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Effect of Biofertilizers on Chlorophyll contents of Maize (*Zea mays* L.) Variety Eco-92

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Abstract: **An attempt has been made to study the effect of different biofertilizers such as Azotobacter and *Phosphate solubilizing bacteria, (PSB)* on chlorophyll content on maize (*Zea mays* L.) variety Eco-92. The experiments were carried out in a randomized complete block design with three replications. The biofertilizers used were Azotobacter (A), phosphate solubilizing bacteria (P) and combine treatment Azotobacter + phosphate solubilizing bacteria (A +P), without treatment was control. The comparative extraction of chlorophylls (Chlorophyll a, chlorophyll b and total chlorophyll) And carotenoids from Eco-92 by 80% acetone as extraction method (Arnon, 1949) was studied. The study relates to the amount of concentration of chlorophyll and carotenoids between the control and treated of maize crop. Investigation revealed that method of Arnon (1949) [1], is simpler method for extracting the pigment molecules along with other methods used for extraction and results showed higher content of chlorophyll-a, Chlorophyll-b, total chlorophyll and Carotenoids in the treated plants in comparison with the control plants. By the application of biofertilizers treatment levels were corresponding to (TA_1), (TP_1),($TA+P_1$) respectively to the treated fodders, little amount of differences were observed in the concentrations of pigments between treated and control plants selected for present study.**

Keywords: **Chlorophyll, carotenoids Azotobacter, *PSB*, Eco -92 etc.**

I. INTRODUCTION

Maize is an important staple food crop, occupies a prominent place among cereals and first rank in terms of productivity and third in total area and production after wheat and rice, while in India it strands fourth ranks next to rice, wheat and Jowar in terms of area and production. Total pigment molecules present in the leaf, are chlorophyll-a, chlorophyll-b and total chlorophyll, carotenoids which are essential for photosynthesis[10],[11]reported that the chlorophyll coloration is related to the amount of nutrients absorbed by the plant from soil, This crucial Pigment also plays role as an index of plant growth and production of organic matter. Biofertilizers contain micro-organism that increases or promotes the important nutrients crucial for overall production the soil [9]. Biofertilizers applied to the soil supply of plant nutrients for crop growth and serve as important instruments in yield development and physiological processes. Moreover, they play important roles in photosynthesis capturing light energy which is converted into chemical energy [3], [15]. Most plants possess chlorophyll a and chlorophyll b which are the main photosynthetic pigments. Chlorophylls and carotenoids are essential pigments of higher plant assimilatory tissues and responsible for variations of color from dark-green to yellow. Carotenoids provide bright coloration, serve as antioxidants, and can be a source for vitamin A activity [4]. N is a key element in chlorophyll, therefore is usually a high correlation between them [13]. Positive correlation of nitrogen and chlorophyll is previously reported by some researchers [7]. The distribution of chlorophyll is the key indicator of crop

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photosynthesis within maize leaves is quite homogenous at a specific growth stage indicator. Chlorophyll content of leaf tissue is a good index of photosynthetic activity [6] and timing of fertilizer application [8], [14].of crop. Chlorophyll content is an indicator for crop growth and development, therefore accurately determining and assessing of chlorophyll concentration is essential [2]. The quantification of chlorophyll and carotenoids provides important information about the effects of environments on plant growth. Chlorophyll concentration usually is a good indicator of plant nutrient stress, photosynthesis and growing periods, the content of chlorophyll in the plant leaves indicates the growth status of the crops, also it is the important condition for exchange of mass and energy from the outside world and therefore real-time monitoring of the content of chlorophyll is a key step to complete crop monitoring and yield estimation [5]. [12].

II. MATERIALS AND METHODS

The chlorophyll and carotenoids contents were quantitatively estimated by Arnon's (1949) [1] method. The results thus obtained were compared with the control.

Sample Collection: The biofertilizers used were Azotobacter (A), phosphate solubilizing bacteria (P) and combine treatment Azotobacter + phosphate solubilizing bacteria (A+P), without treatment was control. For the experimentation viz. to find out the chlorophyll and carotenoids contents in the maize crop treated with biofertilizers (TA_1), (TP_1) and ($TA+P_1$), the leaf samples were collected from the field in fresh and clean polythene bags from the plot in the morning, while bringing the leaf samples to the laboratory, Precautions were taken so as to avoid the mechanical or other damage. All the samples were washed under tap water to remove dust particles and other unwanted particles from the surface of leaves and were then analyzed for the determination of Chlorophyll-a, Chlorophyll-b, total Chlorophyll and Carotenoids.

Extraction of chlorophyll (Arnon, 1949):

The Quantitative estimation of chlorophyll-a, chlorophyll-b and total chlorophyll was carried out by the method of Arnon (1949), while carotenoids were determined by following method. 1g fresh leaf material was taken and homogenized with 80% acetone and centrifuged at 5000 rpm for 5 min. Supernatant was adjusted to 100 ml in the volumetric flask. The absorbance (O.D.) of this extracted solution was measured at 480, 510, 645 and 663λ. From these readings concentrations of chlorophylls and carotenoids pigment were determined by using following formula/equation:

The absorbance (O.D.) of this extracted solution was measured at 480, 510, 645 and 663λ. From these readings concentrations of chlorophylls and carotenoids pigment was determined.

Table 1: Chlorophylls and carotenoids pigment were determined by using following formula/equation:

Solvent	Formula /Equation
80% Acetone	Chlorophyll -a mg/g tissue $= \frac{12.7\,(AR663R) - 2.69\,(AR645R) \times V}{1000} \times W$
	Chlorophyll -b mg/g tissue $= \frac{22.9\,(AR645R) - 4.68\,(AR663R) \times V}{1000} \times W$
	Total chlorophyll mg/g tissue $= \frac{20.2\,(AR645R) + 8.02\,(AR663R) \times V}{1000} \times W$
	Carotenoid mg/g tissue $= \frac{7.6\,(AR480R) - 1.49\,(AR510R) \times V}{1000} \times W$

Where, A = Absorbance at specific wavelengths

V = Final volume of chlorophyll extract in 80% acetone

W = Fresh weight of tissue extracted.

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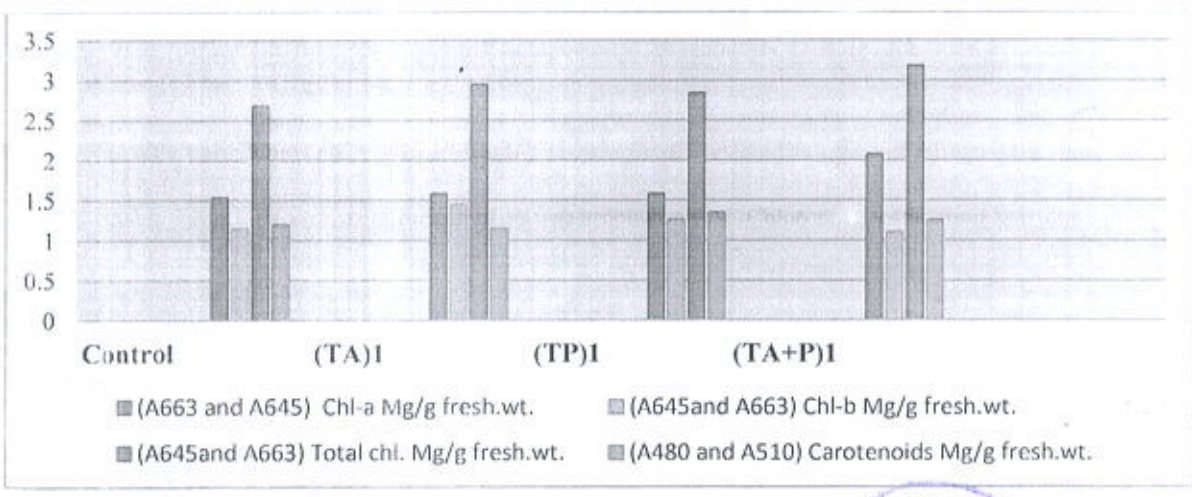
Table 2: The Spectrophotometric determination of absorbance for Chlorophylls and Carotenoids

Eco.92	(A_{663} and A_{645}) Chl-a Mg/g fresh.wt.	($A_{645}$and A_{663}) Chl-b Mg/g fresh.wt.	($A_{645}$and A_{663}) Total chl. Mg/g fresh.wt.	(A_{480} and A_{510}) Carotenoids Mg/g fresh.wt.
Control	1.536	1.149	2.685	1.202
$(TA)_1$ *Azotobacter*	1.585	1.449	2.950	1.149
$(TP)_1$ *Phosphate solubilizing bacteria*	1.585	1.256	2.840	1.349
$(TA+P)_1$ *Azotobacter + Phosphate solubilizing bacteria*	2.079	1.100	3.178	1.255

A=Absorbance, Ch-a=Chlorophyll-a, Ch-b=Chlorophyll-b, Total chl. =Total Chlorophyll.

III. RESULT AND DISCUSSION

Leaf pigment content provides valuable information about the physiological status of crops. The content of foliar pigment varies depending on leaf pigments (chlorophyll and carotenoids) and its relation due to the internal factors and environmental conditions. The chlorophyll and carotenoids contents were quantitatively estimated by Arnon"s (1949) [1] method. The results thus obtained were compared with the control. In this study control and treated plant leaves were used to estimate the chlorophyll content. A total 10 healthy plants of each variety (Eco-92 and African tall) were selected for this study. The extractions of Chlorophyll and carotenoids pigments molecules by 805 acetone method from the treated and control maize variety Eco-92 were measured by spectrophotometer. Chlorophyll estimation was done in the fresh green leaf samples extracted with the acetone solvent the absorbance Reading of chlorophyll extracts were measured in two different wavelengths 645nm and 663 respectively. Based on the absorbance value calculations were made using Arnon's (1949) equation and the amount of chlorophyll a. chlorophyll b, total chlorophyll and carotenoids were estimate and tabulated. (Table: 2) For cultivars (Eco-92) concentration of total chlorophyll (chlorophyll a+b), carotenoids and chlorophyll a/b were ratio significantly different as compared to control. Result showed that, the effect of biofertilizer *Azotobacter* (A), *phosphate solubilizing bacteria* (P) and interaction between them *Azotobacter + phosphate solubilizing bacteria* (A+P) on chlorophyll-a, Chlorophyll-b, total chlorophyll and Carotenoid content of variety Eco-92 in combine treatment of biofertilizer ($TA+P_1$) ,were highest in 2.079, 1.100, 3.178, 1.255 mg/g fresh wt respectively as compared to the chlorophyll-a, Chlorophyll-b, total chlorophyll and Carotenoid content of control plant 1.536,1.149,2.685,1.202 mg/g fresh wt. respectively.



Graph no.1: Effect of biofertilizer on chlorophyll and carotenoids content (mg/g fresh wt.) in Maize variety Eco-92.

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IV. CONCLUSION

It is concluded that, the treatment of biofertilizer chlorophyll-a, Chlorophyll-b, total chlorophyll and Carotenoid content increase the more effectively than the control. The use of biofertilizer influenced the Maize variety Eco-92 positively. The application of biofertilizers as a source in agricultural production, and its proper use is an environmental friendly way of strengthening plant growth and improvement for farmers.

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RESEARCH ARTICLE

ALTERATIONS IN HYDROXYL ION SCAVENGING ACTIVITY IN RAISIN VARIETIES A FUMIGATED WITH SALTS

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ABSTRACT

Grape is one of the most commercial horticultural crops of the world. Grapes are very nutritious, rich source of minerals and different vitamins. It revels from the figure, the Thompson seedless raisins treated with Changes in the hydroxyl ion scavenging potential in the Thompson and Sonaka seedless raisins treated with different chemical compounds on the basis of percent inhibition are presented are shown in Figure. It revels from the figure, that the Thompson seedless raisins treated with K2CO3+sulphur has a greater hydroxyl ion scavenging potential than the raisins treated with other compounds, while Sonaka seedless raisins treated with CaCO3 shows higher OH- ions scavenging potential than the raisins treated with other compounds.

