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TWO NEW BLACK MILDEW FUNGI FROM BHIMASHANKAR, MAHARASHTRA, INDIA

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Abstract: **The present paper deals with two new Black Mildew Fungi, namely *Meliola bhimashankarensis sp. nov.* and *Prillieuxina dichapetali sp. nov.* belongs to family Meliolaceae and Asterinaceae, respectively. These Black Mildews occur on the leaves of *Dichapetalum gelonioides* (Roxb.) Engl (Dichapetalaceae), collected from Bhimashankar. The detail morphological description, colour photographs, line drawings and discussions are provided here.**

Keywords: **Bhimashankar Wildlife Sanctuary, Black Mildew, Fungi, Taxonomy.**

Abbreviations: IARI= Indian Agricultural Research Institute; HCIO= Herbarium cryptogammae indiae orientalis.

I. INTRODUCTION

Bhimashankar Wildlife Sanctuary is situated on the boundaries of Thane and Pune Districts in Maharashtra state. It is one of the five wildlife sanctuaries located along the Northern Western Ghats in Maharashtra [11]. The sanctuary spreads on near about 130.78 square kilometer area and covered by evergreen, semi-evergreen, moist deciduous forests along with large no. of plateau vegetation. The sanctuary shows unique environmental conditions such as high altitude, heavy rainfall and specific humidity, which favours the rich floristic diversity and hence it provides more suitable conditions for the growth and development of Black Mildew Fungi.

Black Mildews are black colony forming fungi and they infect mostly leaves, soft stems and petioles. They are obligate, superficial and most probably host specific in nature. They are categorized into different taxonomic groups like Meliolaceous, Asterinaceous, Schiffnerulaceous, and Hyphomycetous fungi [6], [8]. During exploration of black mildews from study area, the *Dichapetalum gelonioides* (Roxb.) Engl found infected with two black mildews. This plant specimen was thoroughly observed, examined and classified under the genus *Meliola* and *Prillieuxina*. Till date, there were two reports of genus *Meliola* on the same plant while the genus *Prillieuxina* was reported on a wide range of angiospermic plants from tropical and subtropical regions [4]; there are 79 epithets of genus *Prillieuxina* have been reported from world, among which 13 different species are reported from India [5].

II. MATERIAL AND METHODS

The leaves and young twigs of *Dichapetalum* was found infected with Black Mildew Fungi, were collected from sanctuary area in winter season (2017-2018) in separate polythene bags. This infected sample was tagged with field number, brought in to laboratory, pressed neatly and dried in between blotting papers and kept in standard size envelops within butter paper for further studies. The host plant was identified and confirmed by referring Flora of Maharashtra [12] and by consulting with angiosperm taxonomist. Type specimens were deposited at Herbarium Cryptogammae Indiae Orientalis (HCIO), IARI, New Delhi (India). For detail taxonomical description, macro-morphological and micro-

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morphological characters were studied well. The morphological structure of fungal colonies was observed with the help of hand lens. In the laboratory, for further examination of micro-morpological characters, mounting and slide preparation technique [10] was used and observed under compound light microscope. For microscopic dimension study, at least 20 measurements were taken; illustrations were prepared with Camera Lucida and photographed under Leica DM 2000 fluroscence microscope equipped with digital camera. The detail taxonomic description, beeli formula for Meliola, colour photographs, line drawings, comparative account and discussion are provided in this paper. The identification and confirmation of fungal species was done by using relevant standard literature [1], [2], [3], [5], [6], [8], [13].

III. RESULTS

Taxonomy:

1. *Meliola bhimashankarensis* Lonkar, Patil & Salunkhe *sp.nov.*

MycoBank MB 825480

Beeli Formula: 3111:4232

Type: India, Maharashtra: Bhimashankar Wildlife Sanctuary, on living leaves of *Dichapetalum gelonioides* (Roxb.) Engl (Dichapetalaceae); 08/01/2018, HCIO 52172.

Etymology: The specific epithet is based on name of the type location (Bhimashankar).

Colonies amphigenous, mostly epiphyllous, thin, circular to spreading, crustose, few, dark black, up to 6 mm in diameter. Hyphae brown to black, substraight, slightly undulate, margin crenate, branching opposite to alternate at wide angles, closely reticulate, forming mat like structure, cells 11–36 × 8–16 µm. Appresoria bicelled, alternate, few unilateral, closely placed, antrorse to spreading, straight, 20–30 × 11–23 µm; stalk cells cylindrical to cuneate, 4–11 × 9–13 µm; head cells oblong, obovate, cylindrical, margin crenate, shallowly lobed, straight, 13–21 × 11–23 µm. Phialides mixed with appresoria, opposite to alternate, conoid to ampulliform, neck long, in most of phialides neck is on lateral side, 20–29 × 9–11 µm. Mycelial setae many, simple, straight, apex acute, up to 449 µm. Perithecia globose, closely aggregated at the centre, up to 227 µm. Ascospores cylindrical to oblong, 4-septate, end cells are rounded, slightly constricted at septa, margin smooth, 39–45 × 16–20 µm.

Habitat and Distribution: Inhabiting living leaves of *Dichapetalum gelonioides* along the stream at Gupt Bhimashankar, Bhimashankar Wildlife Sanctuary, Maharashtra, India.

TABLE I: Comparative account of Meliola dichapetali Hansf. & Thirum; M. scott-elliotii Hansf. & Deight. and M. bhimashankarensis Lonkar, Patil & Salunkhe sp.nov

Sr.No.	Morpho-taxonomic characters	*Meliola dichapetali*	*Meliola scott-elliotii*	*Meliola bhimashankarensis sp.nov.*
1.	Host Plant	*Dichapetalum gelonioides*	*Dichapetalum toxicarium*	*Dichapetalum gelonioides*
2.	Colonies	Epiphyllous, dense, up to 3 mm in diam.	Dense, up to 3 mm in diam.	Amphigenous, mostly epiphyllous, thin up to 6 mm in diam.
3.	Hyphae	Branching opposite, cells 10–20 × 6–8 µm.	Branching opposite, cells 20–30 × 7–9 µm.	Branching opposite to alternate, cells 11–36 × 8–16 µm.
4.	Appresoria	Opposite to alternate, ovate-piriform, slightly bent, 15–20 × 9–13 µm long.	Alternate, 5% opposite, globose to elongate, piriform, bent, 18–28 × 8–14 µm long.	Alternate, unilateral, oblong, obovate, cylindrical, margin crenate, shallowly lobed, straight, 20–30 × 11–23 µm long.
5.	Phialides	13–20 × 7–9 µm.	--------	20–29 × 9–11 µm.
6.	Mycelial setae	Up to 280 µm.	Up to 350 µm.	Up to 449 µm.
7.	Perithecia	Up to 180 µm.	--------	Up to 227 µm.
8.	Ascospores	Cylindric, obtuse, 39–44 × 15–17 µm.	Oblong to subellipsoid, 37–42 × 15–16 µm.	Oblong to cylindric, 39–45 ×16–20 µm.

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2. *Prillieuxina dichapetali* Lonkar, Patil & Salunkhe *sp.nov.*

MycoBank MB 825481

Type: India, Maharashtra: Bhimashankar Wildlife Sanctuary, on living leaves of *Dichapetalum gelonioides* (Roxb.) Engl (Dichapetalaceae), 08/01/2018, HCIO 52168.

Etymology: The specific epithet is based on name of the host genus.

Colonies amphigenous, often hyphophyllous, thin, very few, circular to spreading, crustose, black, up to 7 mm in diameter. Hyphae brown, thin, substraight to crooked, branching irregular at acute to wide angles, loosely to closely reticulate, cells 9–29 × 4–7 µm. Appresoria and setae absent. Thyriothecia many, orbicular, closely aggregated, scattered over the colony, stellately dehisced at the centre or cut off central portion, orbicular when single & slightly irregular when attached with other thyriothecia, margin fimbriate, fringed hyphae flexuous, exappresoriate, up to 245 µm in diameter. Asci few, globose, octosporous. Up to 47 µm. Ascospores oblong, elliptic, uniseptate, constricted at septum, smooth to tuberculated, 27–34 × 13–16 µm.

Habitat and Distribution: Inhabiting living leaves of *Dichapetalum gelonioides* (Roxb.) Engl along the stream at Gupt Bhimashankar, Bhimashankar Wildlife Sanctuary, Maharashtra, India.

TABLE II: Comparative account of present taxon with *Asterina dichapetali* & *Prillieuxina* on family Rutaceae.

Sr. No.	Morpho-taxonomic characters	*Asterina dichapetali*	*Prillieuxina citricola*	*Prillieuxina aeglicola*	*Prillieuxina dichapetali sp. nov.*
01.	Host Plant	*Dichapetalum gelonioides*	*Citrus aurantifolia*	*Aegle marmelos*	*Dichapetalum gelonioides*
02.	Colonies	Epiphyllous, up to 5 mm in diam.	Epiphyllous	Epiphyllous to hypophyllous, up to 4 mm in diam.	Amphigenous, up to 7 mm in diam.
03.	Hyphae cells	15–20 × 4–5 µm	6–11 × 2.75–4.5 µm	5.5–10 × 2.75–6.05 µm	9–29 × 4–7 µm
04.	Appresoria	Present	Absent	Absent	Absent
05.	Thyriothecia	Up to 130 µm	Up to 143 µm	Up to 114 µm	Up to 245 µm
06.	Asci	20-30 µm	Up to 30.8 µm	Up to 22 µm	Up to 47 µm
07.	Ascospores	20–24 × 10–12 µm	11–16.5 × 4.4–6.05 µm	7.7–15.4 × 3.3–7 µm	27–34 ×13–16 µm

IV. CONCLUSION

Meliola dichapetali Hansf. & Thirum. from India and *Meliola scott-elliotii* Hansf. & Deight from Sierra Leone are reported on genus *Dichapetalum* [6], [7]. However, the new species differs from the related species described on *Dichapetalum* (Table 1) in having larger colony size, hyphal cells, appresoria, phialides and perithecia. Also, it differs from earlier described species in having crenate margin of hyphal cells and appresoria. The appresoria are obovate, oblong, shallowly lobed and straight in this species. Therefore, present species is treated as new to science. The genus *Prillieuxina* is reported for the first time on *Dichapetalum* (Dichapetalaceae) and treated as new species to science.

ACKNOWLEDGEMENTS

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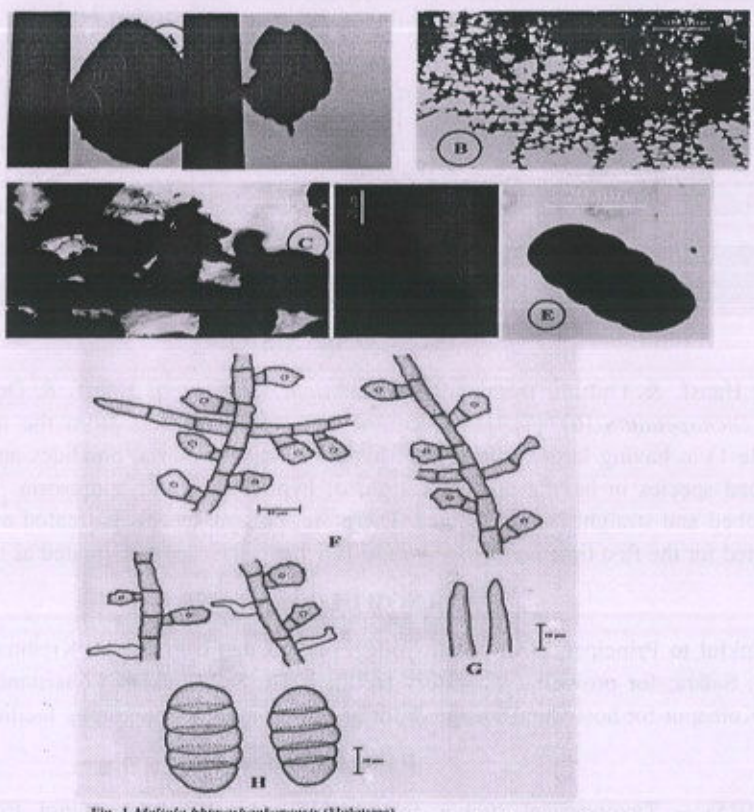

Fig. 1 *Meliola bhimashankarensis* (Holotype)
A. Infected leaves; B. Mycelial colony with thyriothecia; C,F. Mycelium with appressoria and phialides; D,G. Apex of mycelial setae; E, H. Ascospores.

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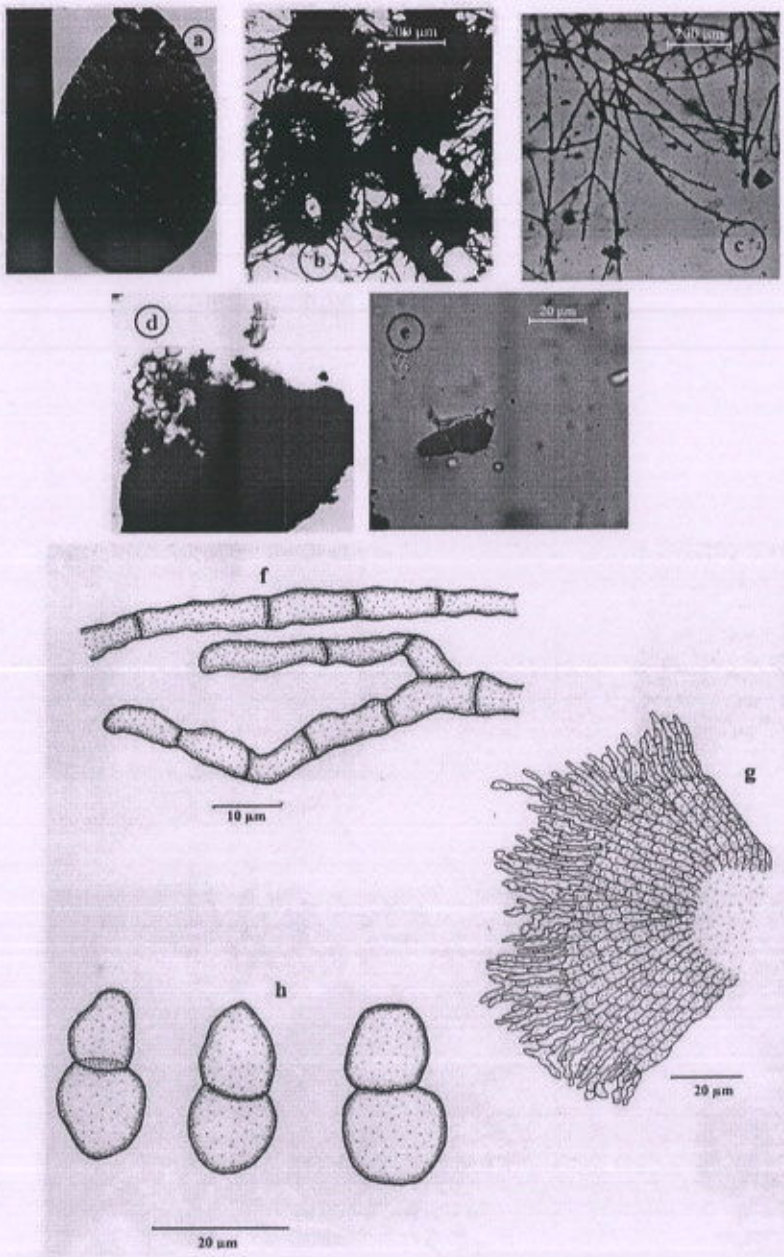

Fig. 2 *Prillieuxina dichapetali* (Holotype)
a. Infected leaf, b. Mycelium with thyriothecia; c, f. Mycelium; g. Part of thyriothecium; d,e,h. Ascospores.

