETS	EAS	HS	ETL	EAL	HL
1.	**Alkaloids**						
	b) Mayer's Test	+	+	+	-	-	-
	c) Wagner's Test	-	-	+	+	+	+
	d) Hager's Test	-	-	-	+	+	+
2.	**Tannins**						
	a) Ferric chloride Test	+	-	-	+	+	+
	b) Potassium dichromate	+	-	-	+	+	-
	c) Lead acetate	+	-	-	+	+	+
	d) Ninhydrin Test	+	+				
4.	**Flavanoids**						
	a) Shinoda Test	-	+	-	-	+	+
6.	**Steroids**						
	a) Salkowski Test	+	-		+	-	-
7.	**Saponin**						
	a) Froth Test	-	-	-	+	-	+

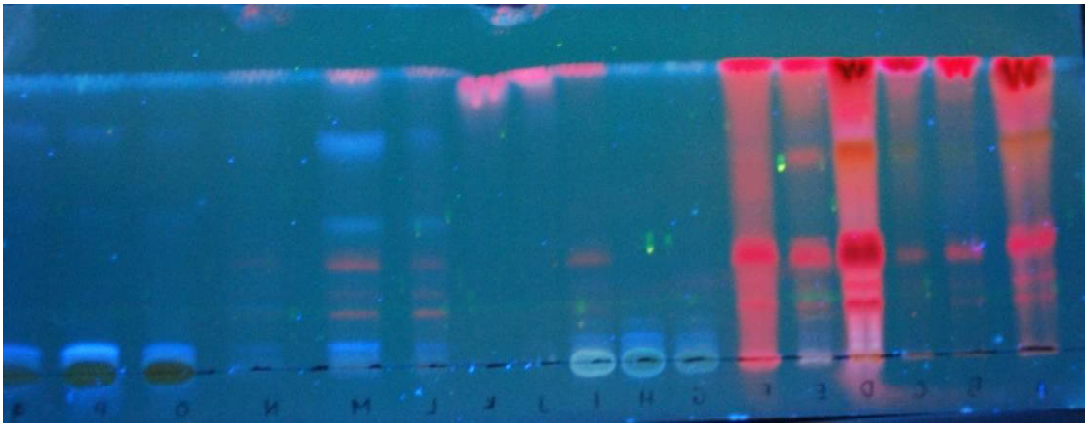

Figure 1: Thin Layer Chromatogram of *C. albidum* stem and Leaf extracts

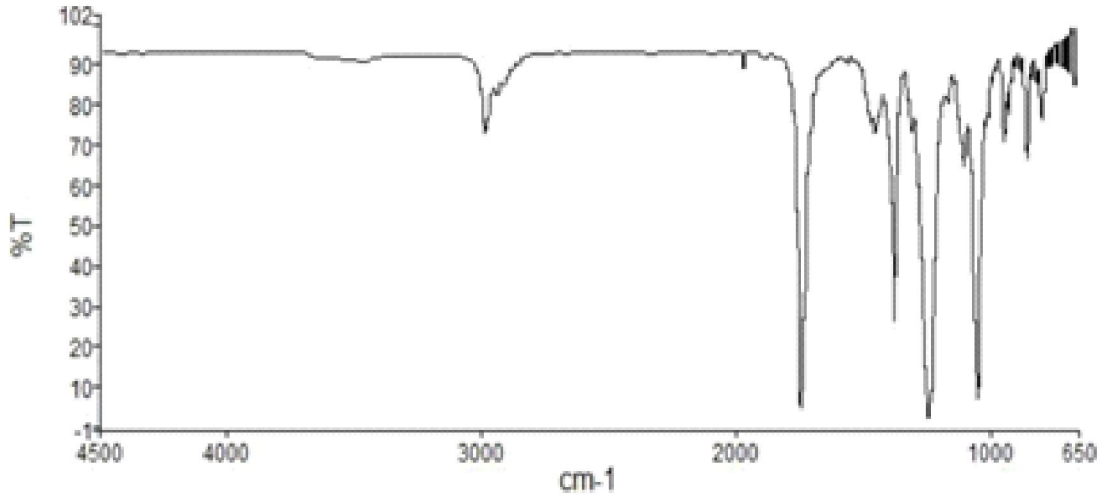

Figure 2: IR analysis of ethyl acetate leaves extract of *C. albidum*

CONCLUSION

The best resolution of bands was obtained in the ethyl acetate Leaves extracts in TLC using toluene: ether (1:1, v/v) saturated with 10% acetic acid in our studies. The presence of active secondary metabolites from *C. albidum* qualitatively determined by using various biochemical tests and TLC, UV, IR. These natural plant origin metabolites can be used in the field of medicines and agriculture.

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