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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 and 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 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 tonnes (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). Nizam of Hyderabad has also introduced some grape varieties into Hyderabad from Persia in the early 20th century (Chadha and Shikhamany, 1999). India is a small producer of grapes, with a world share of less than 2 percent (Barrientos and Kritzinger, 2004). The total average cultivation of grape is near about 80,000 hectares in India and 28,000 hectares in Maharashtra.

MATERIALS AND METHODS

Hydroxyl radical scavenging activity (OH-): The scavenging of the hydroxyl radical was measured according to the method described by Halliwell *et al.* (1987). Methanolic extracts were prepared from raisins. The methods given by Anwar *et al.* (2006) and Sultana *et al.* (2008) described earlier were employed for the preparation of methanolic extracts. The assay mixture contained 0.1 ml of 1 mM EDTA, 0.01 ml of 10 mM $FeCl_3$, 0.1 ml of 10 mM H_2O_2, 0.36 ml of 10 mM Dexoy ribose and 1ml of leaf extract (100 µg/ml), 0.33 ml of potassium phosphate buffer (50 mM, pH 7.4) and 0.1 ml of 1 mM ascorbic acid The mixture was incubated at 37.0C for 1 h. One ml of incubated mixture mixed with 1 ml of 10 % TCA and 1 ml of 0.5 % TBA (in 0.025 M NaOH). The intensity of the pink coloured complex developed measured at 532 nm. The ascorbic (100 µg/ml) acid was used as standard. Scavenging % of the hydroxyl radical was calculated by using the formula,

$$\% \text{ Scavenging activity} = \frac{AC - AE}{AS \times AC} \times 100$$

Where,

AC is the Absorbance of Control
AE is the Absorbance of leaf extract
AS is the Absorbance of standard

RESULTS AND DISCUSSION

Hydroxyl ion content (OH-): Changes in the hydroxyl ion scavenging potential in the Thompson and Sonaka seedless raisins treated with different chemical compounds on the basis of percent inhibition are presented in are shown in Figure 1. It revels from the figure, that the Thompson seedless raisins treated with K_2CO_3+sulphur has a greater hydroxyl ion scavenging potential than the raisins treated with other compounds, while Sonaka seedless raisins treated with $CaCO_3$ shows higher OH- ions scavenging potential than the raisins treated with other compounds. The hydroxyl radical is the most reactive of the reactive oxygen species, and it induces severe damage in adjacent biomolecules (Gutteridge, 1984). The hydroxyl radical can cause oxidative damage to DNA, lipids and Proteins (Spencer *et al.*, 1994). Free radicals and other reactive species are constantly generated *in vivo* both by accidents of chemistry and by specific metabolic reaction. The most important reactions of free radicals in aerobic cells involve molecular oxygen and its radical derivates (superoxide anion and hydroxyl radicals), peroxides and transition metals. Reactive species are thought to play an important role in aging and in the pathogenesis of numerous degenerative or chronic diseases, such as cancer, cardiovascular diseases, diabetes and atherosclerosis (Ames *et al.*, 1993). The scavenging abilities of ascorbic acid and black grape seed extracts on hydroxyl radical inhibition were studied by Al-Muwaly *et al.* (2012), they found that ethanolic extract of black grapes shows higher inhibition ability. Balakrishnan and Kokilavan (2011) studied the scavenging activity of *Cucumis trigonus* fruit extract of against hydroxyl radical was found to be 62.53%. Kumar *et al.* (2008) recorded 62.73 % Percentage of H_2O_2 scavenging activity of *Citrullus* fruits. It is well known that the grape skins and seeds, waste products generated during wine and grape juice processing, are rich sources of polyphenol (Murthy *et al.*, 2002). In the present investigation also Thompson and Sonaka raisins showed higher scavenging ability of the hydroxyl ions which may be related to its high polyphenol content. This might be benificil to prevent various degenerative diseases induced due to various reactive oxygen species.

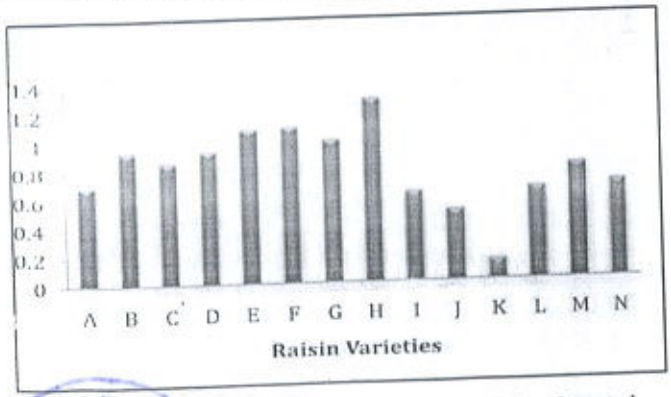

Fig. 1. Changes in hydroxyl ion scavenging activity of treated raisin varieties

A= Thompson seedless treated with $MgCO_3$, B= Sonaka seedless treated with $MgCO_3$, C=Thompson seedless treated with K_2CO_3, D=Sonaka seedless treated with K_2CO3, E=Thompson seedless treated with $CaCO_3$, F=Sonaka seedless treated with $CaCO_3$, G=Thompson seedless treated with K_2CO_3+ sulphur, H= Sonaka seedless treated with K_2CO_3+ sulphur, I=Thompson seedless treated with K_2CO_3+ sulphur + coating, J=Sonaka seedless treated with K_2CO_3+ sulphur +coating, K=Thompson seedless treated with K_2CO_3+ sulphur + coating + Mango essence, L=Sonaka seedless treated with K_2CO_3+ sulphur +coating + Mango essence, M=Thompson seedless treated with K_2CO_3+ sulphur + coating +Orange essence, N=Sonaka seedless treated with K_2CO_3+ sulphur +coating + Orange essence

Conclusion

The result of hydroxyl ion scavenging potential assay suggest that the components within the Thompson seedless raisins treated with K_2CO_3+ sulphur showed a greater hydroxyl ion scavenging potential than the raisins treated with other compounds, while Sonaka seedless raisins treated with $CaCO_3$ showed higher OH- ions scavenging potential than the raisins treated with other compounds. Thompson and Sonaka raisins showed higher scavenging ability of the hydroxyl ions which may be related to its high polyphenol content. Thus, the raisins of both the varieties exhibited potent antioxidant effect by inhibiting free radicals which can be serving as potent source for the cancer chemo protective effects. This might be beneficial to prevent various degenerative diseases induced due to various reactive oxygen species. The higher antioxidant activity may serve as a new potential source of nutraceuticals and functional foods.

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EFFECT OF FERRIC REDUCING ANTIOXIDANT PLASMA ACTIVITY ON TWO VARIETIES OF GRAPES

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ABSTRACT: Grape is one of the most commercial horticultural crops of the world. Grapes are very nutritious, rich source of minerals and different vitamins. It revels from the figure that the FRAP activity of Sonaka seedless treated with + sulphur and Thompson seedless treated with K_2CO_3+ sulphur + coating, is greater than the other raisins. It is also observed that the all the treatment shows quit significant higher FRAP activity in both seedless varieties.

Keywords: FRAP, Thompson seedless, Sonaka seedless.

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 and 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 increased production of table grapes has a great potential to produce raisins with minimum losses of fresh fruits (Telis et al., 2004.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). Nizam of Hyderabad has also introduced some grape varieties into Hyderabad from Persia in the early 20th century (Chadha and Shikhamany, 1999). India is a small producer of grapes, with a world share of less than 2 percent (Barrientos and Kritzinger, 2004). The total average cultivation of grape is near about 80,000 hectares in India and 28,000 hectares in Maharashtra.

MATERIAL AND METHODS :

The ferric reducing / antioxidant power (FRAP) assay was used to measure the total antioxidant power of raisin. In the FRAP assay, reductants (antioxidants) in the sample reduce Fe3+/tripyridyltriazine complex, present in stoichiometric excess, to the blue colored ferrous form, with an increase in absorbance at 593 nm. Antioxidant activity assays were performed by the method described by Benzie and strain, (1996). The results were expressed as ascorbic acid equivalent antioxidant capacity (AEAC).

RESULT AND DISCUSSION :

The ability of raisins to chelate iron (II) is presented in Figure . The Thompson seedless raisins treated with K2CO3+sulphur+coating+ Orange essence are capable of high chelating iron (II) than the thopmson seedless raisins treated with other treatments. Sonaka seedless treated with +sulphur shows higher chelating activity than of the other Sonaka seedless raisins. One of the mechanisms of antioxidative action is chelation of transition metals, thus preventing catalysis of hydroperoxide decomposition and Fenton-type reactions (Gordon, 1990). In the presence of chelating agents, the complex formation is disrupted with the result that the red colour of the complex is decreased. Measurement of colour reduction, therefore, allows the estimation of the chelating activity of the coexisting chelator. According to Aboul-Enein et al. (2003), the transition metal ion, Fe2+ possess the ability to move single electrons by virtue of which it can allow the formation and propagation of many radical reactions, even starting with relatively non-reactive radicals. The greater ferrous ion chelating activity in methanolic extract of Crataegus pentagyna and Sambucus ebulus was determined by Ebrahimzadeh et al., (2008). Ndhlala et al., (2006) noticed that velvet sweet-berry has highest reducing powers as compared to red ivory which are higher

than in the previously recorded in jackal berry by them. Al- Muwaly et al., (2012) reported 81% of inhibition in black grapes.

The extract obtained from Sonaka seedless raisins treated with K2CO3+sulphur and Thompson seedless raisins treated with K2CO3 + sulphur+ coating+ orange essence showed the most active extract interfered with the formation of ferrous and ferrozine complex, suggesting that it has greater chelating activity and captures ferrous ion before ferrozine than the other treatments. Transition metal ions, catalyses the initiation and decomposition of hydroperoxides, contribute to lipid oxidation which is the main source of degradation of food products (Antolovich et al., 2002). The higher levels of ferrous ion chelating ability of the K2CO3+sulphur treated raisins will certainly improve the antioxidant potential of raisins and also helps to protect the membranes of raisins from lipid peroxidation. Which will helps to improve the texture of raisins. Hence, the metal chelating activity of raisins can be of potential interest in the food industry.

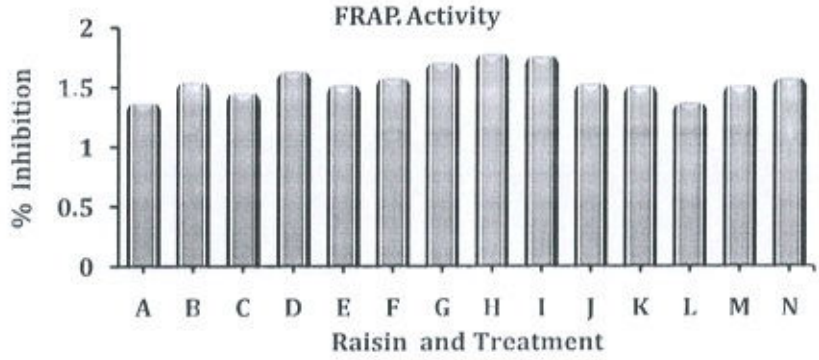

Fig. 1: Changes in FRAP activity of treated raisin varieties.