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Effect of Biofertilizers on seed germination of Maize (*Zea mays* L.) varieties Eco-92 and African tall

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Abstract :

An attempt has been made of study the effect of biofertilizers (Azotobacter and Phosphate Solubilizing Bacteria) on the seed germination of Maize (Zea mays L.) varieties Eco-92 and African tall. The biofertilizers were applied in concentration of [100gm each packet per 10Kg of seeds].Seed and Filter paper treatments were used in the experiments, completed with autoclaves biofertilizers treatment. The seed and filter paper treatment of biofertilizers were applied to seeds of Eco-92 and African tall. It is revealed from the experiment that, there is considerable enhancement of seed germination and also in length of root and shoot of Eco-92 as compared to control. These biofertilizers treatments are found to be stimulate the seed germination and growth performance of root and shoot.

Keywords– Biofertilizers, Maize seed, filter paper, germination

Introduction:

Maize originated from Mexico .Maize is one of the three most important cereal crops in the world. Every part of the maize plant has economic value and cob can all be used to produce a large variety of food and non-food production (IITA 2006).It is cultivated on over 13% of world's croplands (Leff *et al*,2004). Seed germination is a basic growing skill that involves causing a seed to sprout. It is the process of reactivation of metabolic machinery of the seed resulting in the emergence of radical and plumule .Various sources of biofertlilizer include nitrogen fixers, Phosphate solubilizing bacteria, plant growth promoting rhizobacteria (shekh,2006) Application of biofertlilizer became a great necessity to get a yield of high quality and to avoid the environmental pollution(Shevananda,2008).

Though nitrogen and phosphorous are essential nutrient for plant growth and development in corn, biofertilizers are able to fix atmospheric nitrogen in the available form of plants (Chen, J.2006). Positive response to maize to nitrogen fertilizer has been reported by (Aflakpui *et al*). Biofertlilizer contain micro-organism, that increases or promotes the important nutrients crucial for overall production the soil (Karthick *et al* 2014) .In maize application nitrogen and phosphate biofertlizer increased yield components of maize (Beyranvanv and *et al* 2013) .It has been revealed that ,the effect of nitrogen fixation induced by nitrogen fixers is not only significant for legumes, but also non-legumes (Doebereiner and Pedrosa, 1987).One of the ways to improve germination is' to use seed priming'. A major aim of seed priming is to partially hydrate the seed to a point where germination process starts but does not end. Several ways to seed priming exists, such as hydro priming, solid matrix priming and biopriming (Ashraf, M. *et al* 2005). Various priming treatments have been developed to increase the seed and synchrony of seed germination.

Material and Methods –

In present study the healthy seeds of Maize (*Zea mays* L.) variety Eco-92 and African tall, procuved from Eco Agriseeds pvt.Ltd.Hyderabad and Biofertilizers *Azotobacter* and phosphate solubilizing bacteria respectively from Mahatma Phule krishi vidyapeeth, Rahuri. In these experiments direct seed treatment method was used. Germination was tested in Petri dish. Filter

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paper was applied as germination medium. Distilled water was used in the case of control and triplets are used to treat sets with biofertilizers .The seeds were sterilized by 0.1% $HgCl_2$ for 5 second and washed several times with sterilized distilled water. Direct seed treatment was applied to inoculate or slurry coated to seeds with different biofertlizer concentration using (TA_1) (TA_2) (TA_3), (TP_1) (TP_2) (TP_3) respectively and stored at room temperature for 24 hours before the experiment started. Distilled water was used for all control sets. (Table no.1)

Germination test were conducted in 3 replicates of 10 seeds in 9 cm sterilized petridishes. They were incubated at 20^0c for 7 days .In each petridish 10 seeds were placed. In all treatments, seed were coated with solution of biofertlilizer, with different concentrations. After treatment seed were placed in each petridish under dark condition. In order to calculate germination rate, from the second day of germination. Every day the numbers of germinated seeds were counted. Germination was defined as at least 5mm of radical emergence. Traits measured including germination percentage, root length, shoot length, seedling length and vigor index .Root and shoot length of individual seedling was measured to determine vigor index= (Mean root length +mean shoot length) x % of germination (Baki and Anderson, 1973). The statistical analysis was carried out accordingly, for the means compared and the seed germination; and seedling growth analyzed by analysis of variance (ANOVA) and Duncan's Multiple Range Test (DMRT) used to determine the level of significance at $p \leq 0.05$ with SPSS excel software .

Table1.1 showing method of direct seed treatment:

		(Eco -92 and African tall)
Direct seed treatment	1.	Control (H_2O)
	2.	(TA_1)*Azotobacter* biofertilizer in the concentration 0.5gm+0.75ml D.W.
	3	(TA_2) *Azotobacter* biofertilizer in the concentration 1.0gm+1.5ml D.W.
	4	(TA_3), *Azotobacter* biofertilizer in the concentration 1.5gm+2.25ml D.W.
	5	(TP_1) *PSB* biofertilizer in the concentration 0.5gm+0.75ml D.W.
	6	(TP_2) *PSB* biofertilizer in the concentration 1.0gm+1.5ml D.W.
	7	(TP_3) *PSB* biofertilizer in the concentration 1.5gm+1.5ml D.W.
	8.	($TA+TP_1$) *Azotobacter* biofertilizer in the concentration 0.5gm+0.75ml D.W.+ *PSB* biofertilizer in the concentration 0.5gm+0.75ml D.W.
	9.	($TA+TP_2$) *Azotobacter* biofertilizer in the concentration 1.0gm+1.5ml D.W.+ *PSB* biofertilizer in the concentration 1.0gm+1.5ml D.W.
	10.	($TA+TP_3$) *Azotobacter* biofertilizer in the concentration 1.5gm+2.25ml D.W.+ *PSB* biofertilizer in the concentration 1.5gm+1.5ml D.W.

Table 2: Effect of Biofertilizers on seed germination, Root, Shoot and seedling length and Root /Shoot ratio of Maize (Zea mays L.) Variety Eco 92

Eco.92 Treatments	GERM.S	GERM.P	RL	SL	SDL	VI
Control	8.67b	86.67b	8.57f	11.60f	20.17f	1748.00f
0.5(TA_1)	9.67a	96.67a	12.53c	16.13a	28.67b	2774.67a

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1.0(TA_2)	9.67a	96.67a	14.27a	17.37a	31.63a	3066.33a
1.5(TA_3)	9.67a	96.67a	12.27c	14.87c	27.13c	2619.67b
0.5(TP_1)	9.33a	93.33a	10.40e	12.40e	20.80e	2131.00e
1.0(TP_2)	9.33a	93.33a	13.00b	14.80c	27.80c	2596.00b
1.5(TP_3)	8.67b	86.67b	11.47d	13.20d	24.67d	2136.67d
1.0(TA+TP_1)	9.67a	96.67a	13.67a	16.63a	30.30a	2929.33a
2.0(TA+TP_2)	9.67a	96.67a	14.17a	15.70b	29.87a	2887.67a
3.0(TA+TP_3)	9.67a	96.67a	14.57a	17.07a	31.63a	3059.00a
Df	29	29	29	29	29	29
F	0.211	0.211	0.00	0.00	0.00	0.00

Different letters (a-e) followed values in same column indicate significant difference in Means ofat ($p \leq 0.05$)

Table 3: Effect of Biofertilizers on seed germination, Root, Shoot and seedling length and Root /Shoot ratio of Maize (Zea mays L.) Variety African tall

African tall Treatments	GERM.S	GERM.P	RL	SL	SDL	VI
Control	8.33c	83.33c	9.17f	11.80f	20.97f	1745.67f
0.5(TA_1)	9.67a	97.67a	13.03b	14.67c	27.70b	2681.33b
1.0(TA_2)	9.67a	97.67a	13.00b	15.33b	28.33b	2745.67a
1.5(TA_3)	9.67a	97.67a	12.03d	14.83c	26.87d	2600.67b
0.5(TP_1)	9.33a	93.33b	11.00e	12.83e	23.83e	2229.00d
1.0(TP_2)	9.00b	90.00b	13.53a	13.67d	27.20c	2455.33c
1.5(TP_3)	8.33c	83.33c	12.27c	13.83d	26.10d	2180.67e
1.0(TA+TP_1)	8.33c	83.33c	13.73a	16.17a	29.90a	2497.33c
2.0(TA+TP_2)	9.67a	97.67a	14.67a	16.20a	30.87a	2986.00a
3.0(TA+TP_3)	9.67a	97.67a	14.73a	16.13a	30.87a	2984.33a
Df	29	29	29	29	29	29
F	0.025	0.025	0.00	0.00	0.00	0.00

Different letters (a-e) followed values in same column indicate significant difference in Means ofat ($p \leq 0.05$)

Result and Discussion

The congruent seed emergence and the intensity of germination determine the performance of crops and Maize seed germination. Table .2 and 3 revealed that the significant [illegible] were

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observed among the treatments on 24hrs to 120hrs. because the biofertilizers treatment increased the number of the germination of seed in the case of direct seed treatment. The treatments of biofertilizers enhance the germination more intensive in first two days. The contribution of Eco 92 and African Tall show increased seed germination percentage, root and shoot length, significantly after the application of *Azotobacter* and *Phosphate Solubilizing Bacteria* as compared to control. Analysis of variance showed that, there was significant increase in height of seedlings, root length, shoot length on the application of the biofertilizer. The result suggests that, biofertilizer enhances the growth of Maize variety Eco-92 and African tall and such biofertilizer its usage should be encouraged because of it is ecofriendly.The findings of this study have clearly showed that, combined application of *Azotobacter* and *Phosphate Solubilizing Bacteria* along with recommended dose has resulted in highest seedling length.

Seed Germination: Seed inoculation significantly enhanced seed germination %, seedling length and vigour index of Maize variety Eco 92and African Tall .However, the rate of enhancement varied with treatment of biofertilizers. Seeds were treated with *Azotobacter* [(TA_1), (TA_2),(TA_3)] and combination of *Azotobacter* and PSB [($TA+TP_1$),($TA+TP_2$),($TA+TP_3$)] increased seed germination over control.

Seedling Length: The effect of all treatments on seed germination, seedling height was significant. The comparison of the mean values of the seedling height showed that, among the treatment of *Azotobacter* and combination of biofertilizers Azotobacter and PSB treatments has the highest seedling height and control lowest seedling height .

Vigor Index: The vigour index (VI) of the seedlings can be estimated as suggested by (Abdul-Baki and Anderson in 1973) method using formula- VI=RL+SL X GP (where RL is root length (cm), SL is Shoot length (cm) and GP is germination percentage). The highest vigour index in Eco 92 was obtained from (TA_1),($TA+TP_1$),($TA+TP_2$)),($TA+TP_3$) and in African Tall (TA_2),($TA+TP_2$), ($TA+TP_3$) respectively.

Conclusion:

Based on the results of these experiments it is concluded that biofertilizer enhance the germination more effective. Thus significantly increasing the number of the germination of seed as compared to the control in case of the direct seed treatment. The biofertilizer treatment influenced the Maize variety Eco-92 and African tall positively

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Mass Spectral Analysis (GCMS) of Various Volatile Bioactive Compounds in Thompson Seedless Raisins Gas Chromatography and Mass Spectrometry

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Introduction: -

Grape (*Vitis sp.*) belonging to Family Vitaceae is a commercially important fruit crop of India. Grapes are eaten as raw or they can be used for making wine, raisins, jam, and jelly, which are very nutritious and rich source of minerals like potassium, phosphorus, calcium, magnesium, other micronutrients and different vitamins. The dried grapes, commonly known as raisins, have a great importance in economy of the country and considered as one of the nutritious most popular dry fruits in the world. Raisins are dried fruits of certain varieties of grapevines with a high content of sugar and solid flash (Khair and Shah, 2005). The important raisin grape varieties are Thompson seedless and their selections like Tas-A-Ganesh, Sonaka and Manikchaman. The increased production of table grapes has a great potential to produce raisins with minimum losses of fresh fruits (Telis *et al*., 2004). According to FAO data, grape production all over the world is about 62,348 million tons (WHO and FAO, 2003). According to De Candolle (1886), the cultivation of grape goes back to 4000 BC in Egypt and the oldest wine was found in Armenia near the Caspian Sea in Russia. As per the report of Parker *et al.* (2007), the Thompson seedless grapes, were first introduced in 1876, accounted for 95% of the California crop used for golden raisin production. Thapar (1960) indicated that grape was introduced in India in 1300AD by the Persian invaders in North and South India (Daulatabad in Aurangabad districts of Maharashtra) during the historic event of changing the capital from Delhi to Daulatabad by King Mohammed-bin-Tughlak and in South India districts Salem and Madurai by the Christian missionaries around 1832 A. D. From Daulatabad grape cultivation was spread to Hyderabad in Deccan during the Nizam's period. Nizam of Hyderabad has also introduced some grape varieties into Hyderabad from Persia in the early 20th century (Chadha and Shikhamany, 1999). There are two subgenera viz *Euvitis* and *Muscadania*. All commercially important varieties of grape belong to sub genus *Euvitis*, referred as true grape. The total average cultivation of grape is near about 80,000 hectares in India and 28,000 hectares in Maharashtra. The total yield in India is about 15 to 18 lakh tons and in Maharashtra, it is about 7 to 9 lakh tons. Out of this annual production, 76% is used as table grapes, 0.3% in wine industry, 3. 70% exported to Middle East and European countries as table fruit and 20% used for preparation of raisin. Recently, grape cultivation is increased more in Maharashtra and the major growing districts are Nasik, Sangli, Sholapur, Ahmednagar, Pune and Osmanabad. Near about 80 % of grape production comes from Maharashtra followed by that from Karnataka and Tamil-Nadu. The commercial production of grapes started in India only after seedless varieties were introduced in Maharashtra during the 1960s. Maharashtra accounts for 70 percent of India's total grape acreage and 63 percent of production. Varieties grown include Thompson, Sonaka, Sharad and Tas-A-Ganesh Seedless. Harvesting of grapes starts from early February to early April. Within Maharashtra, the grape crop comprises 12 percent of the total fruit acreage, with 42,500 acres. Sangli, Sholapur, Pune and Ahmednagar are the other locations, with more than 2,500 acres each under grape cultivation. Due to the higher water content, these fruits dry only

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disintegrate and are spoiled. Hence dehydration of such fruits is urgent need to avoid the spoilage. Grape is an important source of carbohydrates, minerals and vitamins but due to its low shelf life it is very difficult to fulfill the needs of the society. The preparation of raisin was started long back, and known as "Manuka" (simply drying the grapes in open sunlight). Then after introduction of mutant Thomson seedless variety many grape growers turned to prepare yellowish Golden raisin and from last fifteen years many of grape growers from Sangli district are diverted towards the preparation of green raisin at Junoni [Sholapur] and nearby areas which has a good market potential in Delhi, Kanpur and other cosmopolitan cities. Nasik, Sangli and Sholapur are the leading grape producing districts of Maharashtra. The most of these regions are drought prone. So the area under grape cultivation is increasing day by day, which will create a problem of marketing of table grape. During last 19 to 20 years due to increase in yield, expanding area under cultivation and fluctuation in the market price the farmers are slowly turning towards raisin production. Hence, an attempt has been made to study some aspects of post - harvest physiology in relation to production of raisin in two verities of grape, Thompson and Sonaka seedless growing in Sangli district.