A = Thompson seedless treated with MgCO3, B= Sonaka seedless treated with MgCO3, C=Thompson seedless treated with K2CO3, D=Sonaka seedless treated with K2CO3, E=Thompson seedless treated with CaCO3, F=Sonaka seedless treated with CaCO3, G=Thompson seedless treated with K2CO3+ sulphur, H= Sonaka seedless treated with K2CO3+ sulphur, I=Thompson seedless treated with K2CO3+ sulphur + coating, J=Sonaka seedless treated with K2CO3+ sulphur +coating, K=Thompson seedless treated with K2CO3+ sulphur + coating + Mango essence, L=Sonaka seedless treated with K2CO3+ sulphur +coating + Mango essence, M=Thompson seedless treated with K2CO3+ sulphur + coating + Orange essence, N=Sonaka seedless treated with K2CO3+ sulphur +coating + Orange essence

SUMMARY AND CONCLUSION :

The FRAP activity of Sonaka seedless treated with K2CO3+ sulphur and Thompson seedless treated with K2CO3+ sulphur + coating, showed greater activity than the other raisins, suggesting that treatment are more suitable and may store the polyphenols from the natural degeneration have very high primary antioxidant activity. FRAP assay suggests that the both the raisins exhibits greater reducing ability. The availability of polyphenols in the raisins of both the species seems to be an important factor dictating the antioxidant and free-radical- scavenging capacity of fruits. The antioxidant efficiency determined by the present FRAP assay depends on the redox potentials of the Phenolic compounds present in the fruits, characterized by the complexity of their molecules. From our findings, it is apparent that the reducing ability of polyphenols, as determined by the FRAP assay, seems to depend on the degree of hydroxylation and extent of conjugation of the phenolic compounds available in the raisins.

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Lecideopsella arnaudii (C. and M. Moreau) Dopare and Patil *Comb. Nova.* A Black Mildew from Western Ghats -I

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ABSTRACT: *In present paper a species of Lecideopsella from Loculoascomycetes is described as comb. nova. viz. Lecideopsella arnaudii (C. and M. Moreau), Dopare and Patil comb. nova. The species is reported on new host.*

Keywords: *Black mildew, Fungi, Lecideopsella, Loculoascomycetes, Taxonomy.*

INTRODUCTION :

Genus *Lecideopsella* Hohnel. Was established by Hohnel (1909), However genera like *Gymnopeltis* Stev. and *Plectomyriangium* Moreau were merged into genus *Leptophyma* Sacc. by Arx and Muller (1975) in their re-evaluation of bitunicate ascomycetes. But Eriksson and Hawksworth (1987) treated *Leotophyma* Sacc. invalid and not classified in their classification due to its uncertain affinity and kept into a valid genus *Lecideopsella* Hohnel.

Plectomyriangium arnaudii (C. and M. Moreau) was reported on *Lophira alata*. This genus is merged in *Lecideopsella* by Hohnel (1909) The present collection matches with taxonomical description (as reported by C. and M. Morreau, on *Lophira alata*) as *Plectomyriangium arnaudii.* Therefore, the genus of present collection is treated as *Lecidceopsella* and species is described as *Lecideopsella arnaudii*(C. and M. Moreau)as combination nova.

MATERIAL AND METHODS :

The diseased plant material was collected from Amboli forest and deposited in paper envelopes after the host identification. Specimen was examined by usual laboratory methods by staining with cotton blue, melzers reagent etc. The specimen identified by referring recent and most upto date Literature. The specimen was deposited in the department herbarium of college as well as in the H.C.I.O.New Delhi.

RESULT AND DISCUSSION :

Lecideopsella arnaudii (C. and M. Moreau) Dopare and Patil combination nova.
(Syn=*Plectomyriangium arnaudii* C. and M. Moreau), Rev. Mycologia, Paris, N.S. 24 : 348-355,1959)

Free mycelium absent, ascomata hypophyllous, 290-540 µm in diameter; asci globose to ovoid or spherical, sessile, 8-spored, 37-54 × 41-50 µm ascospores elliptical,1-septate, hyline, smooth, cells 2-3 guttulate, 20-29×7-9µm., conidial state absent.

Holotype- On living leaves of *Diospyros candolleana* wight. (Ebenaceae), Amboli, M. S. Leg. S.R.Yadav, Isotype- H.C.I.O. 41010.

Table 1: Comparative account of *Lecideopsella* and present collection.

	Ascomata µm in Diameter	Asci µm	Ascospores µm	Host
Present Collection	Hypophyllous 290 × 540	37-54 ×41-50	20-29×7-9	*Diospyros candolleana*
(Original) Syn= *Plectomyriangium arnaudii* C. and M. Moreau.	350	40-50	23-27 ×9-11	*Lophira alata*

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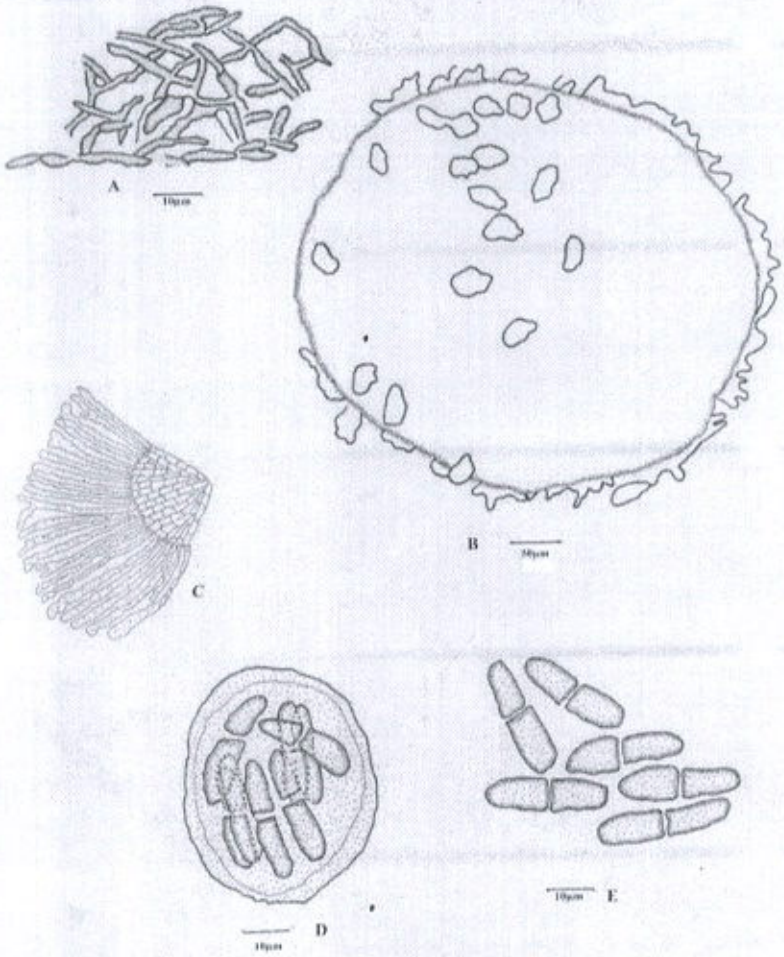

Fig. 1. *Lecideopsella armandii*
A. Mycelium; B. Entire thyriothecium; C. Part of thyriothecium; D. Ascus; E. Ascospores

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RESEARCH ARTICLE

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Ipomoea fulvicaulis (Convolvulaceae), a new record for India

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Abstract: *Ipomoea fulvicaulis* (Hochst. ex Choisy) Boiss. ex Hallier f. (Convolvulaceae), recently collected from Nandi hills of Karnataka state, is reported here as a new record for the flora of India. A detailed taxonomic account, including description, illustrations and photographs are provided to facilitate easy identification.

Keywords: *Ipomoea fulvicaulis*, Karnataka, New Record.

INTRODUCTION

Ipomoea L. is the largest and widely distributed genus of the family Convolvulaceae. Worldwide the genus is represented by 650 species having high distributional range in the tropical and sub-tropical regions (Mabberley, 2017). In India the genus is represented by *c.* 63 species (Shimpale *et al.*, 2014) with 4 endemic taxa (Singh *et al.*, 2015). During a taxonomic revision of the genus *Ipomoea* for India, the authors collected some interesting specimens from Nandi hills of Chikkaballapur District, Karnataka State of Peninsular India. After critical examination of specimens, scrutiny of relevant literature (Clarke, 1883; Cooke, 1905; Verdcourt, 1963; Johari, 1983; Goncalves, 1987; Biju, 1997; Hyde & Wursten, 2011; Wood *et. al.*, 2015) and consultation of protologues and types, it was identified as *I. fulvicaulis* (Hochst. ex Choisy) Boiss. ex Hallier f., a species reported previously from Tropical East Africa, Botswana, Ethiopia, Malawi, Mozambique, Zambia and Zimbabwe. This taxon is so far not reported from Indian subcontinent and therefore it forms a new distributional record for the flora of India. The species is morphologically close to *I. barlerioides* (Choisy) Benth. ex C.B. Clarke in having perennial habit, prostrate or twining hirsute stems and ovate-oblong, hairy leaves but differs from it in having short peduncle (0.5–0.7 cm long), sessile to sub-sessile flowers, 3–3.5 cm long corolla and summer flowering against long peduncles (3–8 cm long), distinctly pedicellate flowers, 5–6 cm long corolla and monsoon flowering in *I. barlerioides* (Table–1). A detailed description, illustrations and relevant notes are provided to facilitate easy recognition of this species in the field.

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Ipomoea fulvicaulis (Hochst. ex Choisy) Boiss. ex Hallier f., Bot. Jahrb. Syst. 18(1–2): 128. 1893; Verdc., Fl. Trop. E. Africa. 1: 97. 1963; Goncalves, Flora Zambesiaca 8(1): 9. 1987; Chapano & Mugarisanwa, Pl. Matobo District, Zimbabwe 22. 2003. *Aniseia fulvicaulis* Hochst. ex Choisy Prodr. DC., 9: 431. 1845. **Type:** ETHIOPIA, Abessinia, 12.01.1893, *W. Schimper* 270 (iso GOET005696 digital image!) Figs. 1 & 2.

Perennial herbs with woody rootstock. Stems slender, spreading, much branched, up to 1 m long, brownish pubescent. Leaves oblong to elliptic-ovate, 2–3 × 1.5–2 cm, oblong to emarginate at apex, entire, cordate to truncate at base, densely pubescent on both surfaces, sparsely pubescent at maturity; petioles 1–2 cm long, densely pubescent. Inflorescences cymose; peduncles *c.* 0.8 cm long, hairy; bracts ovate, 0.5–0.6 × 0.4–0.5 cm, acuminate, hairy out, glabrous in, pink. Flowers sessile or sub-sessile. Sepals 5, unequal, outer 2 ovate, 1.5–1.7 × 0.6–0.7 cm, middle 1 lanceolate, 1.5–1.6 × 0.5–0.6 cm, inner 2 linear, 1.5–1.6 × 0.2–0.4 cm, bristly hairy out, glabrous in. Corolla funnel–shaped, 3–3.5 cm long, pink; tube 2–2.5 cm long, pubescent out, glabrous in; lobes 1.2–1.5 cm

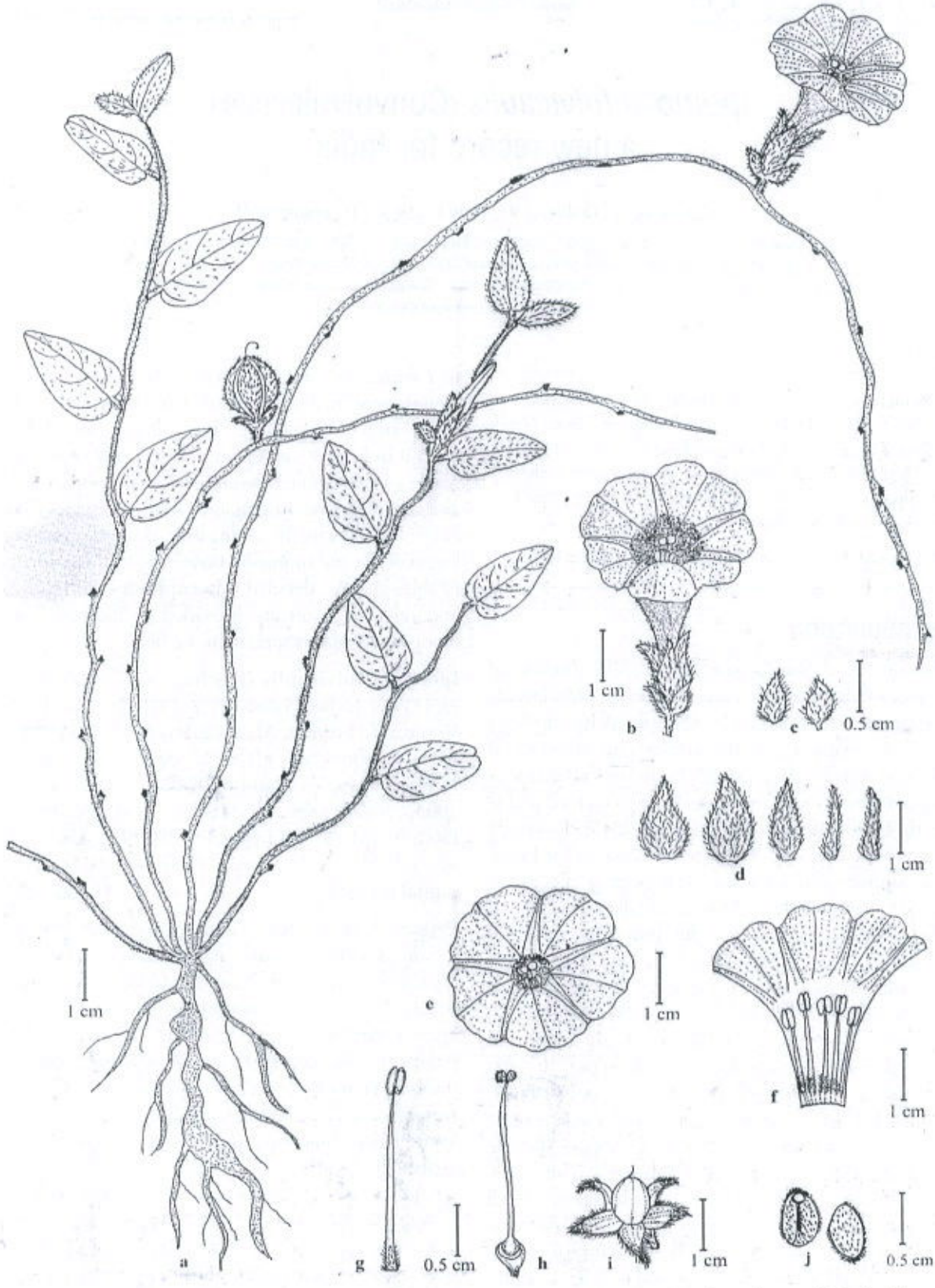

Fig. 1. *Ipomoea fulvicaulis* (Hochst. ex Choisy) Boiss. ex Hallier f.: a. Habit; b. Flower; c. Bracts; d. Sepals; e. Corolla top view open; f. Corolla split open; g. Stamen; h. Gynoecium; i. Capsule; j. Seeds.

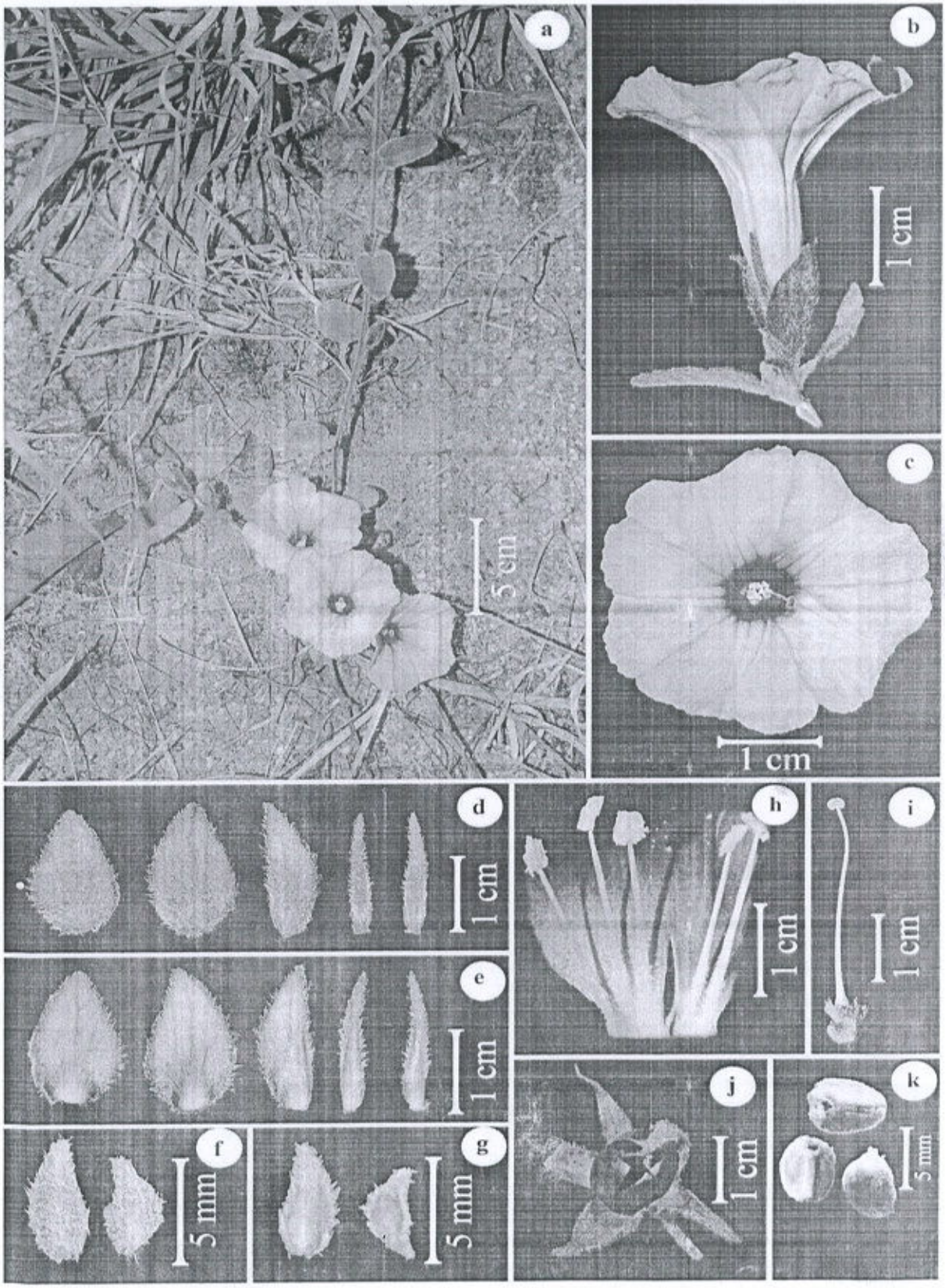

Fig. 2. *Ipomoea fulvicaulis* (Hochst. ex Choisy) Boiss. ex Hallier f.: a. Habit; b. Flower; c. Flower top view; d. Sepals–abaxial view; e. Sepals–adaxial view; f. Bracts–abaxial view; g. Bracts–adaxial view; h. Dissected corolla showing stamens; i. Gynoecium; j. Capsule; k. Seeds.

Table 1. Taxonomic differences between *I. barleriodes* and *I. fulvicaulis*

Characters	*Ipomoea barlerioides* (Choisy) Benth. ex C.B. Clarke	*Ipomoea fulvicaulis* (Hochst. ex Choisy) Boiss. ex Hallier f.
Peduncle	3–8 cm long	0.5–0.8 cm long
Pedicel	0.6–1.2 cm long	Absent or 0.2 cm long
Corolla	6–8 cm long	3–3.5 cm long
Stamens	Filaments attached up to mouth of corolla tube	Filaments attached only at base of corolla tube
Seeds	0.8–1.2 × 0.6–0.8 cm	0.5–0.7 × 0.4–0.5 cm
Phenology	September to November	January to March

long, pink. Stamens sub-equal; filaments included, 1.7–2 cm long, attached to the base of corolla tube, hairy at base; anthers 2-celled, dehiscing longitudinally; pollen grains globular, pantoporate, echinate. Carpels 2, fused; ovary ovoid, glabrous, *c.* 0.2 × 0.1 cm; style 2.8–3 cm long; stigma bi-lobed, slightly exserted, pink. Capsules globose, 0.8–1.2 × 0.5–0.9 cm, glabrous, brown. Seeds ovoid, 0.5–0.7 × 0.4–0.5 cm, brown pubescent, hairy at margins.

Flowering & fruiting: January–March.

Habitat: In rocky crevices at elevation of 1380 to 1420 m, mostly associated with *Cymbopogon martini* (Roxb.) Watson, *Crotalaria albida* B.Heyne ex Roth var. *kangrensis* Ansari, *Shorea roxburghii* Don, *Indigofera mysorensis* Rottler ex DC and *Aristida setacea* Retz.

Distribution: East Tropical Africa, Botswana, Ethiopia, Malawi, Mozambique, Zambia, Zimbabwe (Hilliard, 1983) and now in India.

Specimens examined: INDIA, **Karnataka,** Chikkaballapur district, Nandi Hills, 13°21'32.796"N, 77°40'35.22"E, 03.03.2019, *Kattee, Shimpale & Dalavi* AVK14 (SUK!). **Tamil Nadu,** Tirunelveli district, Kalkkad (Kalakkad), 16.02.1913, *D. Hooper & M.S. Ramaswami* 311430 (CAL!).

Notes: The species is rare, *c.* 50 individuals were located in the Nandi hills. It was also collected previously by Hooper and Ramaswami in 1913 from Kalakkad, Tirunelveli district of Tamil Nadu state but misidentified as *Ipomoea barlerioides* (Choisy) Benth. ex C.B. Clarke. The population from Nandi Hills shows some variations from the protologue like short peduncle, ovate bracts and tubular funnel-shaped corolla but these variations may be due to the change in the habitat.

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RESEARCH ARTICLE

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Notes on the occurrence of *Ipomoea acanthocarpa* and *Ipomoea laxiflora* (Convolvulaceae) in India

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Abstract: *Ipomoea acanthocarpa* (Choisy) Hochst. ex Schweinf. & Asch. an African species is reported for the first time from India. *Ipomoea laxiflora* H.J.Chowdhery & Debta hitherto recorded from North India, is reported for the first time from Peninsular India. Detailed description, illustrations, photographs and taxonomic notes for both the species are provided.

Keywords: Convolvulaceae, India, *Ipomoea acanthocarpa*, *I. laxiflora*, New record.