Material And Methods

Analysis of Bioactive Compounds (GCMS)

The methods described by Anwar *et al*. (2006) and Sultana *et al*. (2008) with slight modifications were employed for the preparation of methanolic extracts. 0.5 grams of oven dried powdered raisins subjected to different chemical treatments of two varieties Thompson seedless were taken in a 250 ml flask and mixed thoroughly with 10 ml of 100 % methanol (HPLC grade). Methanolic extracts were obtained in an electric shaker (Remi Rotary Shaker, Mumbai, India) for 48 hours in ambient conditions (shaking intensity 120 rpm). The extracts were then filtered using Whatman No. 1 filter paper. The residues obtained after the filtration were subjected to re-extraction twice with the fresh methanol and these extracts were added to previous extracts. The crude extracts so obtained were concentrated to dryness on water bath in pre weighed evaporating dishes at 45˚C. After complete drying of the extracts evaporating dishes were again weighed for determination of the yield and stored in a refrigerator (-4˚C), until used for further analysis. From the dried powder, known quantity was dissolved in methanol to prepare stock solution for further use in GCMS analysis. These methanolic extracts were subjected to Gas Chromatography and Mass Spectrometry for the determination volatile metabolites.

GC-MS analysis of the samples was carried out using Shimadzu Make QP- 2010 with non polar 60 M RTX 5MS Column. Helium was used as the carrier gas and the temperature programming was set with initial oven temperature at 40°C and held for 3 min and the final temperature of the oven was 480°C with rate at 10˚C. 2 µL sample was injected with split less mode. Mass spectra were recorded over 35-650 amu range with electron impact ionization energy 70 eV. The total running time for a sample was 45 min. The chemical components from the methanolic extracts of raisins were identified by comparing the retention times of chromatographic peaks using Quadra pole detector with NIST Library to relative retention indices. Quantitative determinations were made by relating respective peak areas to TIC areas from the GC-MS.

Result And Disscussion

Analysis of Bioactive Compounds (GCMS)

The mass spectral analysis of various volatile bioactive compounds in Thompson seedless raisins is shown in GC spectra Plates 11 to 15 and mass fragments in Table 4. It is observed from the table that raisins of variety are rich in various bioactive volatile compounds. Among these compounds some represents to class of Acids, Aldehydes, Alcohols, Ketone, Alkane and Alkene. The major compound reported from the seedless untreated raisins are 2-Furancarboxaldehyde, Octacosane, Decosane, 1H-Indol-

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4-one, 2, 3 dihydro-3,5 dihydoxy- 6 methyl, 1,2- Benzene dicarboxylic acid, Octane, n- Hexadecanoic acid, Heptadecane and Dibutyl phthalate. The raisins treated with K_2CO_3 and Sulphur fumigated shows the presences of 4 H-Pyran-4-one,2,3 dihydroxy -3, 5 dyhydroxy-6-methyl, Dibutyl phthalate, 1,2,3-Propanetriol, mono acetate, 2- Hexanone, 3-methyl-4-methylene, n-Hexdecanoic acid and Octadecanoic acid.

While the Thompson seedless treated with K_2CO_3, Sulphur fumigated and Zein protein coating exhibits 9,12-Octadecadienoic acid, methyl ester, Dibutyl phthalate, Hexadecanoic acid, methyl ester and Octadecenoic acid, methyl ester. Whereas Thompson seedless raisins K_2CO_3, Sulphur fumigated and Zein protein coating with mango essence displays the 8 compounds are 2-Furancarboxaldehyde-5-(hydroxymethyl)-, 2-Propen-1-one,1,3 diphenyl-, (E), 9,12-Octadecadienoic acid, methyl ester, n-Hexdecanoic acid, 9,11-Octadecadienoic acid, methyl ester, Dibutyl phthalate, Octadecanoic acid, 2-(2-hydroxyethoxy) ethyl ester and Hexadecanoic acid, methyl ester. The orange essence coated raisin shows ten volatile bioactive compounds are Xanthosine, 2-Furancarboxaldehyde, 5-(hydroxymethyl)-, 4H-Pyran-4-one,2,3-dihydroxy-3,5-hidroxy-6-methyl, Cyclobutylamine, 1,2-Benzenedia carboxylic,acid, butyl 2-ethylhexyl ester, 7-octen-2-01,2-methyl-6-methylene, Octacosane, Benzyl alcohol, Formic acid, 1-methylethyl ester and Octane, 2,3,3-trimethyl-.

Volatile monoterpenes shows a greater diversity of compounds. Volatiles have diverse structures and arise from the activities of several biochemical pathways. Many plants emit substantial amounts of phytogenic volatile organic compounds (PVOSs). The most common volatiles include C6 volatiles (lipoxygenase/hydroperoxide lyase-dependent pathways), indole and MeSA (the shikimic acid/tryptophane pathway), cyclic and acyclic terpenoids (isoprenoid pathway), and oximes and nitriles (derived from amino acids) (Dicke, 1999). Hanus *et al.,* (2006) reported more than hundreds volatile compounds from the fruits of *Mandragora autumnalis*, which belongs to n-alkanes, branched-chain alkane, cycloxanes, alkenes, , alcohols, aldehydes, six ketones, heterocyclic compounds, thio compounds, benzene hy-drocarbons, phenols, carboxylic acids and esters of carboxylic acids.

According to Ribereau-Gayon (2000), the grape fruit skin volatile compounds terpenes, C13-norisoprenoids, benzene derivatives, and aliphatic alcohols) are the main contributor to the fresh and fruity aroma to grape products Aromatic compounds are one of the most important constituent in governing the quality of grape-derived products. And play a key role affecting the quality of its products. Concentration of these volatile compounds varies according to the grape variety, cultural practices, and climatic or biological factors (Jackson and Lombard, 1993, CSIRO and Australian Bureau of Meteorology; 2012). Sixteen compounds were identified by Sanchez-Palomo *et al.* (2005) in pulp and skins of Muscat grapes including C6-alcohols and aldehydes, terpenes and benzenic compounds. Which (Linalool, geraniol, and nerol) are responsible for the typical floral aroma of Muscat grapes and contribute to the aroma of their wines. The distribution of volatile compounds can be used for the characterisation of grape varieties and considered as important constituent of grape and wine aroma substance (Ribereau-Gayon, 2000). Genova (2012) observed that the various classes of aromatic compounds contribute to the flavor profile of grapes and grape-based products with alcohols and esters along with carbonyl compounds, terpens, organics acids, and norisoprenoids. They concluded that alcohols and aldehyde were the most represented classes, followed by terpenoids benzoic derivatives and C-13 norisoprenoids. Which are derived from carotenoids and found to be determinant in giving its characteristic flowery aroma.

The biological activity of volatile compounds is dependent on the synergistic or additive effects of the constituent types present at different concentrations. Volatile compounds from aromatic plants can cause a number of positive or negative interactions (Vokou *et al.*,2003) Like isoprene, some monoterpenes and sesquiterpenes have the potential to combine with various reactive oxygen species

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(Bonn and Moortgat, 2003), and can protect against internal oxidative damage (Loreto *et al.*,2004). Kubo and Kubo (1995) studied the antimicrobial activity of the constituents (E) 2-Heprenal; (E) 2-octenal; (E) 2-nonenal; (E) 2-decenal; (E) 2-undecenal; (E) (E) 2, 4-decadienal; 3-methyl-2-butenal; hexanoic acid; octanoic acid; hexanal) from the dried flowers of a Brazilian medicinal plant, *Tanaatum balsamita against Bacillus subtilis, Brevibacterium ammoniagenes, Staphylococcus aureus, Staphylococcus mutans, Propionibacterium acnes, Pseudomonas aeruginosa, Enterobactor aerogenes, Escherichia coli, Proteus vulgaris, Pitorosporum ovale; penicillium chrysogenum and Trichophyton mentagrophyte*. Hexanal is viewed as indicator of oxidative state in a number of foodstuffs (Sanches-Silva *et al.*, 2004). Hexanal odour activated hypothalamic nuclei, which control maternal and emotional behavior (Hamaguchi-Hamada *et al.*, 2004). Hence, the presence of some of the important bioactive volatile compounds in the raisins of Thompson seedless variety will certainly prove the use of dry fruits for the preparation of various antimicrobial products and designing of drug against various microbial pathogenic diseases.

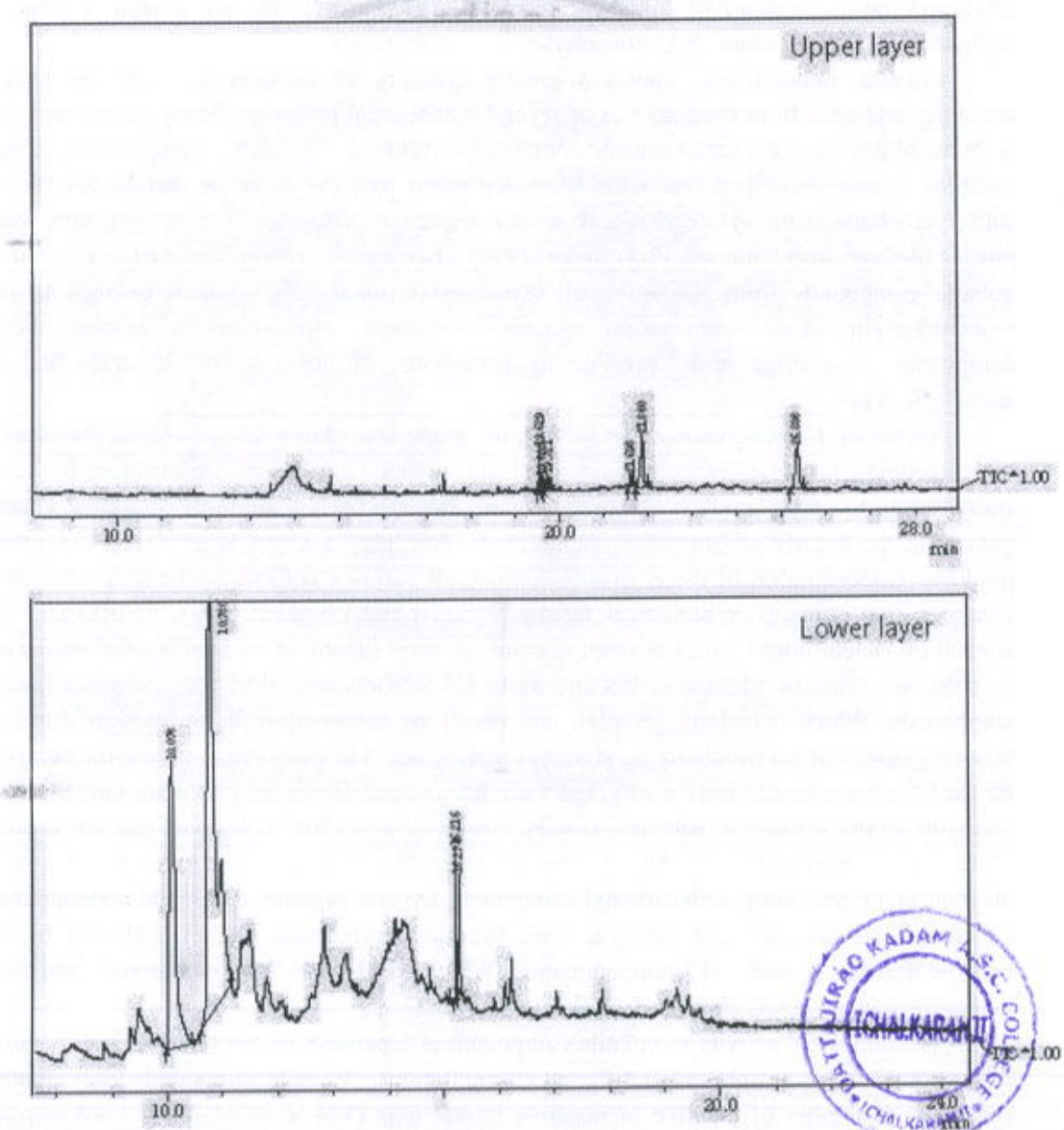

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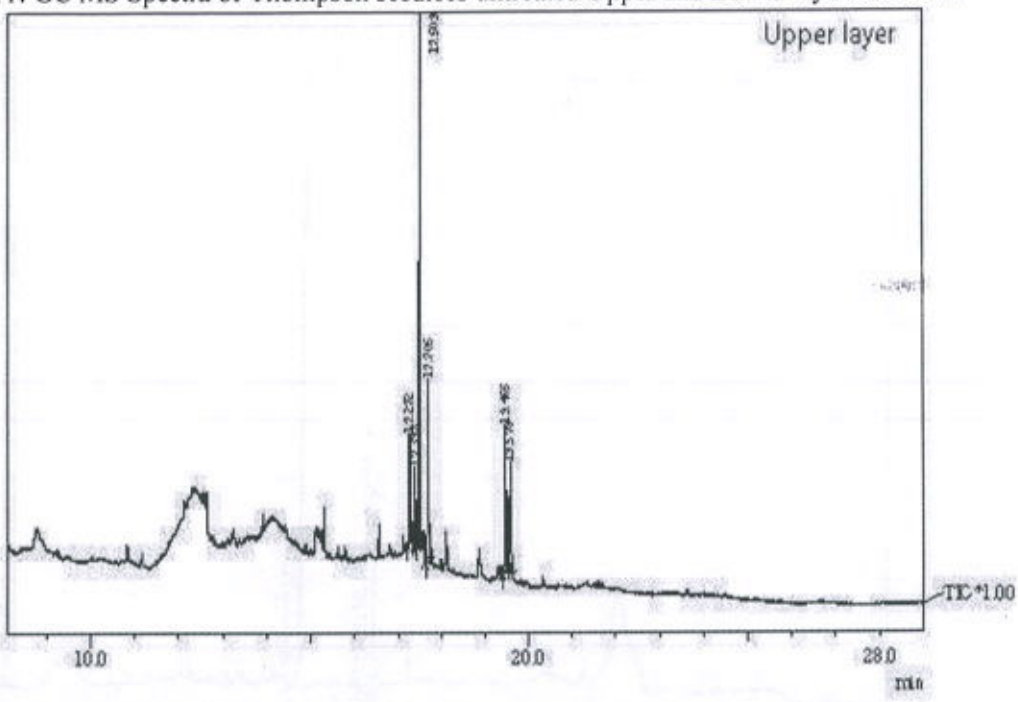
Plate 11: GC MS Spectra of Thompson seedlees untreated Upper and Lower layers of raisin



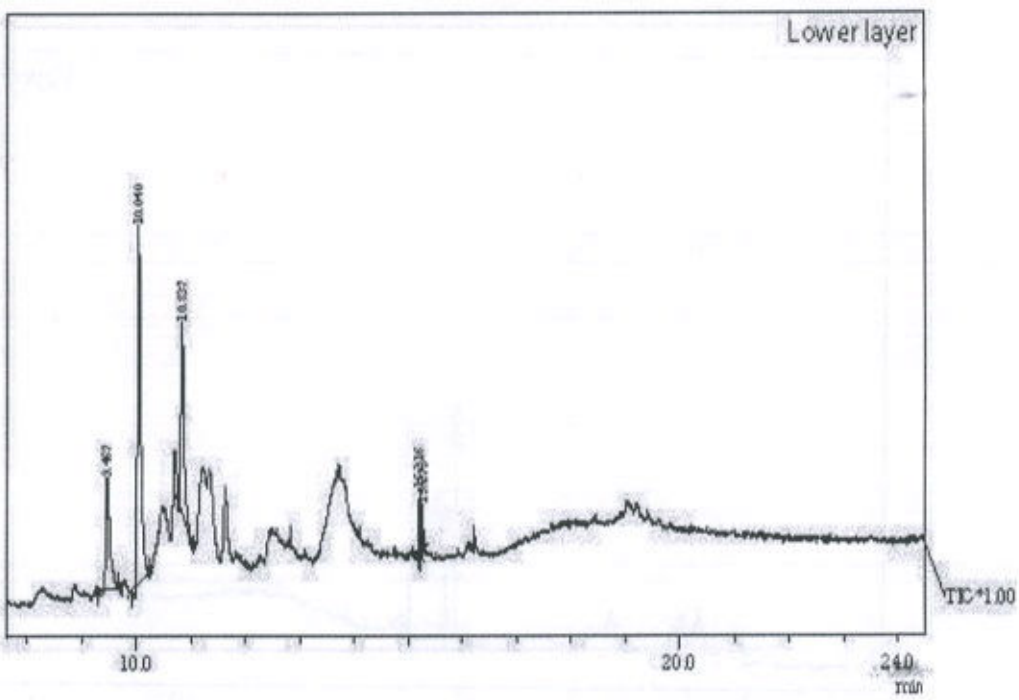


Plate 12: GC MS Spectra of Thompson seedlees treated with sulphur of Upper and Lower layers raisin

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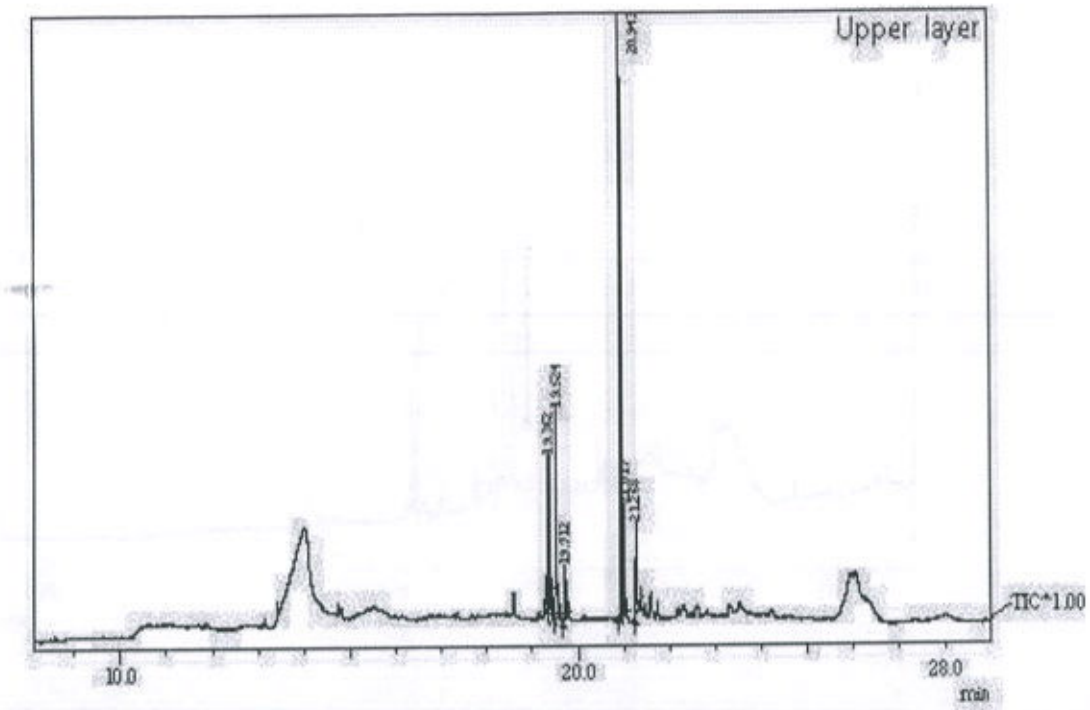

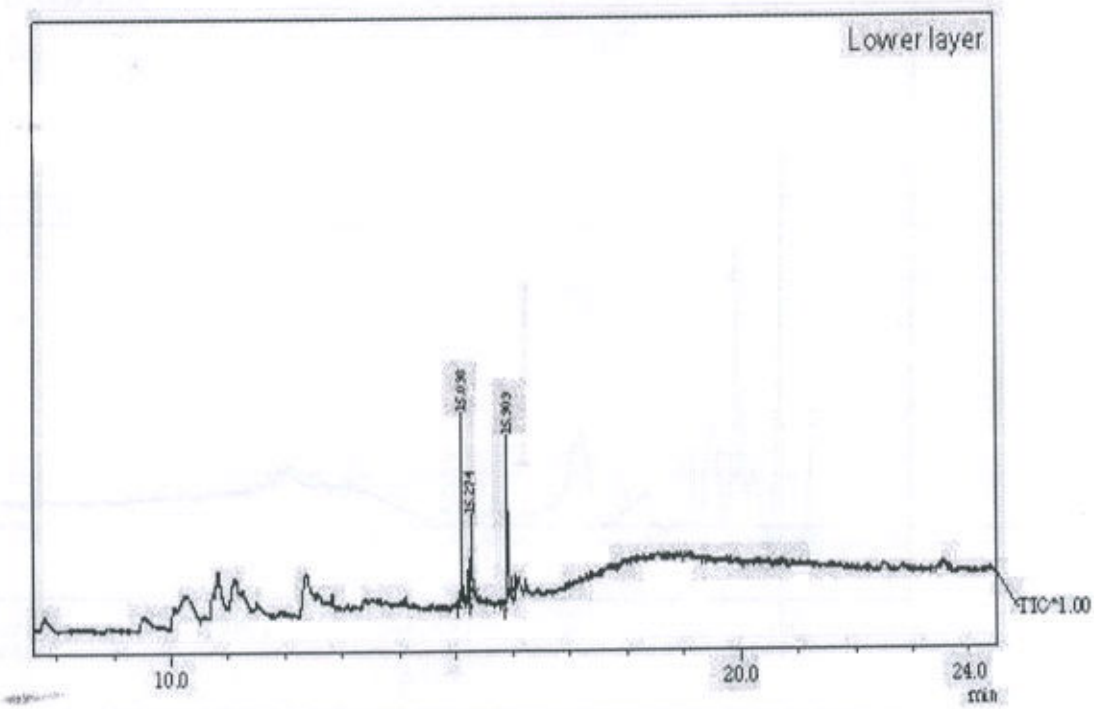

Plate 13: GC-MS Spectra of Thompson seedless treated with K_2CO_3, sulphure fumigated and coated of raisins.

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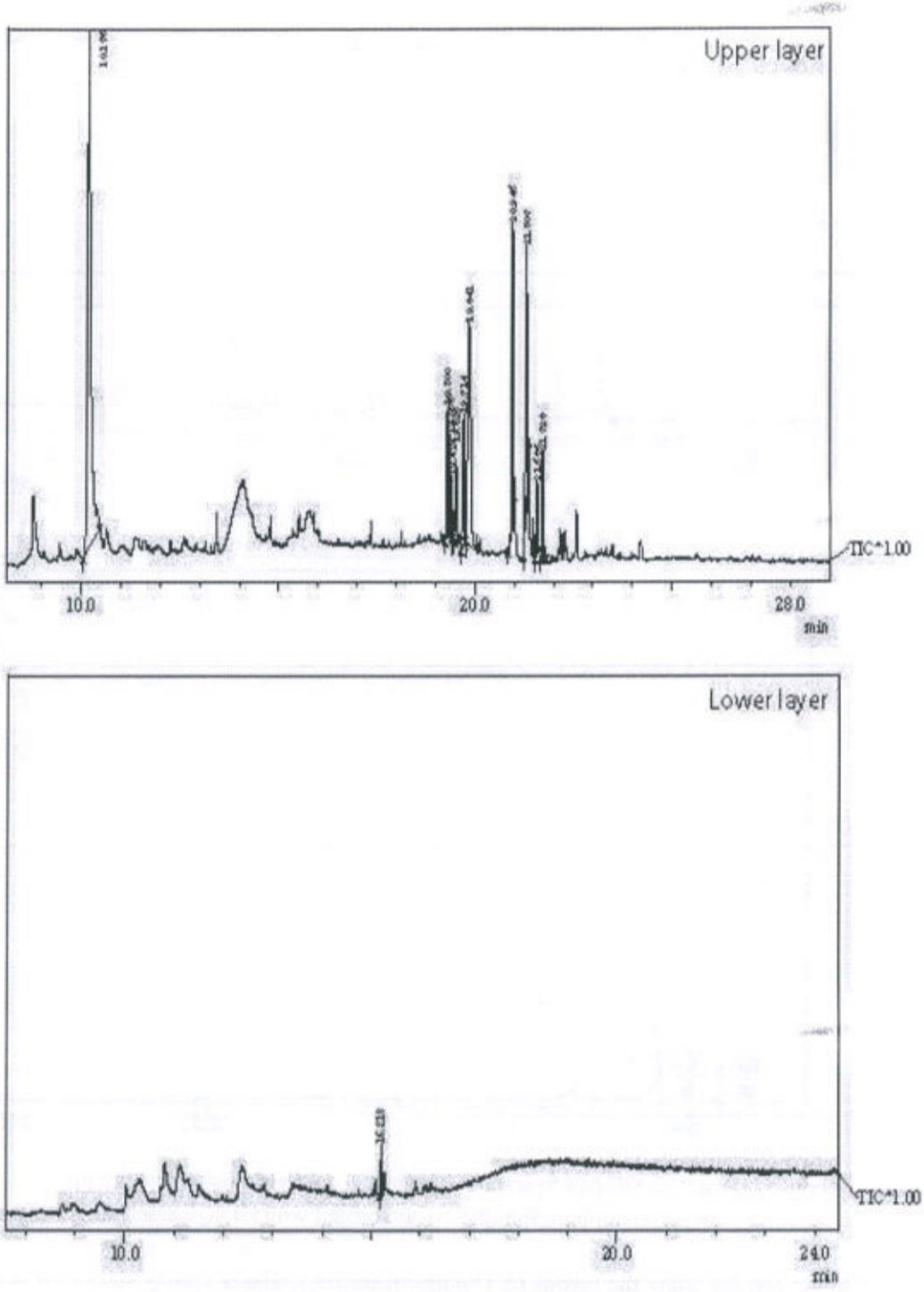

Plate 14: GC MS Spectra of Thompson seedless raisin treated with K_2CO_3+sulphure fumigation and coated with mango essence

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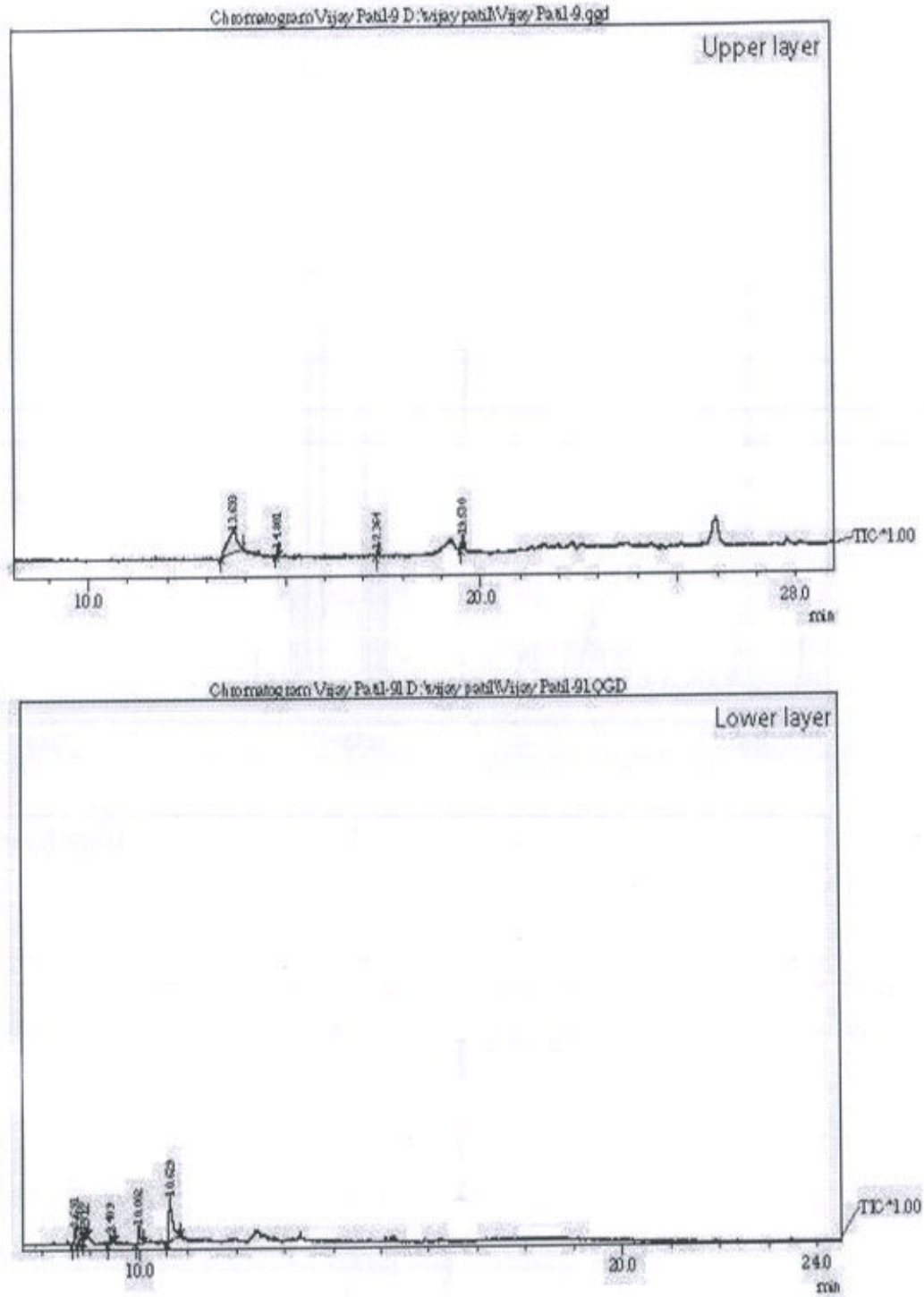

Plate 15: GC MS Spectra of Thompson seedless raisin treated with K_2Co_3+sulphure fumigation and coated with Orange essence.