Introduction

Ipomoea L., with about 650 species, is the largest genus of the family Convolvulaceae (Mabberley, 2017). It is distributed in the tropical and subtropical regions of the world. In India the genus is known to have *c.* 63 species (Shimpale *et al.*, 2014). As a part of the ongoing taxonomic revision on the genus *Ipomoea* in India, authors collected two interesting species, one from Gujarat state and the other from Maharashtra state. After critical examinations and scrutiny with pertinent literature (Hooker, 1883; Cooke, 1905; Hutchinson & Dalziel, 1972; Shah, 1978; Johri, 1983; Fang & Staples, 1995; Biju, 1997; Wood *et al.*, 2015) and herbarium consultation, it was concluded that the species collected from Valsad district of Gujarat state is *I. acanthocarpa* (Choisy) Hochst. ex Schweinf. & Asch., a species so far reported from Tropical Africa. Hence, the present collection forms a new distributional record for India. While the species collected from Maharashtra state is *I. laxiflora* H.J.Chowdhery & Debta, a recently described Himalayan species endemic to North India (Chowdhery & Debta, 2009; Singh *et al.*, 2015). The present collection outside its type locality indicate an extended distriution in Peninsular India. A detailed description for both the species along with colour photoplates, illustrations and relevant notes are provided to facilitate easy identification.

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Ipomoea acanthocarpa (Choisy) Hochst. ex Schweinf. & Asch., Beitr. Fl. Aethiop. 277. 1867. *Calonyction acanthocarpum* Choisy, Prodr. 9: 346. 1845. *Type*: SUDAN, *s.l., s.d., C.G.T. Kotschy* 269. (holo P00434126 digital image!; iso K000097123 digital image!). Figs. 1 & 2

Perennial climbers with milky latex, *c.* 5 m long. Stems twinning, angular, rooting at nodes, tuberculate, brownish when mature; branches hairy at the base. Leaves 5–10 × 6–12 cm, entire, glabrous, cordate at base, acuminate at apex; margins entire or undulate; veins distinct on both surfaces. Petioles 6–12 cm long, tubercled at base, glabrous. Cymes monochasial, axillary, usually 1–5-flowered; peduncles 2–5 cm long, swollen at tip, hairy at base. Pedicels 0.6–1 cm long, elongated in fruit, slightly tubercled, glabrous; bracts small, caducous, *c.* 2 × 1 mm, with distinct veins, glabrous. Sepals 5, sub-equal, 0.6–1 × 0.4–0.8 cm, faintly veined; outer two sepals verrucate, brownish green, smaller; inner three sepals slightly larger than outer, smooth, papery along margins, glabrous. Corolla 5-lobed, 2–3 cm long, funnel-shaped; tube *c.* 1.5–2 cm long, dark purple inside; lobes *c.* 2 cm long, apiculate, glabrous, mid-petaline bands pink-purple, shallowly apiculate. Stamens 5; filaments sub-equal, 5–8 mm long, included, attached at *c.* 2 mm above the base of tube, hairy at base; anthers *c.* 0.3 cm long, basifixed. Ovary ovoid, *c.* 3 × 1 mm, glabrous, 4-locular, one ovule in each locule; style *c.* 6 mm long, slender, gradually narrowed towards the apex, glabrous; stigma *c.* 0.2 × 0.1 cm, bilobed. Capsules sub-globose to ovoid,

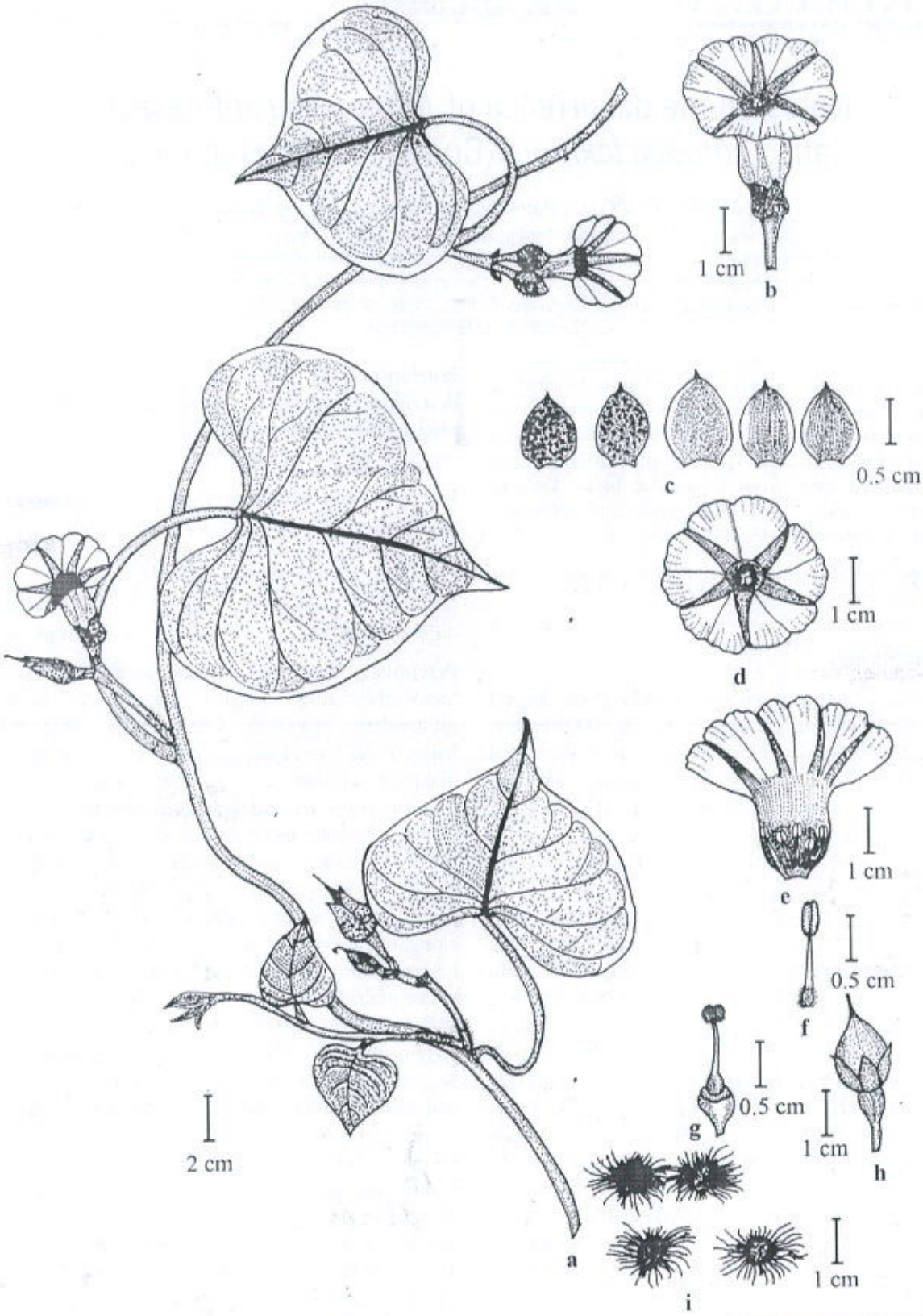

Fig. 1. *Ipomoea acanthocarpa* (Choisy) Hochst. ex Schweinf. & Asch.: **a**. Flowering twig; **b**. Flower; **c**. Sepals; **d**. Corolla front view; **e**. Corolla split open; **f**. Stamen; **g**. Gynoecium; **h**. Capsule; **i**. Seeds.

9–10 mm long, glabrous, brownish, 4-valved, mucronate with persistent stylar beak; stylar beak *c.* 7 mm long, with spinous apex; seeds 4, *c.* 5.5 mm long, grey, pilose at margins.

Flowering & fruiting: October–March.

Habitat: Along roadsides usually in muddy soil along with *I. triloba* L. and *I. muricata* (L.)Jacq. During the present investigation 60–70 individuals were observed in a single population.

Distribution: Tropical Africa, now in India.

Specimen examined: INDIA, **Gujarat**, Valsad district, Makadban Village, 04.10.2017, *Kattee & Shimpale* 1404, 1405 (The New College Herbarium, SUK!).

Ipomoea laxiflora H.J.Chowdhery & Debta, Indian J. Forest. 32(1): 120. 2009. Singh *et al.*, Indian J. Forestry 34(3): 335–338. 2011. *Type*: INDIA, **Uttarakhand,** Dehra Dun district, Kaulagarh Road, Botanical Survey of India Campus, 750 m, 28.09.2008. *H.J. Chowdhery* 108601 (holo BSD!; iso CAL0000018586!). Figs. 3 & 4

Annual climbers, up to 5 m. long; stems purplish green, quadrangular, sparsely hairy at nodes. Leaves variable, simple, entire, 5–12 × 5–10 cm, glabrous, distinctly trilobed; lobes shallow or sharp; petioles *c.* 12 cm long, glabrous. Cymes lax, 3–7-flowered; peduncles 6–8 cm long, slightly verrucose, swollen at apex; pedicels 2.5–3 mm long, quadrangular, glabrous, elongated in fruits. Bracts linear, caducous, *c.* 3–4 mm long. Calyx 5, sub-equal, 0.8–1 × 0.2–0.3 cm, faintly veined, purplish at apex, glabrous. Corolla funnel-shaped, *c.* 1.5 × 1.2 cm; limb 5-lobed; lobes apiculate. Stamens 5; filaments unequal, included, 0.7–0.8 cm long, hairy at base. Ovary *c.* 1 × 1.5 mm, glabrous;

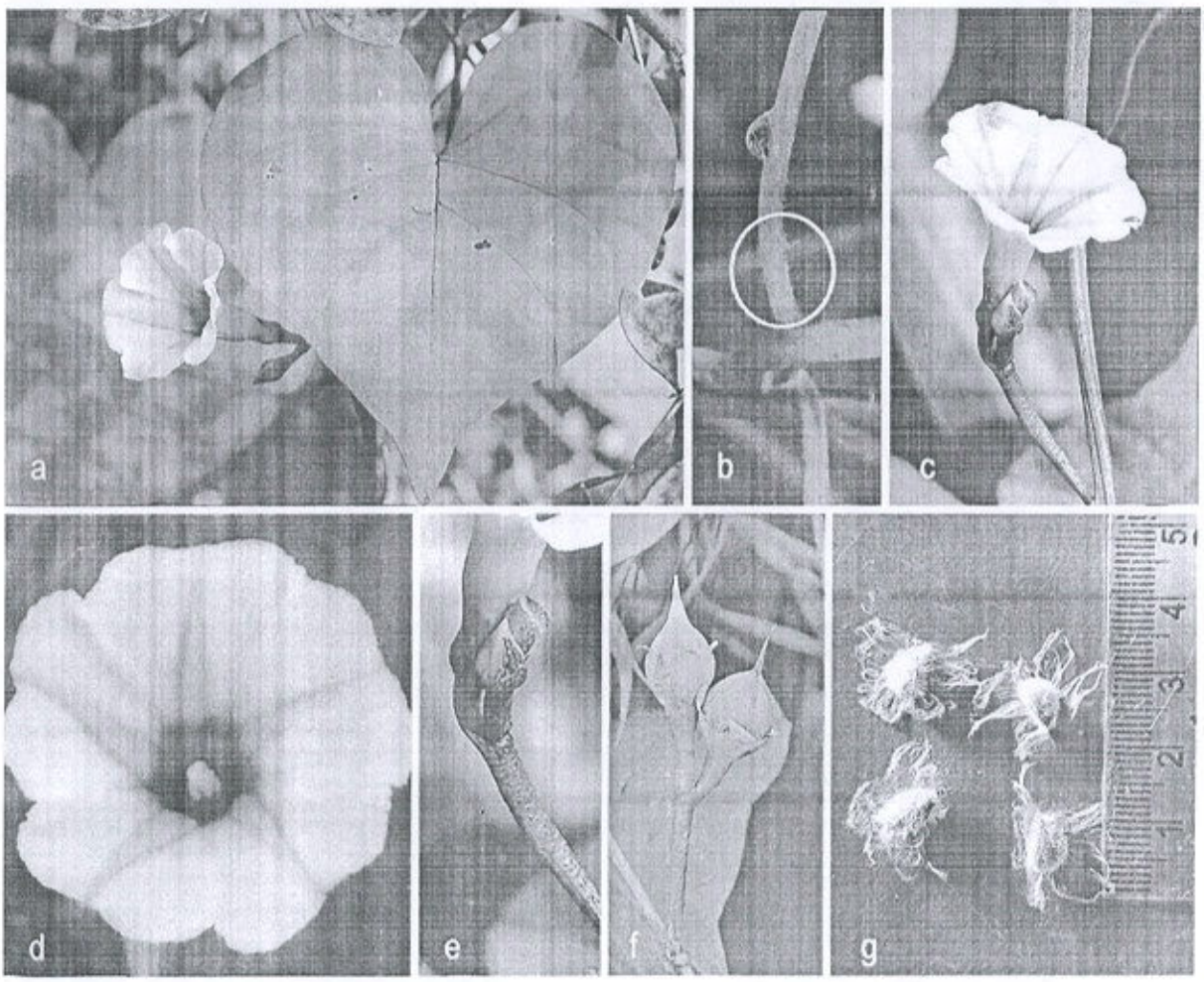

Fig. 2. *Ipomoea acanthocarpa* (Choisy) Hochst. ex Schweinf. & Asch.: a. Flowering twig; b. Axillary branch with hairy base; c. Flower; d. Corolla front view; e. Sepals; f. Capsules; g. Seeds.