In the present study the raisins of Thompson seedless raisins variety shows the accumulation of new volatile bioactive compounds such as (2(3H) Furanone, 5-hexidihydro, 2-Butanol,3,3-oxybis, 4H-Pyran-4-one,2-ethyl-3-hydroxy, 9,12-Octadecadienoic acid, methyl ester, Benzaldehyde, 3-hydroxy-4-methoxy, Benzyl alcohol, Cyclobutylamine, Diphenyl ether, Formic acid, 1-methylethyl ester, Hexadecanoic acid, methyl ester, Octadecanoic acid, Octadeca

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2-(2-hydroxyethoxy) ethyl ester, Octadecenoic acid, methyl ester, Octane, 2,3,3-trimethyl- and Xanthosine) which were not detected in untreated raisins of Thompson seedlees variety.

Summary And Conclusion

Analysis of Bioactive Compound by GCMS

Raisins of Thompson seedless varieties are rich in various bioactive volatile compounds. Among these compounds some represents to class of Acids, Aldehydes, Alcohols, Ketone, Alkane and Alkene. The major compound reported from the seedless untreated raisins were 2-Furancarboxaldehyde, Octacosane, Decosane, 4H-Fyran-4-one, 2, 3 dihydro-3,5 dihydoxy- 6 methyl, 1,2- Benzene dicarboxylic acid. The raisins treated with K_2C0_3 and Sulphur fumigated showed the presence of 4 H-Pyran-4-one,2,3 dihydroxy -3, 5 dyhydroxy-6-methyl, Dibutyl phthalate. The Thompson seedless treated with K_2C0_3, Sulphur fumigated and Zein protein coating exhibits 9,12-Octadecadienoic acid, methyl ester, Dibutyl phthalate, , whereas Thompson seedless raisins treated with K_2C0_3, Sulphur fumigated and Zein protein coating with mango essence displays the 8 compounds are 2-Furancarboxaldehyde-5-(hydroxymethyl)-.

The raisins of Thompson seedless raisins variety showed the accumulation of volatile bioactive compounds such as (2(3H) Furanone, 5-hexidihydro, 2-Butanol,3,3-oxybis, 4H-Pyran-4-one,2-ethyl-3-hydroxy, 9,12-Octadecadienoic acid, methyl ester, Benzaldehyde, 3-hydroxy-4-methoxy, Benzyl alcohol, Cyclobutylamine, Diphenyl ether, Formic acid, 1-methylethyl ester, Hexadecanoic acid, methyl ester, Octadecanoic acid, Octadecanoic acid, 2-(2-hydroxyethoxy) ethyl ester, Octadecenoic acid, methyl ester, Octane, 2,3,3-trimethyl- and Xanthosine) which were not detected in untreated raisins of Thompson seedless variety.

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Table 4: GCMS analysis of Thompson raisins treated with various chemicals.

Sr. No.	Mol. Wt.	Name of compound	O	A	B	C	D	E	F	G
1.	134	1,2,3- Propanetriol, mono acetate	-	24.43	-	-	-	-	-	-
2.	278	1,2-Benzenediacarboxylic acid, bis(2-methylpropyl)ester	-	-	-	-	-	-	-	17.25
3.	334	1,2-Benzenediacarboxylic acid, butyl 2- ethylhexyl ester	10.44	-	-	-	5.74	-	-	82.75
4.	126	2- Hexanone, 3-methyl-4-	-	18.8	-	-	-			

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		methylene		7						
5.	170	2(3H) Furanone, 5-hexidihydro	-	-	-	-	-	2.86	-	-
6.	162	2-Butanol,3,3-oxybis	-	-	-	-	-	6.33	-	-
7.	126	2-Furancarboxaldehyde, 5-(hydroxymethyl)-	63.48	-	-	47.21	65.81	-	-	-
8.	192	2-Propanol,1,1'-[(1-methyl-1,2-ethanediyl]bis-	-	-	-	-	-	58.00	12.06	-
9.	134	2-Propanol,1,1'-oxybis	-	-	-	-	-	25.97	25.97	-
10.	208	2-Propen-1-one,1,3 diphenyl-, (E)	-	-	-	19.15	-	-	-	-
11.	144	4H-Pyran-4-one,2,3-dihydroxy-3,5-hidroxy-6-methyl	31.67	51.44	-	-	14.88	-	-	-
12.	140	4H-Pyran-4-one,2-ethyl-3-hydroxy	-	-	-	-	-	7.85	-	-
13.	154	7-octen-2-01,2-methyl-6-methylene	-	-	-	-	3.91	-	-	-
14.	294	9,12-Octadecadienoic acid, methyl ester	-	-	47.00	7.69	3.04	-	-	-
15.	122	Benzaldehyde,3-hydroxy-4-methoxy	-	-	-	-	-	5.81	-	-
16.	108	Benzyl alcohol	-	-	-	-	3.32	39.10	39.10	-
17.	134	Butanol,3,3'-oxybis-	-	-	-	-	-	-	2.30	-
18.	71	Cyclobutylamine	-	-	-	-	9.41	-	-	-
19.	310	Decosane	36.39	-	-	-	-	-	-	-
20.	278	Dibutyl phthalate	2.32	40.64	17.81	2.32	-	-	-	-
21.	170	Diphenyl ether	-	-	-	-	-	18.12	-	-
22.	88	Formic acid, 1-methylethyl ester	-	-	-	-	2.68	-	-	-
23.	240	Heptadecane	3.30	-	-	-	-	-	-	-
24.	270	Hexadecanoic acid, methyl ester	-	-	11.46	1.91	-	-	-	-
25.	256	n- Hexadecanoic acid	6.12	18.48	-	5.62	-	-	-	-
26.	394	Octacosane	36.66	-	-	-	3.44	-	-	-
27.	284	Octadecanoic acid	-	10.71	-	-	-	-	-	-
28.	372	Octadecanoic acid, 2-(2-	-	-	-	1.95	-			

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		hydroxyethoxy) ethyl ester								
29.	298	Octadecenoic acid, methyl ester	-	-	8.79	-	-	-	-	-
30.	172	Octane	7.10	-	-	-	-	-	-	-
31.	156	Octane, 2,3,3-trimethyl-	-	-	-	-	2.35	-	-	-
32.	284	Xanthosine	-	-	-	-	88.47	-	-	-

O=Untreated, **A**=K_2CO_3+Sulphur fumigated; **B**=K_2CO_3+ Sulphur fumigated and Zein protein coating; **C**=K_2CO_3+Sulphur fumigated and Zein protein coating with mango essence; **D**=K_2CO_3+Sulphur fumigated and Zein protein coating with orange essence; **E**=5% mango essence in methanol; **F**=5% orange essence in methanol and **G**=4% Rapseed oil in methanol.

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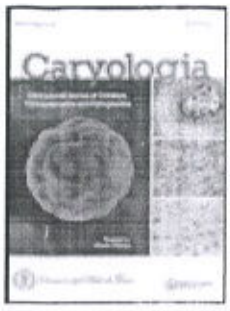

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Cytopalynological studies in some [illegible]onvolvulaceae members from northern Western [illegible]hats, India

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Cytopalynological studies in some Convolvulaceae members from northern Western Ghats, India

Manoj M. Lekhak[a], Sayali D. Patil[a], Amrapali V. Kattee[c], Pradnya B. Yadav[a], Savaliram G. Ghane[b], Sandip K. Gavade[a], Vinod B. Shimpale[a] and Shrirang R. Yadav[a]

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ABSTRACT

This paper presents a cyto-palynological study of four species of Convolvulaceae from the northern Western Ghats of India. *Ipomoea clarkei* and *Operculina tansaensis* are endemic to the region, whereas *I. diversifolia* and *O. turpethum* show wide distribution. A new cytotype with $2n = 28$ was reported for *I. diversifolia*. The chromosome number $2n = 30$ in *O. turpethum* was in conformity with earlier reports. Chromosome numbers for *I. clarkei* and *O. tansaensis* (both with $2n = 30$) were reported for the first time. Meiosis was found to be normal. At diakinesis 14 bivalents were observed for *I. diversifolia* while *I. clarkei* and *O. tansaensis* showed 15 bivalents. In all the species, chromosomes were small with median region centromeres. The largest chromosome was recorded in *I. clarkei* (2.15 ± 0.25 µm) and the shortest for *I. diversifolia* (1.62 ± 0.19 µm). The karyotypes were symmetrical and exhibited Stebbins's 4a category. Pollens were heteroporate echinate in both the *Ipomoea* species and tricolpate-smooth in *Operculina*.

Abbreviations: THL, total haploid chromosome length; CV_{CL}, coefficient of variation of chromosome length; M_{CA}, mean centromeric asymmetry; L, length of the largest chromosome; MCL, mean chromosome length; mean arm ratio; R, ratio between the largest and the smallest chromosome of the complement; St, type of asymmetry.

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Chromosomes; karyotype; narrow endemics; pollen; scanning electron micrographs

Introduction

Western Ghats of India is a biodiversity hotspot comprising 7402 species of flowering plants, of which 2253 species are endemic to India and 1273 species are exclusive to the Western Ghats (Nayar et al. 2014). Biological investigation of endemics has always been a key issue for botanists, and particularly for taxonomists. To study endemics requires precise knowledge of their location and reproductive biology. Lack of comprehensive taxonomic documentation of endemics from the Western Ghats obstructs botanists from taking up studies on cytogenetics, ecology and reproductive biology.

Ipomoea L. is a large and complex genus of Convolvulaceae Juss. containing over 500 species of vines and shrubs that are widely distributed throughout the tropical and subtropical regions of the world (Rane et al. 2012). In India, *Ipomoea* is represented by 51 taxa (48 species, two subspecies and one variety) (Table 1) (modified after Santapau and Henry 1973). Western Ghats comprises 37 species, three subspecies and two varieties (42 taxa) (modified after Nayar et al. 2014). *Operculina* Silva Manso on the other hand comprises 15 species (The Plant List 2013). Four species (*O. petaloidea* (Choisy) Ooststr., *O. tansaensis* Santapau & V.Patel, *O. turpethum* (L.) Silva Manso and *O. ventricosa* (Bertero) Raizada) are recorded from India. Two species of *Ipomoea* (*I. clarkei* Hook.f. and *I. salsettensis* Santapau & V.Patel) and one of *Operculina*, i.e. *O. tansaensis*, are endemic to the Western Ghats and restricted to the state of Maharashtra. *Ipomoea clarkei*, *I. salsettensis* and *O. tansaensis* are restricted to the state of Maharashtra, India. *I. clarkei* and *I. salsettensis* were categorized (following IUCN criteria) as endangered whereas *O. tansaensis* is considered critically endangered (Mishra and Singh 2001). The distribution of *I. diversifolia* R.Br. ranges from India to north-east Australia and Philippines (Luzon Island, province of Ilocos Norte) (Staples 2012) while *O. turpethum* grows naturally in warm temperate and tropical Asia, and is naturalized, possibly a long time ago, in parts of Africa, Australia and the Pacific islands (Prasad 2013).

The ornamental (many *Ipomoea* species are cultivated as climbers) and medicinal use (some species of *Ipomoea* and *Argyreia* Lour. species possess ergoline alkaloids that have hallucinogenic properties) attributed to many Convolvulaceae members has been one of the main drivers of cytogenetical examination in this family. In India, most of the cytological studies on Convolvulaceae were focused on somatic chromosomes (Vij et al. 1974; Bir and Sidhu 1975; Bir et al. 1978; Roy 1979; Sampathkumar 1979; Rao and Mwasumbi 1981; Sinha and Sharma 1992; Rane et al. 2012). All these

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Table 1. Indian taxa of *Ipomoea* and *Operculina* and their diploid chromosome c[illegible]s (2*n*).

Sr. No.	Taxa	2*n*	Author (s)
1	*I. aculeata* Blume	30	Yen et al. (1992)
2	*I. alba* L.	30	Yen et al. (1992)
3	*I. aquatic* Forssk.	30	Sampathkumar and [illegible]gar (1984)
4	*I. asarifolia* (Desr.) Roem. & Schult.	30	Sampathkumar (197[illegible]
5	*I. barlerioides* (Choisy) Benth. ex C.B. Clarke	-	-
6	*I. batatas* (L.) Lam.	90	Sinha and Sharma (1[illegible]
7	*I. cairica* (L.) Sweet	#30	Sampathkumar and [illegible]gar (1984)
8	*I. carnea* Jacq.	30	Sinha and Sharma (1[illegible]
9	*I. carnea* subsp. *fistulosa* (Mart. ex. Choisy) D.F. Austin	-	-
	= *I. crassicaulis* (Benth.) B.L. Rob.	30	Sampathkumar (197[illegible]
	= *I. fistulosa* Mart. ex Choisy	30	Vij et al. (1974)
10	**I.clarkei* Hook.f.	30	Present communicati[illegible]
11	*I. coptica* (L.) Roth ex Roem. & Schult.	28; 30	Sampathkumar (197[illegible] [illegible]et al. (1992)
12	**I. deccana* var. *lobata* S.C. Johri	-	-
13	*I. dichroa* Choisy.	30	Vij et al. (1974)
14	*I. diversifolia* R.Br.	30; 28	Yen et al. (1992); Pre[illegible] [illegible]communication
15	*I. eriocarpa* R.Br.	30	Bir et al. (1978)
16	*I. hederacea* Jacq.	-	-
17	*I. hederifolia* L.	30	Sampathkumar (197[illegible]
18	*I. horsfalliae* Hook.	-	-
19	*I. illustris* Prain	-	-
20	*I. indica* (Burm.f.) Merr.	-	-
	= *I. congesta* R.Br.	30	Sampathkumar (197[illegible]
21	*I. koschyana* Hochest. ex Choisy	-	-
22	*I. lacunosa* L.	30	Probatova et al. (199[illegible]
23	**I. laxiflora* H.J. Chowdhery & Debta	-	-
24	*I. littoralis* Blume	30	Ozias-Akins and Jarret[illegible]
25	*I. marginata* (Desr.) Verdc.	-	-
26	*I. mauritiana* Jacq.	30	Yen et al. (1992)
27	*I. maxima* Don ex. Sweet	30	Sampathkumar (197[illegible]
28	*I. mombassana* Vatke.	#30	Rao and Mwasumbi [illegible]
29	*I. muelleri* Benth.	30	Yen et al. (1992)
30	*I. nil* (L.) Roth.	30	Sampathkumar (197[illegible]
31	*I. obscura* (L.) Ker Gawl.	30	Sampathkumar (197[illegible]
32	*I. ochracea* (Lindl.) G.Don	-	-
33	*I. parasitica* (Kunth.) G.Don	-	-
34	*I. pes-caprae* (L.) R.Br.	30	Sampathkumar (197[illegible]
35	*I. pes-caprae* subsp. *brasilensis* (L.) Ooststr.	30	Yen et al. (1992)
36	*I. pes-tigridis* L.	28, 30	Bir and Sidhu (1975)
37	*I. pileata* Roxb.	30	Oguntwenmo (1999)
38	*I. purpurea* (L.) Roth.	30; 32	Bir et al. (1978); Roy [illegible]
39	*I. quamoclit* L.	30; #30	Sampathkumar (197[illegible] [illegible]pathkumar and Ayyangar (1984)
40	**I. salsettensis* Santapau & V.Patel	-	-
41	*I. sindica* Stat.	#30	Khatoon and Ali (19[illegible]
42	*I. sinensis* (Desr.) Choisy.	-	-
43	*I. staphylina* Roem. & Schult.	#30, 32	Sampathkumar (197[illegible]
44	*I. tenuipes* Verdc.	-	-
45	*I. triloba* L.	30; 38	Yen et al. (1992); Wa[illegible] al. (1998)
46	*I. tuberculata* Ker Gawl.	-	-
47	*I. turbinata* Lag.	-	-
	= *Calonyction muricatum* G. Don.	30	Gao and Zou (1995)
	= *I. muricata* (L.) Jacq.	30	Sampathkumar (197[illegible]
48	*I. vagans* Baker	-	-
49	*I. verticillata* L.	-	-
50	*I. violacea* L.	30	Sampathkumar (197[illegible]
51	*I. wightii* (Wall.) Choisy.	-	-
52	*O. petaloidea* (Choisy) Ooststr.	-	-
53	*O. tansaensis* Santapau & V.Patel	30	Present communicat[illegible]
54	*O. turpethum* (L.) Silva Manso	30	Sampathkumar (197[illegible] [illegible]ha and Sharma (1992); Present communication
55	*O. ventricosa* (Bertero) Peter	-	-