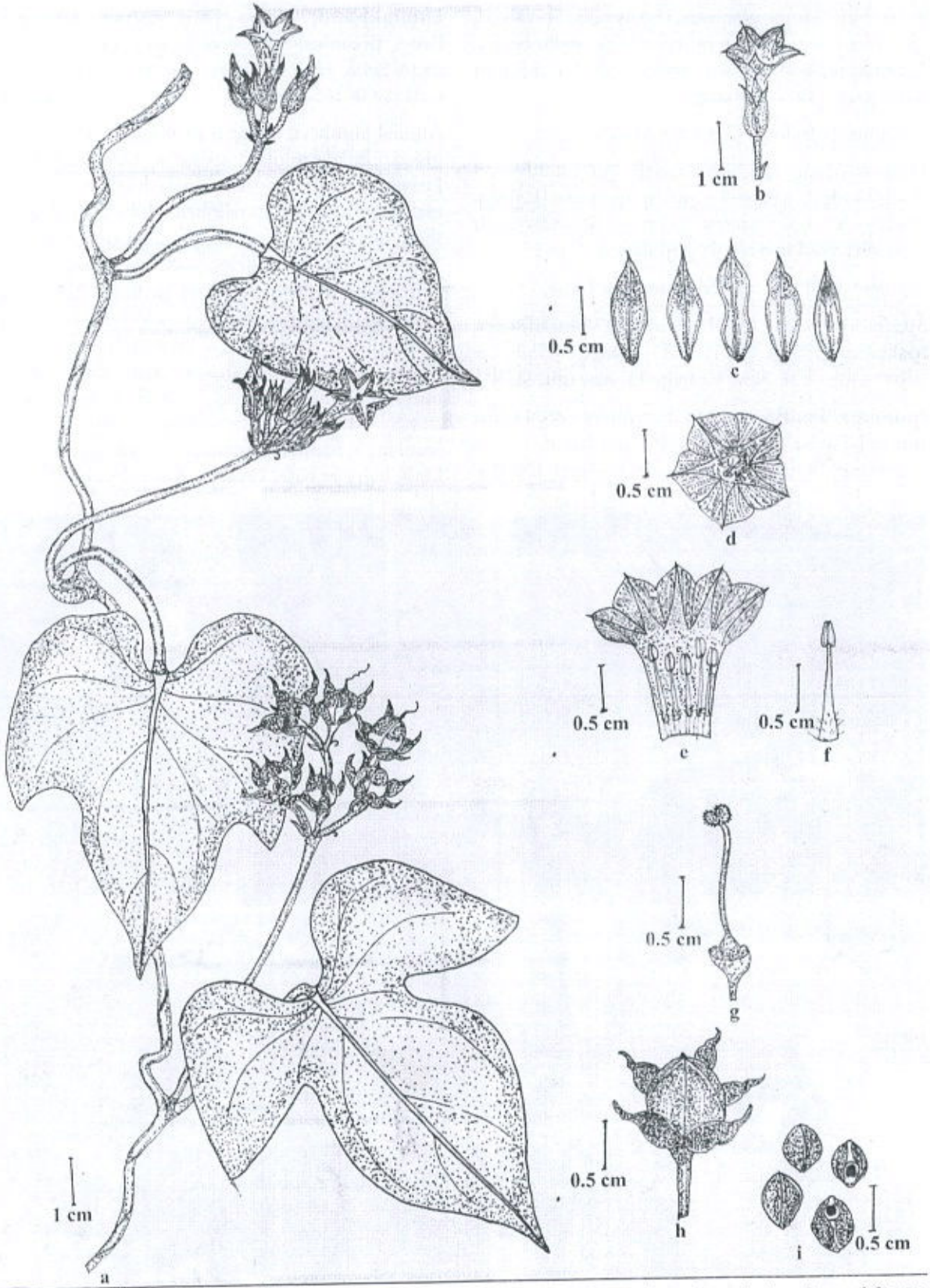

Fig. 3. *Ipomoea laxiflora* H.J.Chowdhery & Debta: **a.** Flowering twig; **b.** Flower; **c.** Sepals; **d.** Corolla front view; **e.** Corolla split open; **f.** Stamen; **g.** Gynoecium; **h.** Capsule; **i.** Seeds.

style *c.* 1 cm long; stigma unlobed or 2-lobed. Capsules ovoid, *c.* 5 × 6 mm, 4-valved, with purple tinge when young, glabrous; seeds *c.* 4 × 4 mm, brownish-black, glabrous.

Flowering & fruiting: September–October.

Distribution: India.

Specimens examined: INDIA, Maharashtra, Kolhapur district, Ichalkaranji, 02.10.2016, *Kattee & Shimpale* 1541, 1542, 1543; Gadchiroli district, Gadchiroli, 15.10.2016, *Kattee & Shimpale* 1544, 1545 (The New College Herbarium!, SUK!).

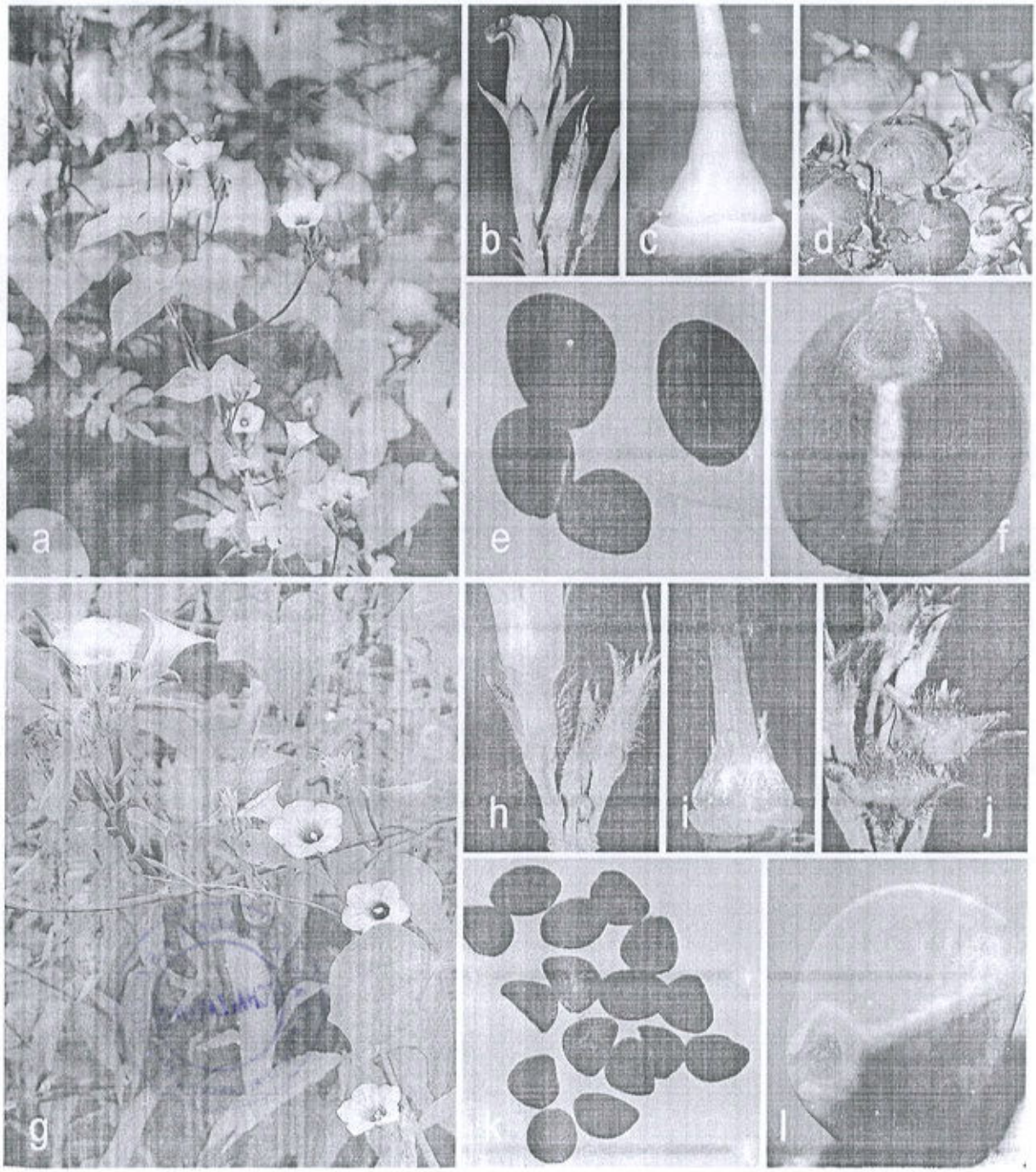

Fig. 4. *Ipomoea laxiflora* H.J.Chowdhery & Debta (a-f): a. Habit; b. Sepals; c. Ovary; d. Capsules; e. Seeds; f. Seed-enlarged view. *Ipomoea triloba* L. (g-l): g. Habit; h. Sepals; i. Ovary; j. Capsules; k. Seeds; l. Seed-enlarged view.

Table 1. Comparison of distinguishing characters of *I. laxiflora* and *I. triloba*

Character	*I. triloba* L.	*I. laxiflora* H.J.Chowdhery & Debta
Cymes	Densely flowered	Laxly flowered
Ovary	Densely pubescent	Glabrous
Stigma	2-lobed	Unlobed or slightly 2-lobed
Fruit	Bristly hairy	Glabrous

Notes: This species is close to *I. triloba*, a wide spread species, the differences between them are given in Table 1. The specimens collected from Maharashtra state show variation in leaf size, inflorescence (from solitary to 5–7-flowered) and stigma slightly bilobed.

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Effect of Biofertilizers on Chlorophyll Contents in Maize (*Zea Mays* L.) Variety African Tall

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ABSTRACT

An attempt has been made to study the effect of different biofertilizers such as *Azotobacter* and Phosphate solubilizing bacteria (PSB) on chlorophyll content of maize variety African Tall. The experiments were carried out in a randomized complete block design with three replications. The biofertilizers used were *Azotobacter* (A), phosphate solubilizing bacteria (P) and combine treatment *Azotobacter* + phosphate solubilizing bacteria (A + P), without treatment was control. The comparative extraction of chlorophylls (Chlorophyll a, chlorophyll b and total chlorophyll) and carotenoids from maize was studied by using 80% acetone as extraction method. The studies relate to the amount of concentration of chlorophyll and carotenoids between the control and treated of maize crop. Investigation revealed that method of Arnon is simple method for extracting the pigment molecules along with other methods used for extraction and results showed higher content of chlorophyll-a, Chlorophyll-b, total chlorophyll and Carotenoids in the treated plants in comparison with the control plants. By the application of biofertilizers treatment levels were corresponding to (TA_1), (TP_1), ($TA+P_1$) respectively to the treated fodders, little amount of differences were observed in the concentrations of pigments between treated and control plants selected for present study.

1. Introduction

Maize is an important staple food crop, occupies a prominent place among cereals and first rank in terms of productivity and third in total area and production after wheat and rice while in India it strands fourth ranks next to rice, wheat and Jowar in terms of area and production (IITA, 2006). Total pigment molecules present in the leaf, are chlorophyll-a, chlorophyll-b and total chlorophyll, carotenoids which are essential for photosynthesis. Follet et al. (1981) reported that the chlorophyll coloration is related to the amount of nutrients absorbed by the plant from soil. Biofertilizers applied to the soil, supply plant nutrients for crop growth and serve as important instruments in yield development and physiological processes. Most plants possess chlorophyll a and chlorophyll b as the main photosynthetic pigments (Young and Britton, 1993).

Chlorophylls and carotenoids are essential pigments of higher plant assimilatory tissues and responsible for variations of color from dark-green to yellow. Moreover, they play important roles in photosynthesis capturing light energy which is converted into chemical energy (Bauernfeind, 1981). Carotenoids provide bright coloration, serve as antioxidants, and can be a source for vitamin A activity (Britton et al., 1995).

Nitrogen (N) is a key element in chlorophyll, therefore there is usually a high correlation between them (Schepers et al., 2005). Positive correlation of nitrogen and chlorophyll is previously reported by some researchers (Ding et al., 2005; DaMatta et al., 2002). The distribution of chlorophyll is the key indicator of crop photosynthesis within maize leaves is quite homogenous at a specific growth stage indicator. Chlorophyll content of leaf tissue is a good index of photosynthetic activity (Chowdhury and Kolari, 2003) and timing of fertilizer application (Haboudane et al., 2002; Wu et al. 2008) of crop. This crucial pigment also plays role as an index of plant growth and production of organic matter (Lahai et al. 2003).Chlorophyll content is an indicator for crop growth and development, therefore accurate determining and assessing of chlorophyll concentration is essential (Ramani et al., 2007).

The quantification of chlorophyll and carotenoids provides important information about the effects of environments on plant growth (Schlemmer et al., 2005). Chlorophyll concentration usually is a good indicator of plant nutrient stress, photosynthesis and growing periods, the content of chlorophyll in the plant leaves indicates the growth status of the crops, also it is the important condition for exchange of mass and energy from the outside world and therefore real-time monitoring of the content of chlorophyll is a key step to complete crop monitoring and yield estimation (Canfield et al, 1993; Rao et al, 2007;

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Costache et al, 2012). The research was conducted by taking three treatments including one standard (control) check variety with following objectives:

- To evaluate the relationship between the chlorophyll contents with spectral measurements as a basis to improve nutritional diagnosis of this maize crop variety African tall.
- To study the chlorophyll content and its roles in maize productivity.

2. Materials and Methods

The chlorophyll and carotenoids contents were quantitatively estimated by Arnon's (1949) method. The results thus obtained were compared with the control.

2.1-Experimental site:

The field experiment were conducted at the Experimental farm Belanki (Santoshwadi Lat. 16050'42"N, Long.74051'54" E), Dist.Sangli Maharashtra.

2.2-Experimental design, planting and Fertilizer application:

The treatment of bio-fertilizer levels were corresponding to (TA_1), (TP_1), ($TA+P_1$) respectively. The experiments were carried out in plot based on a randomized block design (RBD). Application of biofertilizers *Azotobacter* and Phosphate solubilsing Bacteria, enriched at the rate of (TA_1) : 150 gm *Azotobacter* / 10kg, (TP_1) : 150 gm Phosphate Solubilizing Bacteria (PSB), 150/ 10kg , ($TA+TP_1$) :75gm *Azotobacter* + 75gm Phosphate Solubilizing Bacteria (PSB).These doses were applied to the plants at sowing and then together with irrigation every 10-12 days. Each cultivar was planted in 4 ridges, 70 cm between ridges and 20 cm between holes. Seeds rate was maintained at 2 seeds per hole, the seeds were sown manually. Weeding was done manually whenever needed.

2.3-Sample Collection:

The biofertilizers used were *Azotobacter* (A), phosphate solubilizing bacteria (P) and combine treatment *Azotobacter* + phosphate solubilizing bacteria (A +P), without treatment was control.For the experimentation viz. to find out the chlorophyll and carotenoids contents in the maize crop treated with biofertilizers (TA_1), (TP_1) and ($TA+TP_1$), A random sample of five plants was taken from each plot after 90 days from sowing (vegetative growth stage). Five plants were randomly selected and the samples were collected from the field in fresh and clean polythene bags from the plot in the morning, while bringing the leaf samples to the laboratory. Precautions were taken so as to avoid the mechanical or other damage. All the samples were washed under tap water to remove dust particles and other unwanted particles from the surface of leaves and were then analyzed for the determination of Chlorophyll-a, Chlorophyll-b, total Chlorophyll and Carotenoids.

2.4-Extraction of chlorophyll (Arnon, 1949):

The Quantitative estimation of chlorophyll-a, chlorophyll-b and total chlorophyll was carried out by the method of Arnon (1949), while carotenoids were determined by following method. 1g fresh leaf material was taken and homogenized with 80% acetone and centrifuged at 5000 rpm for 5 min. Supernatant was adjusted to 100 ml in the volumetric flask. The absorbance (O.D.) of this extracted solution was measured at 480, 510, 645 and 663λ Atomic Absorption Spectrophotometer (Perkin Elmer 3030). From these readings concentrations of chlorophylls and carotenoids pigment were determined by using following formula/equation:

Chlorophylls and carotenoids pigment were determined by using following formula/equation:
$\text{Chlorophyll -a mg/g tissue} = \frac{12.7\,(AR663R) - 2.69\,(AR645R) \times V}{1000} \times W$
$\text{Chlorophyll -b mg/g tissue} = \frac{22.9\,(AR645R) - 4.68\,(AR663R) \times V}{1000} \times W$
$\text{Total chlorophyll mg/g tissue} = \frac{20.2\,(AR645R) + 8.02\,(AR663R) \times V}{1000} \times W$
$\text{Carotenoid mg/g tissue} = \frac{7.6\,(AR480R) - 1.49\,(AR510R) \times V}{1000} \times W$

Where, A = Absorbance at specific wavelengths

V = Final volume of chlorophyll extract in 80% acetone

W = Fresh weight of tissue extracted.

3. Results and Discussion

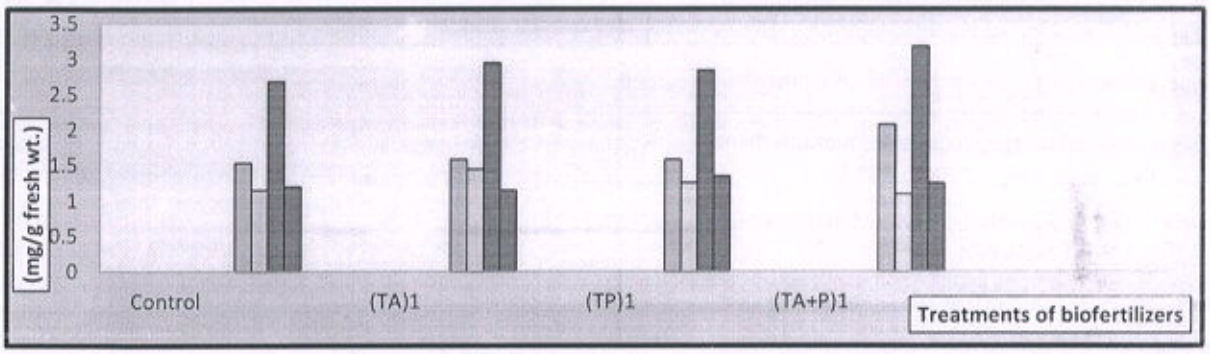
Leaf pigment content provides valuable information about the physiological status of crops. The content of foliar pigment varies depending on leaf pigments (chlorophyll and carotenoids) and its relation due to the internal factors and environmental conditions.In this study control and treated plant leaves were

Table 1 - The Spectrophotometric determination of absorbance for Chlorophylls and Carotenoids of maize (*Zea mays* L.) Variety African Tall

Treatments	(A_{663} and A_{645}) Chl-a Mg/g fresh.wt.	(A_{645} and A_{663}) Chl-b Mg/g fresh.wt.	($A_{645}$and A_{663}) Total chl. Mg/g fresh.wt.	(A_{480} and A_{510}) Carotenoids Mg/g fresh.wt.
Control	1.261	1.089	2.35	0.869
(TA_1) *Azotobacter*	1.555	1.226	2.810	1.319
(TP_1) Phosphate solubilizing bacteria	1.293	1.165	2.458	0.978
($TA+P_1$) *Azotobacter*+Phosphate solubilizing bacteria	2.049	1.070	3.148	1.225

A=Absorbance, Chl-a=Chlorophyll-a, Chl-b=Chlorophyll-b

Figure.1 Effect of biofertilizer on chlorophyll and carotenoids content (mg/g fresh wt.) in Maize variety African



used to estimate the chlorophyll content. Total 10 healthy plants of maize variety African tall were selected for this study.

Based on the absorbance value calculations were made using Arnon's (1949) equation and the amount of chlorophyll a, chlorophyll b, total chlorophyll and carotenoids were estimated. For cultivars African tall, concentration of total chlorophyll (chlorophyll a+b), carotenoids and chlorophyll a/b ratio was significantly different as compared to control as presented in Table 1 and Figure1.

The results showed that, biofertilizer application significantly increased chlorophyll content in maize in variety African Tall. The chlorophyll-a, Chlorophyll-b, total chlorophyll and carotenoid content of variety African Tall were highest (2.049,1.070,3.148,1.225 mg/g) in *Azotobacter* + Phosphate solubilizing bacteria treatment respectively as compared to chlorophyll-a, Chlorophyll-b, total chlorophyll and Carotenoid content of control maize plant (1.261,1.226,2.810,1.319 mg/g) in fresh wt. respectively. Increase in chlorophyll content was observed in maize inoculated with *Azotobacter* strains which is similar to the findings of Shaukat *et al.* (2006) in sunflower. The positive effects of PGPR's on the yield maize (Egamberdiyeya, 2007) and Soybean (Cattelan *et al.*, 1999) were explained by N_2fixation ability, Phosphate solubilizing capacity and phytohormone production.

The differential responses of the combination of different biofertilizer regarding various growth characters are well expected since the growth and development of a plant is the consequence of coordinated interplay of the hereditary characters and environmental conditions. The genetic constitution of a given plant sets definite and ultimate limit to the trend and levels of growth, development and yield of plants. The performance cannot be pushed up beyond this limit. The combination of biofertilizer differed significantly in respect of chlorophyll content and dry matter accumulation at different growth stages of the crop due to their varied growth habits.