*Taxa endemic to India; = denotes synonyms; – indicates taxa with no available data on cytoge[illegible] #gametophytic count converted to sporophytic count.

studies report chromosome counts for many species of *Ipomoea* and only a single species of *Operculina* (i.e. *O. turpethum* showing $2n = 30$) has been investigated cytogenetically. The most common diploid chromosome number reported in *Ipomoea* is $2n = 30$, although species with $2n = 28$ and $2n = 32$ have also been reported. So far, no instances of polyploidy have been reported except for *I. batatas* (L.) Lam. where hexaploidy ($2n = 6x = 90$) was reported by Sinha and Sharma (1992).

This paper [illegible] part of continuous program on karyological [illegible]stigation of endemics of northern Western Ghats (Gosavi et al. 2011; Lekhak et al. 2011; Lekhak [illegible]d Yadav 2011; Bagane et al. 2014; Gavade et al. [illegible]15; Joshi et al. 2016) and aims to generate new [illegible]genetical data. As there is no information on re[illegible] for karyotype of *I. clarkei* and *O. tansaensis*, w[illegible]ects on the cytogenetics of these endemic spec[illegible] from Western Ghats. Also, *O. turpethum* are w[illegible]

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cytogenetical variation, if any, was a assessed. This resulted in the reporting of a new ytotype for *I. diversifolia* while the chromosome nt of *O. turpethum* was confirmed. Additional palynological details, as observed under scanning ectron microscope, for all the four species have been provided.

Materials and methods

The plant materials for the present investigations were collected in the field in northern W rn Ghats, and for each species a herbarium specimen was prepared and deposited in the Herbarium of Department of Botany, Shivaji University, Kolhapur (acronym SUK) (Table 2). Mitotic preparations were made from the root-tips of germinated seeds. Seed face was sterilized with 0.1% (w/v) $HgCl_2$ for 4 nicked at the distal end by a sharp razor and germinated on wet filter paper in Petri dish. The well grown root-tips (6–10 mm long) were excised and pre-treated with saturated solution of para-dichlorobenzene (*p*DB) for 4–5 h at 9 ± 3°C. Further, the root-tips were hydrolysed in 1N HCl and squashed in 2% propionic-orcein. For meiotic studies, appropriate sized flower buds were fixed in Carnoy's fixative (3:1 absolute ethanol and acetic acid) and smears of floral buds were stained using 2% propionic-orcein. Suitable somatic and meiotic plates from freshly prepared slides were photographed with a camera mounted on a fluorescence microscope (Leica DM2000, Wetzlar, Germany) at 1000× magnification. Ten plates with well-separated somatic chromosomes were selected for karyotype analysis by adopting the method of Levan et al. (1964). The degree of karyotype asymmetry was determined using the categories of Stebbins (1971) and the CV_{CL} (coefficient of variation of chromosome length) and M_{CA} (mean centromeric asymmetry) as proposed by Peruzzi and Eroğlu (2013).

Pollen grains fixed in glacial acetic acid were acetolysed (in freshly prepared 9:1 acetic anhydride: concentrated sulphuric acid) following the technique of Erdtman (1960) and mounted on a double sided sticky carbon tape bound to an aluminium stub. Pollen grains were then coated with gold/palladium for 75 s on a Quorum SC7620 sputter coater and examined using a TESCAN VEGA3 scanning electron microscope at 10 and 15 kV. The measurements were made from semi-permanent preparation of acetolysed pollen grains mounted in glycerine jelly. Measurements of at least 20 pollen grains for each species were taken and expressed as mean ± standard deviation. The values of P (polar axis length) and E (equatorial diameter) were calculated to find out P/E ratio.

Results

Cytogenetics

I. diversifolia exhibited $2n = 2x = 28$ chromosomes while the rest of the species had $2n = 2x = 30$ chromosomes (Figures 1(a), 1(g), 2(a), 2(f)). Comparative karyotypes of all the species investigated are provided in Table 3 whereas in Figure 3 the karyograms of the species are represented. All the studied species had only one type of chromosomes, i.e. chromosomes with median region centromere, and hence the karyotype formula 14m (*I. diversifolia*) or 15m (*I. clarkei*, *O. tansaensis* and *O. turpethum*). Karyotypes of all the species were symmetrical and occupied Stebbins's 4a category of karyotype asymmetry. Mean chromosome length (MCL) was recorded to be the highest (1.62 ± 0.26 µm) in the case of *I. clarkei* and lowest (1.29 ± 0.17 µm) in *I. diversifolia* (Table 3). Total haploid chromosome length (THL) ranged from 18.07 ± 0.17 µm (*I. diversifolia*) to 24.37 ± 0.26 µm (*I. clarkei*). *I. clarkei* showed maximum value (1.82) for R (ratio of largest and the smallest chromosome of the complement) while the minimum (1.59) was recorded for *O. turpethum* (Table 3).

Meiotic studies were carried out in three species (*I. clarkei*, *I. diversifolia* and *O. tansaensis*). Meiotic course was found to be normal with no anomalous behaviour of chromosomes. At diakinesis, pollen mother cells (PMCs) of *I. diversifolia* showed 14 bivalents ($n = 14$) (Figure 1(h)) while 15 bivalents ($n = 15$) were noted in *I. clarkei* and *O. tansaensis* (Figures 1(b) and 2(b)). Different stages such as metaphase-I and anaphase-II were also observed (Figures 1(c-f), 1(i-m) and 2(c-e)). Microspore tetrads were tetrahedral for *I. clarkei* and *O. tansaensis* whereas decussate tetrads were seen in *I. diversifolia* (Figure 1(o)).

Palynology

Investigation of the pollen grains led to recognition of two types, viz. pantoporate-echinate (*I. clarkei* and *I.*

Table 2. Geographical distribution and voucher specimen details of *I. clarkei*, *I. diversifolia*, *O. tansaensis* and *O. turpethum*.

Species	Collection locality	GPS coordinates	Altitude (metres)	Voucher specimens
I. clarkei	Malshej Ghat, Pune district, Maharashtra	19°20.349 N 073° 44.232 E	198	SDP-01
I. diversifolia	On the way to Manjare, Kolhapur district, Maharashtra	16°53.191 N 073° 53.778 E	659	MML-506
O. tansaensis	Near Tansa Lake, Palghar district, Mumbai, Maharashtra	19°34.131 N 073° 11.243 E	71	SDP-02
O. turpethum	Bhiwandi wada road, near Vaitarna river bridge, Palghar district, Mumbai, Maharashtra	19°27.172 N 073° 20.579 E	58	SDP-03

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diversifolia) and tricolpate-smooth (*O. tansaensis* and *O. turpethum*) (Figure 4(a-h)). Pollen grains of *I. clarkei* were spheroidal, radially symmetrical, 80–98 µm in diameter, exine echinate; spines 8.98 ± 0.83, µm long with blunt tip and bulbous base, compactly arranged, tapering towards apex; microreticulum only on the basal cushion of the spines. *I. diversifolia* had spheroidal, pantoporate pollen grains, radially symmetrical, 78–98 µm in diameter, exine echinate; microreticulum spread throughout the exine; pores elliptic, 6.33 ± 1.44 µm in diameter; spines 6.7 ± 0.52 µm long with blunt tip and bulbous base, laxly arranged, non-tapering towards apex.

Operculina tansaensis had oblate to spheroidal pollen grains with P/E ratio 0.92 ± 0.04 tricolpate; colpus with microgranulate membrane, 12.39 ± 2.37 µm wide, usually acute at the ends mesocolpium psilate, minutely dotted rarely with few spheroidal deposits. In *O. turpethum* pollen grains were oblate to spheroidal with P/E ratio 0.89 ± 0.06, tricolpate; colpus with microgranulate membrane, 12.15 ± 0.86 µm wide, usually acute at the ends, mesocolpium minutely dotted with gemma-like depositions.

Discussion

Cytogenetics

The basic chromosome number for the genus *Ipomoea* is x = 15 (Darlington and Wylie 1955). According to Löve and Löve (in Sinha and Sharma 1992) x = 15 is a secondarily derived number while x = 5 is the primary basic number of Convolvulaceae. Of the 51 taxa occurring in India, 33.3%, i.e. 17 are yet to be examined cytogenetically (Table 1). About 68.6% (35 taxa) of the Indian species are diploid with $2n$ = 30 chromosomes. This further corroborates the basic chromosome number x = 15 for *Ipomoea*. Two species (*I. purpurea* and *I. staphylina*) have $2n$ = 32 chromosomes, three species (*I. coptica, I. diversifolia* and *I. pes-tigridis*) possess $2n$ = 28 chromosome and a single species (*I. triloba*) has been reported with $2n$ = 38 (Table 1). The cytotypes $2n$ = 32 and $2n$ = 38 have not previously been confirmed by any other worker and hence need to be reinvestigated. The unusual chromosome number may be attributed to polyploidy, aneuploidy or dysploidy or because of occurrence of polysomaty (cells with different ploidy levels in the same organ or tissue) in the root-tip cells. Polyploidy has only been reported in case of *I. batatas* ($2n = 6x = 90$), a cultivated tuber crop (Sinha and Sharma 1992). Polyploidy in cultivated crops is of common occurrence and is on account of the fact that polyploids have bigger size and vigour as compared to their diploid counterparts.

Rane et al. (2012) studied the karyomorphology of 10 species of *Ipomoea* from Maharashtra and found that the THL value ranges from 29.88 to 58.83 µm. The highest values of MCL (3.39 ± 0.74 µm) and THL (50.83 µm) was recorded for *I. carnea* and the lowest value of MCL (1.99 ± 0.38 µm) and THL (29.88 µm) for *I. aquatica* Forssk. The THL values recorded for *I. clarkei* and *I. diversifolia* were 24.37 ± 0.26 µm and 18.07 ± 0.17 µm, respectively. The low value of THL is due to smaller chromosomes of *I. clarkei* and *I. diversifolia*. The MCL value in the former was 1.62 ± 0.26 µm and for the latter 1.29 ± 0.17 µm. Additionally, *I. diversifolia* has only 28 somatic chromosomes in its complement which decreases the THL. All the chromosomes in *I. clarkei* and *I. diversifolia* possess median region centromeres and hence the karyotype formulae 15m and 14m, respectively (Table 3). This makes the karyotype highly symmetrical (4a category). On the other hand, studies by Sampathkumar (1979) and Rane et al. (2012) reported chromosomes with median to submedian centromere in *Ipomoea*. Nakajima (1963) could also observe median to terminal centromere in *I. lacunosa* L. and *I. violacea* L. and hence reported asymmetrical karyotypes. A highly symmetrical karyotype is due to the prevalence of median or submedian centromeres (Levitzky 1931). Consequently, the karyotypes of *I. clarkei* and *I. diversifolia* with median region centromeres are highly symmetrical when compared with the karyotypes of species analysed by Nakajima (1963) and Rane et al. (2012). Arm ratio (r) and ratio between the largest and the smallest chromosome of the complement (R) for *I. clarkei* and *I diversifolia* showed slight differences. The former was on the higher side for *I. diversifolia* and the latter for *I. clarkei*. Low MCL of *I. diversifolia* explains this while larger chromosomes in *I. clarkei* account for its high R ratio. The maximum value (16.12) for CV_{CL} (a measure of interchromosomal asymmetry) was observed for *I. clarkei* and the minimum (13.03) for *O. tansaensis*. In *I. clarkei*, the chromosomes ranged from 1.18 ± 0.17 µm to 2.15 ± 0.25 µm while in *O. tansaensis* the range was 1.22 ± 0.11 µm to 2.00 ± 0.25 µm. The heterogeneity in chromosome sizes (interchromosomal asymmetry) was recorded more in *I. clarkei* as compared to *O. tansaensis*. M_{CA} (a measure of intrachromosomal asymmetry) reflects heterogeneity in centromere position. The highest value (11) was recorded for *O. turpethum* while *O. tansaensis* had the lowest (7.73). However, on account of small chromosomes it was not possible to observe much difference in the centromere positions in the chromosome complements of both the species. Both *I. clarkei* and *I. diversifolia* fall under similar Stebbins's karyotype asymmetry classes, i.e. 4a. M_{CA} is higher for *I. diversifolia* and CV_{CL} for *I. clarkei*. Therefore, it is not possible to assess overall karyotype symmetry based on M_{CA} and CV_{CL}. Nevertheless, larger chromosomes in

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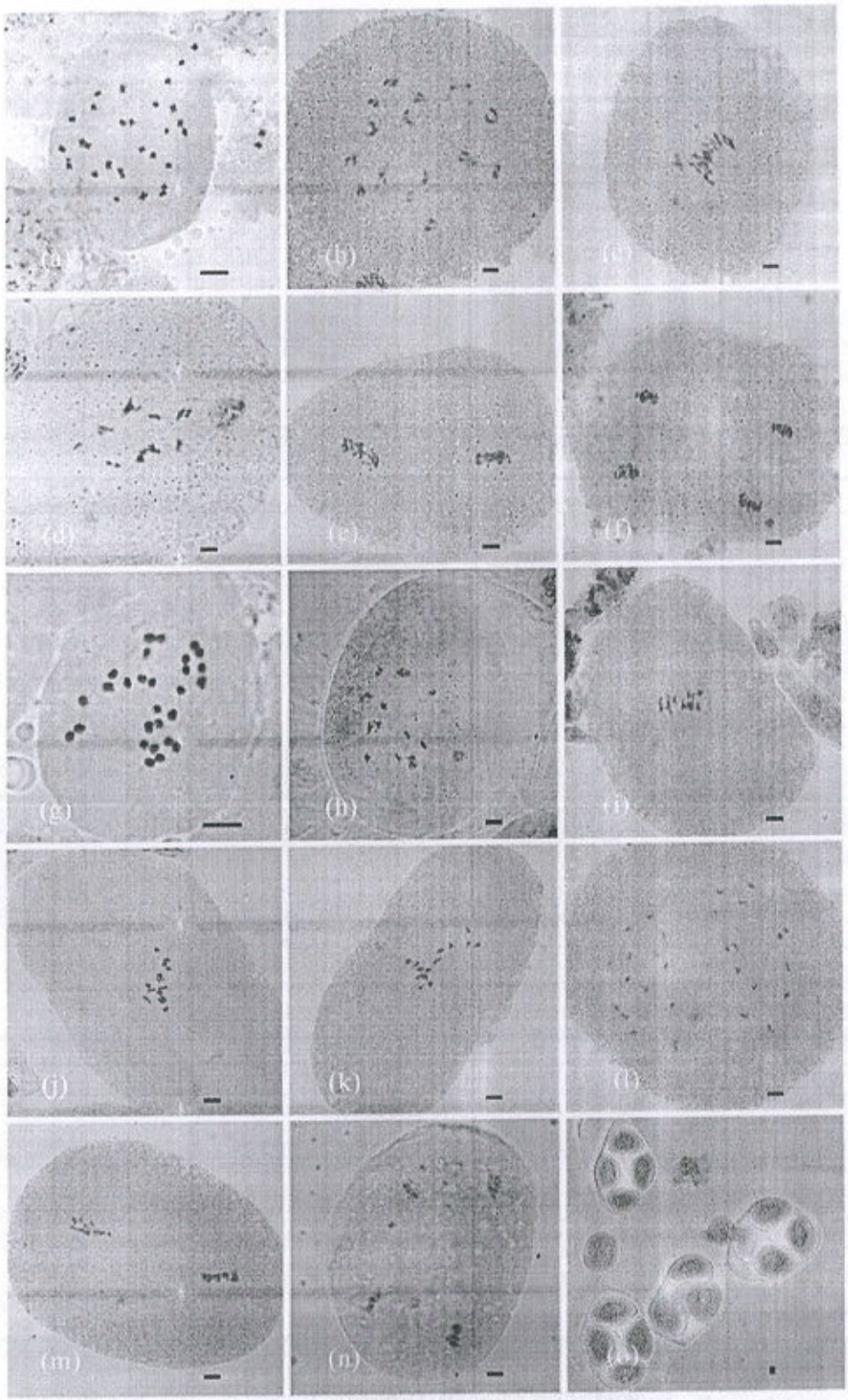

Figure 1. Somatic chromosomes and meiotic behaviour in *Ipomoea*: (a–f) *I. clarkei* (a) mitotic metaphase ($2n = 30$); (b) PMC at diakinesis ($n = 15$); (c) PMC at metaphase-I; (d) PMC at early anaphase-I; (e) PMC at metaphase-II; (f) PMC at anaphase-II. (g-o) *I. diversifolia* (g) mitotic metaphase ($2n = 28$); (h) PMC at diakinesis ($n = 14$); (i-k) PMCs at metaphase-I showing precocious separation of chromosomes; (l) PMC at anaphase-I; (m) PMC at metaphase-II; (n) PMC at anaphase-II; (o) decussate tetrads. Bars: 5 µm.

Table 3. Comparative karyotypes of *I. clarkei*, *I. diversifolia*, *O. tansaensis* and *O. turpethum*.

Species	2n	THL ± SD (µm)	Haploid karyotype formulae	CV_{CL}	M_{CA}	L±SD (µm)	MCL±SD (µm)	r±SD	R	St
I. clarkei	30	24.37 ± 0.26	15m	16.12	8.16	2.15 ± 0.25	1.62 ± 0.26	1.35 ± 0.04	1.82	4a
I. diversifolia	28	18.07 ± 0.17	14m	13.14	11	1.62 ± 0.19	1.29 ± 0.17	1.24 ± 0.05	1.64	4a
O. tansaensis	30	23.42 ± 0.20	15m	13.03	7.73	2.00 ± 0.25	1.56 ± 0.20	1.28 ± 0.04	1.71	4a
O. turpethum	30	21.30 ± 0.19	15m	13.37	8.86	1.82 ± 0.23	1.42 ± 0.19	1.28 ± 0.04	1.71	4a

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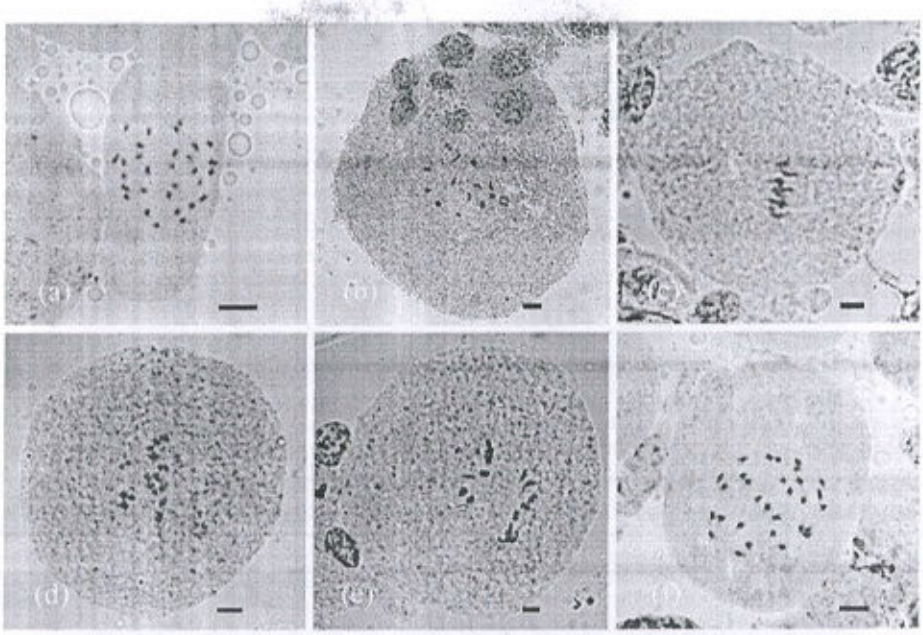

Figure 2. Somatic chromosomes and meiotic behaviour in *Operculina*: (a) mitotic metaphase of *O. tansaensis* ($2n = 30$); (b) PMC at diakinesis ($n = 15$); (c) PMC at metaphase-I; (d, e) PMCs at early anaphase-I; (f) mitotic metaphase of *O. turpethum* ($2n = 30$). Bars: 5 µm.

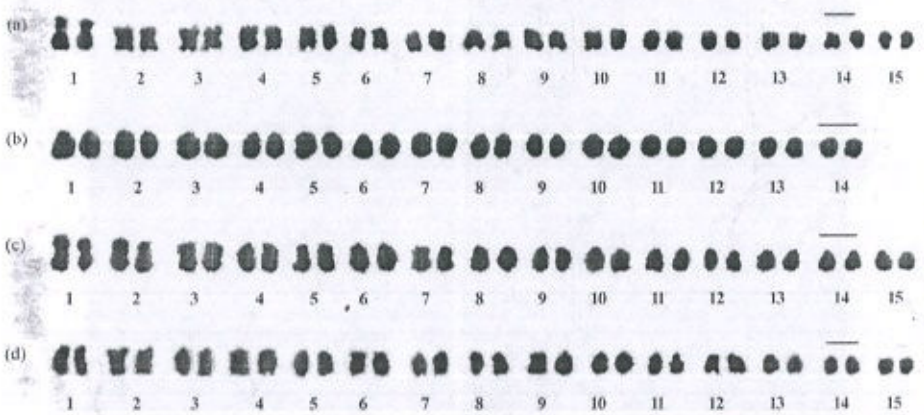

Figure 3. Karyograms of the studied species: (a) *I. clarkei*; (b) *I. diversifolia*; (c) *O. tansaensis*; (d) *O. turpethum*. Bars: 2 µm.

THL value of *I. clarkei* indicate that the karyotype is more symmetric than *I. diversifolia*.

Amongst *Operculina* species, cytogenetical data are available only for *O. turpethum*. Karyological parameters of *O. tansaensis* are comparable to that of *O. turpethum* (Table 3) indicating genetic proximity between both the species. Cytological details of *O. turpethum* obtained in the present study were in good agreement with Sampathkumar (1979). Sampathkumar (1979) reported $2n = 30$ chromosomes with median and submedian centromeres, R value of 1.57 and the chromosome range of 1.9–3.0 µm. We have observed that our population of *O. turpethum* also has $2n = 30$ chromosomes with median region centromeres, R value of 1.59 and chromosomes ranging from 1.15 ± 0.22 µm to 1.82 ± 0.23 µm. The differences in chromosome length can mainly be attributed to the tremendous genetic diversity existing in this widespread species. Based on higher values of CV_{CL} (13.37) and M_{CA} (8.86) it can be said that the karyotype of *O. turpethum* is more asymmetric. It has been noticed that karyotypes of the genera like *Hewittia* Wight & Arn. (*H. sublobata* (L.f.) Kuntze), *Merremia* Dennst. ex Endl. (*M. dissecta* (Jacq.) Hallier f., *M. hederacea* (Burm.f.) Hallier f.) and *Operculina* (*O. turpethum*) show similarity (Sampathkumar 1979). *O. tansaensis*, however, showed some differences with the karyotypes of *Hewittia* and *Merremia*. The chromosomes of *H. sublobata* were larger (2–4 µm) than *O. tansaensis* which has chromosomes ranging from 2.00 ± 0.25 µm to 1.22 ± 0.11 µm. Both *Hewittia* and *Merremia* possessed chromosomes with median and submedian centromere while only median centromeres were observed for chromosomes of *O. tansaensis*. The R value of *H. sublobata* (2.0) was comparable to *O. tansaensis* (1.63); however,

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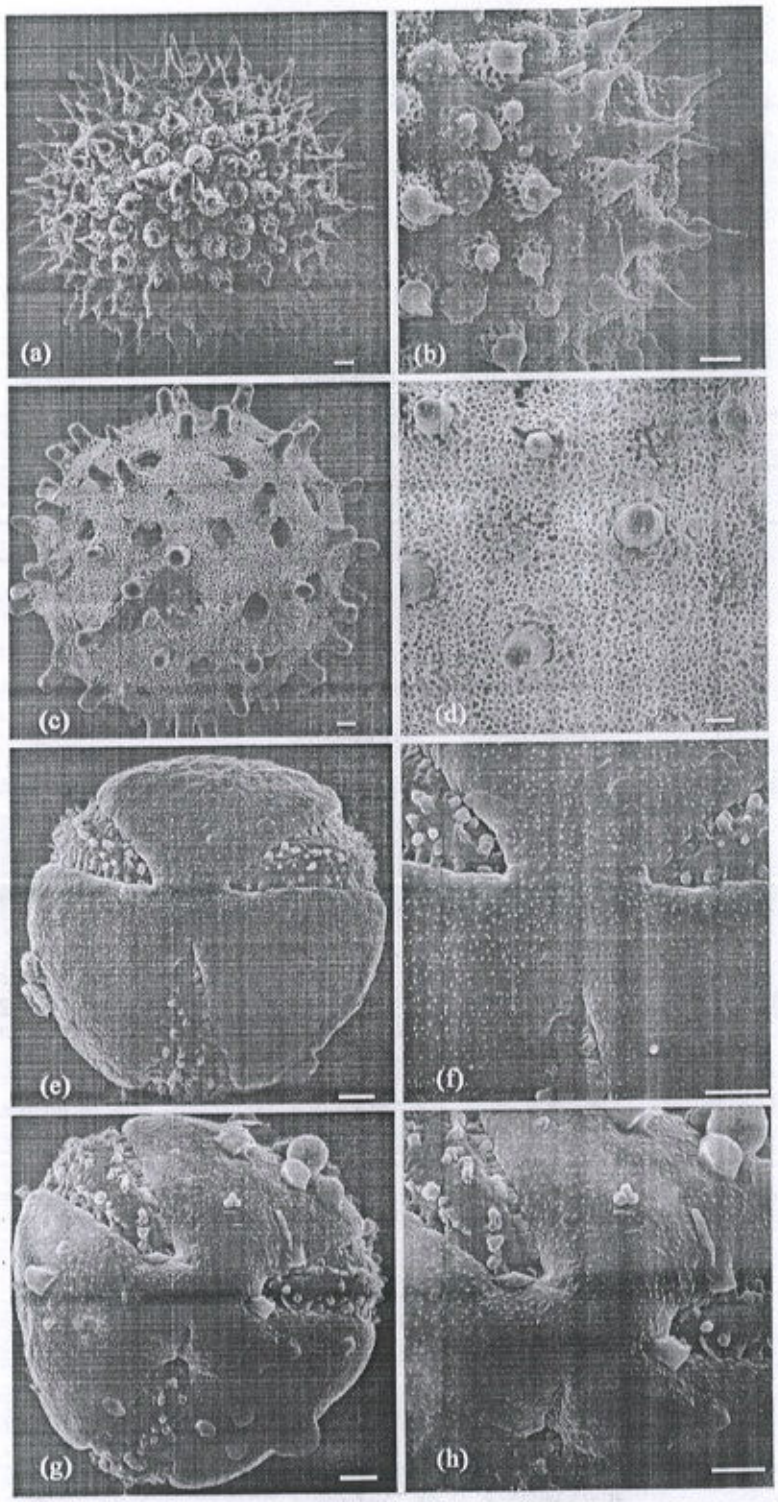

Figure 4. SEM micrographs showing whole and enlarged pollen: (a, b) *I. clarkei*; (c, d) *I. diversifolia*; (e, f) *O. tansaensis*; (g, h) *O. turpethum*. Bars: 5 µm.

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hederacea showed higher values of 2.5 and 3.3, respectively (modified after Sampathkumar 1979).

Palynology

The pollen morphology of Convolvulaceae illustrates great diversity and has taxonomic importance (Tellería and Daners 2003). Extensive investigation of the pollen morphology of the family was carried out by Sengupta (1972).

In the present investigation two kinds of pollen, namely pantoporate-echinate and [illegible], were recognized following Ferguson [illegible]. The former were observed in *I. clarkei* and [illegible]

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the latter type in *O. tansaensis* and *O. turpethum*. Echinate, micro-reticulate and pantoporate pollens have been also reported in *I. indica, I. nil, I. pubescens Lam, I. purpurea* and *I. rubriflora O'Donell* (Tellería and Daners 2003). The pollens of *O. tansaensis* differ slightly from *O. turpethum* in the absence of gemma-like depositions on mesocolpium. Similar tricolpate-smooth pollens have also been observed in *M. lobata* Verdc., *M. dissecta* and *O. macrocarpa* (L.) Urb. by Ferguson et al. (1977). The pollens of *I. clarkei* and *I. diversifolia* convincingly differentiate each other in terms of the presence of microreticulum on the exine, spine density and its structure and hence are of diagnostic value in taxonomy. This does not hold good for the two *Operculina* species presently investigated. More palynological data on remaining *Operculina* species will certainly throw light on the taxonomic utility of pollen character in the genus.

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The authors wish to express sincere thanks to the Head, Department of Botany, Shivaji University, Kolhapur for providing all necessary facilities. One of the authors (SDP) is also grateful to DBT for financial support under 'Network Programme for Enrichment and Update of Plant Chromosome Database for Spermatophytes and Archegoniate' vide sanction letter BT/PR7866/NDB/39/272/2013 dated 23 March 2015.

Disclosure statement

No potential conflict of interest was reported by the authors.

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16. Africa and Political Situation in V.S. Naipaul's 'In a Free State'

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Abstract

The titular story "In a Free State" is about the political upheavals. Since the beginning of the story, we observe the war between the King and the President. Everything in this part of Africa is supported by Americans. At the background of the novel, there is the tribal war between the tribes of the president and the King. With independence the age-old enmity between the different tribes has revived and there is a struggle for power between the President and the King.

Key words: Africa, Politics, tribal war, the King, the president

The Third World nations are being handled and controlled by politics. But unskilled, uneducated mob, economic bankruptcy and neo-colonialism are making politics impotent. So the individuals are confused and disoriented. The titular story "In a Free State" is about the political upheavals. Since the beginning of the story, we observe the war between the King and the President. Everything in this part of Africa is supported by Americans. At the background of the novel, there is the tribal war between the tribes of the president and the King. With independence the age-old enmity between the different tribes has revived and there is a struggle for power between the President and the King. The King as well as the President intrigues with the local representatives of White Governments for support, but the white men chooses to support the President who is in command of the new army and thus stronger than the King.

An African, at the king station, damages the widescreen of Bobby's car that Bobby loses his patience and cries out angrily:

"These people should not be employed. They and their King have had it all their way for too long. But their little games are over now. Look at my windscreen".(P.156)

Through this episode Naipaul tries to show that the Africans have borrowed technologies which they are unable to understand and handle. It indicates the neocolonialism at work in this newly independent African country. The interference of whites in their internal affairs and their developmental programme are in reality the policies of [illegible]

What is significant about the outburst is that Bobby demonstrates his ang[illegible]

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has recognized the attending African to be a man of the King's tribe – already persecuted people. It is clear that Bobby knows where he stands after the scales of power have been inverted. When President's soldiers beat him up, there is a little he can do besides nursing his wounds, both physical and psychological.

No doubt, the negative picture of Africa and Africans is depicted in a rude manner by V. S. Naipaul but his intention behind it is very honest. It is to touch a truth hidden in social, political, economic and individual scenarios. V.S. Naipaul often takes a racialist tone where he draws the sameness between the wild dogs and the Africans. This is further sustained by Naipaul's cursory dismissal of African readership in 1979 interview where he said: "No I don't count the African readership and I don't think one should. Africa is a land of bush, again not a very literary land."

Naipaul focuses too much on the violence that has been unleashed after independence. As Ania Loomba points out, the "internal fractures" or "fissures" that existed alongside colonialism surfaces after independence. The war between the King and the President that forms the backdrop of the title is a manifestation of internal differences. Besides, "decolonization", as Frantz Fanon emphasizes, "is always a violent phenomenon." It is natural that people who were subjugated to centuries of oppression and violence should themselves react with violence. In this violence, the minds and selves also are violated.

In the epilogue Naipaul's bold gesture seeks to show to us the bitter reality that the colonized people who are now free but still under the impact of the colonizers. They want to start afresh but the colonizers still revive post-colonial's past of dependency, oppression, cruelty, exploitation and slavery. The modern predicament of post-colonials is not still changed. Post colonials' selves are being insulted on domestic, social and political grounds by the colonizers in modern-post modern era even. Hence there is still disorientation, inferiority, broken society, fractured communities and hopelessness in the world.

Naipaul has successfully conveyed the effects of the colonial and postcolonial politics on the psyche of the colonized. In his analysis, disorientation, both at the macrocosmic level of the society and microcosmic level of the individual, acts as the major deterrent to progress in the post- independence period. As a result of the first, the colonized develop a split personality and lose their sense of solidity. Having lost their sense of self, they resort to mimicry in an attempt to experience a sense of wholeness and the model for mimicry is invariably a European one. Social disorientation even precludes a sense of oneness which is basic pre-requisite for the formation of meaningful society and politics.

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The task of nation building after independence becomes a major problem due to social, cultural and economic fragments which make politics only a game of powerful people/parties in the country. Naipaul shows that because of neocolonialism the economy and politics of a country is in the hands of outside power and hence independence ceases to have any meaning. These socio-political reasons lead post colonials towards a deeper disorientation.

In the last few pages Naipaul concludes his book with a reference to the historical context. In Luxor, Naipaul tries to survey the landscape for a historical context by linking the present day landscape of Egypt to the past one, which exits in the form of the ruins of ancient Thebes. The first time he views the ancient ruins, he tries to get the sense of the past by isolating it from the present distress of Egypt. The landscape, represented in the paintings by ancient artists, speaks of an ordered world whose inhabitants have a sense of place.

Naipaul draws a big line of difference between 'placed' and 'placeless' postcolonial people. He even says that the ancient world was an ordered world but the present post-colonial's world is total chaos. Naipaul concludes that such an ordered landscape could have been perceived only by "the special vision of men who knew no other land and saw what they had as rich and complete"(P.251). Therefore, "the muddy Nile was only water: in the paintings, a blue green chevron: recognizable, but remote, a river in fairy land."(P.251) Naipaul, however, with his "stranger's eye" and the knowledge of many lands finds it hard to believe that there had been such an ordered world as portrayed in the paintings on the tombs. He can only conclude: "perhaps that vision of land, in which the Nile was only water, a blue-green chevron, had always been a fabrication, a cone for yearning, something for the tomb."(P.256) Naipaul says that the present reality is bitter and unavoidable. Each individual in the post-colonial era is disoriented on socio-economic, political, domestic and individual levels from which no one can recover easily.

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A ROLE OF WOMEN CHARACTERS IN JAMES BALDWIN'S NOVELS

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Introduction :

James Baldiwn in considered as one of the most significant writers in the contemporary African-American literature in the 2nd half of the 20th century. In his exclusive writing of essays, novels and plays, Baldwin has applied humanitarian approach in presenting the role of women. He has pointed out the struggle of women, for their identity , and overcoming the plights with courage in life for individual and domestic purposes. The African American literature also shows that the Negroes were always looked down upon by the whites and they were always regarded as inferior beings. But, it was James Baldwin who became a prophet of humanism and followed the redemptive force of love of a prophet in bringing out the role of women in his writing. Therefore an attempt is made to focus on the role of different types of female characters in James Baldwin's novels and their prominence in the families and social life.

Novels of James Baldwin :

The renowned novels of James Baldwin, for instance, "Go Tell It on the mountain" , " Going to Meet the Man", "Another Country" , If Beale Street Could Talk" and "Just Above My Head" are praiseworthy for depicting the women characters with bravery and facing every plight at every step in domestic and social life. He has focused on the women characters without alternatives. In most of the novels written by black writers, gender is recognized as a social factor of major importance. More particularly, Baldwin through his novels contributed to the enterprise of marking gender fully visible and comprehensible. The treatment given to women in society is disheartening and pathetic. Baldwin has depicted the women characters with foresight. He has power to penetrate sufficiently the female psyche to draw accurate picture of females from humanitarian point of view.

While most of the African - American writers, particularly female writers have not fully become successful, in large scale to draw convincing portraits of self-sufficient women, their status and attitude in writing, James Baldwin's writings keenly and with great interest present the female characters who are courageous, extraordinary strong, full of patience and even more dynamic. The closer insight into Baldwin's writings makes it clear the worldly insight. More than this, the women are often more aggressive, more intelligent and more successful. Although she is sound and stronger in character, she is not given due place in the society.

Role and Presentation of Women Characters in Fiction :

In "Blues for Mister Charlie' Juanito is clearly the most dynamic, intelligent, clear sighted and aggressive character in the drama. Baldwin has tried not to traditionally define roles, but dominantly and more often he inverts the roles, brilliantly to project the treatment meted to women in the racist regime. From humanitarian point of view, when we study 'Go Tell it on the mountain' (1953), it becomes explicit that James Baldwin's women characters - Florence, Deborah, Esther and Elizabeth are stronger women and think passionately. Florence in particular rebels against injustice and suffocation of sexual role definitely. With double standard and dramatically, she leaves the safety of her home for New York, declaring herself sufficiency. She says, " I am a woman grown, I know what I am doing." Thus, Baldwin shows us not only glimpse of Florence's adolescence, but her unflinching decisiveness , her bitterness towards men, and her religious disbelief. He has made Florence too desperately independent and resentful of men to surrender to them. This becomes clear that Baldwin's women characters obviously differ from other fictitious females in the sense that they act and are not

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condemned for doing so. Society offers no protection to women in Baldwin's writings. They [illegible] into a world hostile to their very existence.

Critics on James Baldwin :

In the opinion of Trudier Harris, a writer and a critic on Baldwin's novels, "Female characters tend to be treated either cursorily or as helping or hindering the development and self-knowledge of the male protagonists. " She thinks that some characters are neglected in specific discussion of Baldwin and in more generalized discussions of American and black American literature. The characters in 'Go Tell It on the Mountain" - Florence, Deborah, Elizabeth and Esther live within the limits set by their victimization through the church and the males in their lives. For the safe of freedom, Julia in 'Just above My Head' rejects both the Church and the men in her association. Baldwin's sexual, racial and social policies are crucial to an understanding in his portrayal of women, he has depicted the women characters impressively and with great velour.

Some critics think that Baldwin generally portrays women characters in less nuance than men. But, the women struggle for identity and for separate and independent private world. Trudier Harris points out that in Baldwin's work, only Julia Miller, the woman in " Just Above my Head" approaches a kind of independence, but Julia is not the main character. The women in Baldwin's novels can be seen to develop over the years. The women confront against the Church, customs, values, and theology of black Christian fundamentalism. The female characters free themselves of the dependence upon the Church. Julia moves from a child preacher to an independent women, finding a contentment that most of the other Black women in Baldwin's fiction do not. Julia has moved beyond gender, beyond the prescriptive roles of the nuclear family and beyond sexuality.

Conclusion :

After considering James Baldwin's writings and novels, it becomes clear that like Richard Wright, Martin Luther King, Ralf Ellison and many others, James Baldwin has also described the sufferings of the black people and particularly women characters impressively. In his writings Baldwin has created an image of women that will recover their dignity and spell out what they have to teach. At the same time, his proud hearted love of his people often sent him close to euphoric boosting. Baldwin expected that the black men and women be treated humanely by those around them. His approach to the American people was that they should treat the colored men and women as human-beings with equality and dignity.

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Efficient Role of ICT in Strengthening Under Graduate Education and Language

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In the modern world of Science and Technology, one cannot ignore the unique and peerless role of ICT in the advancement of undergraduate education which give qualitative and capable approach in fulfilling the needs of undergraduate students. Right from the pre-independent era and even after independence tills 1990. Education was a deprived entity for many school going students who were not aware of significance of education. But, now the advancing science and its tools have created revolution in Indian Education System. The use of television, mobile, internet, laptop, E-library etc. have contributed and sharing a lot in improving and expanding education and its quality.

While considering elementary role of ICT in Rejuvenation of undergraduate education in our country, it becomes essential to consider the facades and imprint of ICT. Prior to the use of ICT at this level much more emphasis was given on the reading of books and references relevant to the studies. So, libraries were regarded as "the Temples of Knowledge" in India and in the world too. But, with the fast advancement and various inventions in science and technology, changes in educational field also became inevitable. the changes in the form of e-library, different apps, mobiles for the use of e-books and dictionaries created awesome and revolutionary changes.

In the 21st century, as far as the conventional approaches are concerned, the students' approach to modern education seems to be changed.

On one hand, some students use libraries, but on the other hand many more students are applying the modern modes of ITC to improve knowledge. They are efficiently applying the ITC tools, like laptop, wireless internet, wifi etc. for obtaining latest and recent knowledge. These changes show qualitative acquisition of knowledge in undergraduate education. Instead of using the typing machines, the undergraduate students use keyboards of laptop, computer and mobile for quick print and for sharing cut-paste and communicating the acquired knowledge from one place to another among themselves.

In this regard language as a means of communication ICT plays a vital role for the students. For communication purposes the students use short messaging service. They use short-cuts in the use of words and languages. e.g. 'U' for "you, '2' for two, 'UR' for you are, 'r' for are and such many words for quick typing and sending messages to others. This applied attitude and approach has become a challenge in qualitative language. Only practical and utility of language won't create lucid and qualitative language in literature, particularly in fiction. The use of short cuts may not communicate the desired and proper message to the receiver. This will create misinformation and misunderstanding, and to avoid this type of events it becomes inevitable to accept the challenges in strengthening the quality of language

Another point of inclusion of new regional words in a language is also important. When we think of English as a link language or language of literature, it is enhancing and becoming more practical with regional words in every geographic area in the world. For example the Marathi people and writers use and include Marathi words while speaking and writing in English, e.g. jungle, verandah, lathi, pakka-bandobast, loot, curry etc. words are generally used 'by marati people and 'bevkuf' , 'sala', 'pagal' and such other words are used by Hindi speakers. The same inclusion of words from the people living in other parts of the world is going on continually. The Japanese , Russians, French and other people add their local word in English communication. That is why, for more understanding of the knowledge of English language its important to take help of ICT.

In case of hardles in understanding the language, ICT and the advanced softwares become useful. Now a day the facilities of Dictaphone, translation system etc. play an efficient role in knowing and realization of the matter from one language to other. it becomes useful for the person who has no idea or knowledge of English language. This technology in the 21st century has created a revolutionary change in communication technology. A deaf and dumb person can read the language and information with the help of ICT, the blind person can listen the matter with the help of headphone, and the help of sign/code language, the physically and mentally impaired persons /students can recognize the meaning and content of the language.

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The use of computers and laptop attached with internet has brought the people of different language groups together With the use of various software's the hurdles and difficulties in knowing the knowledge from other language are removed. From this point of view, efficient role of ICT has become a "must" improving languages and communication In the teaching, learning process the use of blackbord and pieces of chalk has become 'bygone'. The use of smart board , PPT, camera, headphone etc. have become usual things. The use of modern technological means at undergraduate level will strengthen education in the proper direction.

When we consider the changing scenario and developing and enhancing horizons of language, it is the fact that the efficient role of ICT cannot be ignored. But, its use in information and communication will create harmony among different groups of people speaking different languages.

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