4. Conclusion

It is concluded that, the treatment of biofertilizer increase chlorophyll-a, Chlorophyll-b, total chlorophyll and Carotenoid content more effectively than the control maize plants. In the variety African tall highest level of total chlorophyll was observed in combine treatment of biofertilizers *Azotobacter* and Phosphate solubilizing bacteria(PSB) and optimum level was observed in *Azotobacter* while minimum level of chlorophyll content was found in control maize plants. In the same variety better carotenoids level was observed in treatment of *Azotobacter*, optimum level Carotenoids level observed in combine treatment of biofertilizers *Azotobacter* and Phosphate solubilizing bacteria (PSB) and lowest carotenoids level observed in control maize

crop. The use of biofertilizer influenced the maize variety African Tall positively.The application of biofertilizers as a source in agricultural production, is an environmental friendly way of strengthening plant growth and useful for farmers.

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Conflicts of interest

The authors declare that there are no conflicts of interest.

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RESEARCH ARTICLE

EFFECT OF BIOFERTILIZERS ON YIELD AND YIELD COMPONENTS 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 different biofertilizers such as *Azotobacter* and *Phosphate Solubilizing Bacteria* (*PSB*) on yield and yield components of Maize (*Zea mays* L.) varieties viz.Eco-92 and African tall. The experiments were carried out in a randomized complete block design with three replications. The yield parameters like weight of cob, diameter of cob, length of cob, number of rows per cob, weight of grains, number of grains per cob, weight of 100 grains, grain yield Kg/ha . Result showed that, maize yield and yield components were significantly different at ($p \leq 0.05$) higher in application of biofertilizers treatments. However, treatment with combined application of *Azotobacter+PSB* biofertilizer (A+P) biofertilizers had the highest weight of cob and grain yield Kg/ha as compaired to control. Overall, *Azotobacter* and *PSB* biofertilizers improved the quality and quantity of yield.

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INTRODUCTION

Maize (*Zea mays* L.) being an important staple food crop after Rice and Wheat throughout the world (FAO, 2002). Maize originated from Mexico. 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).Apart from the soil the fertility and productivity issues, use of chemical fertilizers are also becoming more and more difficult for the farmers due to their high costs. Large amount of chemical fertilizers and pesticides are being used for its higher yield production, but the problem is, they influence human and environmental health. To get rid off from the problems, we required to alter ways of increasing yield production by applying biofertilizers (Shevananda, 2008).Nitrogen and phosphorus are essential nutrients for plant growth and development in Maize.N_2-fixing and P-*solubilizing bacteria* are important for plant nutrition by increasing N and P uptake by the plants and playing a significant role as that like biofertilizer, so *Azotobacter* and *Phosphate solubilsing bacteria* are used in this study.

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). For highest grain yield in agriculture in addition to both, the nitrogen and phosphate fertilizer are very important (Shaban.2013 a.b). Biofertilizers include mainly the nitrogen fixing, phosphate solubilizing and growth promoting microorganisms (Goel *et al*., 1999). Among biofertilizers benefitting the crop production are *Azotobacter*, *Azospirillum*, Blue green algae, *Azolla* (Hegade *et al*., 1999) Application of biofertilizer provides effective implementation of biological mechanisms of plant nutrition, growth promotion and protection (Bashan and Levanony, 1990; Docbereiner, 1995).In Maize the present positive effect of biofertilizers on growth, yield and yield component was revealed because of the increasing demand for food and livestock feed. The similar results are concurved in case of barley (Azimi *et al* 2013). *Azotobacter* species besides playing a [illegible] it has the capacity to synthesize [illegible] amounts of biological active [illegible] gibberellins and auxins (Subba-

Nitrogen is the most critical element of plant growth and plays a key role in many metabolic and physiological functions (Balasubramaniyan and Palaniappan, 2001) .Biological fertilizers are obviously an important part of a sustainable agricultural system, they The present study was undertaken to assess the effect of liquid biofertilizer different levels (doses) on growth and yield of two maize cultivars and to determine the optimum level suitable for improving maize production. According to Beyranvand *et al* 2013 them nitrogen and phosphate biofertilizers increase in the yield components like plant height, cob weight, and cob length, number of grain per cob and grain yield.

MATERIALS AND METHODS

To evaluate effect of biofertilizers (*Azotobacter* and *Phosphate Solubilizing Bacteria*) on yield and yield components two maize (*Zea mays* L.) varieties Eco-92 and African tall are selected.

Experimental site: The field experiment were conducted at the Experimental farm Belanki (Santoshwadi Lat. 16°50'42"N, Long.74°51'54" E), Dist.Sangli.

Land Preparation, experimental design: The land was ploughed twice with bullock drawn mould board plough followed by harrowing using cultivator and the entire plot was leveled with leveler. A rectangular plot having uniform fertility and even topography was selected for conducting the field experiment and individual plots were made manually as per experimental plan. Pre-sowing irrigation was given 10 days before the land preparation. The land was prepared to good tilth and leveled uniform before sowing. The two maize cultivars were considered as main plots and the three levels of biofertilizers as sub-plots.

Treatments : *Azotobacter* biofertilizer considered as 'A'.PSB biofertilizer considered as 'P' and collective application was considered as 'A+P' arranged respectively as in the form. Characters using a split plot based on a randomized complete block design with three replications.

Fertilizer applications: The treatment of bio-fertilizer levels were corresponding to (TA_1), (TA_2), (TA_3), (TP_1), (TP_2), (TP_3) and ($TA+P_1$), ($TA+P_2$), ($TA+P_3$) respectively.

Seed and Sowing: Before sowing of crop, furrows were opened at 60 cm interval with the help of hand hoe. Two seeds were dibbled at 30 cm spacing on 22nd May 2015. Advised nutrients and microbial inoculants were applied separately at the base of row and covered with soil.

Thinning: A week after emergence, seedlings were thinned to control two plants per hill. Final thinning was appeared two weeks after the emergence to maintain only one healthy seedling per hill.

Weeding: Hand weeding was done at 30 days after sowing and one time planting by chipkunte was carried at 20 days after sowing to keep all the plots systematic weed release throughout the crop growth period. Earthing up of soil was also made at 30 days after sowing to have good support and aeration to the plant roots.

Irrigation: Protective irrigation was supplied to the crop. Proper care was taken to keep away from movement of fertilizers from one plot to another during irrigation. All plots were irrigated immediately after sowing for uniform germination. Further irrigation was given at 5 days interval during crop growth. Irrigation was stopped one week earlier to harvest of the crop.

Harvesting and threshing: The crop was harvested when the cobs became green stage and plants showed physiological maturity. First, the cobs were removed from the standing crop and stover was harvested later. The harvested cobs were kept in separate gunny bags for each plot and dried in sun before shelling. After shelling the grains were dried in the sun to bring the moisture content 15% and then the final weights were recorded. Five plants were randomly selected in each net plot area for recording yield attributing parameters. The crop in the net plot was harvested and threshed separately. The stover was also bundled separately for each plot and dried thoroughly in the sun before taking the final weight. Grain and straw were sun dried and weight was recorded as per treatment and converted to yield in kg per hectare.

Measurements and data gathering: All plant growth observations were recorded treatment wise in the net plot area at monthly interval, starting from 30 days after sowing to till harvest. Five plants were tagged at random in each plot and observations were recorded. The crop in the net plot was harvested and threshed separately .10 plants were randomly selected to each plot area for recording yield attributing parameters .At harvest, the following characters were measured included: Plant height (cm), cob diameter (cm), Cob length (cm), Number of rows cob per plant, Number of rows cob, Number grains per cob, 100-grain weight (g) and Grain yield (kg ha^{-1}).

Statistical analysis: The collected data was statistically analyzed separately according to the analysis of variance (ANOVA) by and Duncan's Multiple Range Test (DMRT) used to determine the level of significance at $p \leq 0.05$ with SPSS excels software.

RESULTS

Cob length and Diameter: The Analysis of variance showed that, the effect of *Azotobacter, PSB* and interaction between them on cob length and diameters were significant. The comparison of the mean values of the cob length and diameter for interaction between different biofertilizers showed that combine treatment of *Azotobacter* and *PSB* ($TA+TP_1$), ($TA+TP_2$), ($TA+TP_3$) had the highest length and diameter as compared to control in variety Eco 92 and African tall(Table 1 and 2).

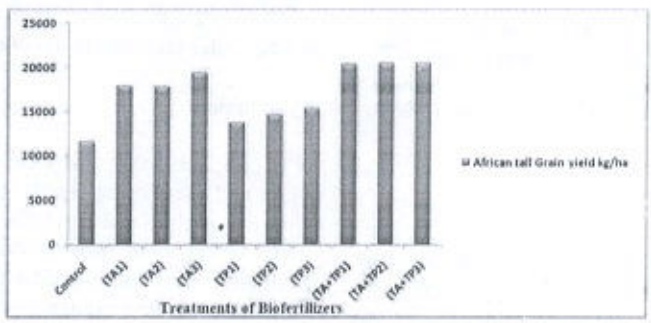
Number of row per cob: The effect of biofertilizer *Azotobacter* and *phosphate solubilizing bacteria* on number of row per cob were significant. The comparison of the mean values of African tall and in Eco 92 number of rows per cob for (TA_3), ($TA+TP_2$), ($TA+TP_3$) treatment showed that, the highest number of row per cob (16.3),(16.0) and control treatment had lowest number of row per cob (11.33),(16.33) and the differences were significant. The combined biofertilizer treatment had the highest number of row per cob as compared to control (Table 1 and 2).

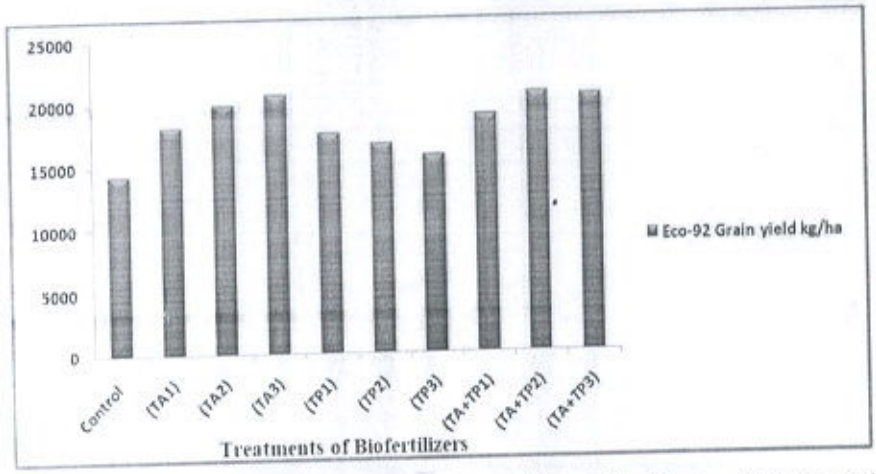
Table 1. Effect of Biofertilizers on yield and yield components of Maize (*Zea mays* L.) Variety African tall

Sr.no	Treatments	No. of cob/Plant	Diameter of cob	Length of cob	Horizontal cob lines /cob	Vertical cob lines /cob	No. of grain /cob	Cob weight	Weight of grains /ear	100 grain weight	Grain yield kg/ha
0	Control	2	3.50e	14.67e	32.00e	11.33e	320e	179.10e	107.69e	28.68e	11486e
1	(TA_1)	2	4.37b	16.00c	38.67c	15.33b	521 b	271.32b	167.59b	44.43b	17870d
2	(TA_2)	2	4.53b	16.27b	38.67c	15.33b	529b	270.18b	166.62b	45.02b	17773b
3	(TA_3)	2	4.57b	16.17b	39.33b	15.67b	541a	278.87b	182.27b	42.31c	19373a
4	(TP_1)	2	4.10d	16.00c	35.53d	13.33d	438c	223.24d	128.35d	39.03d	13669d
5	(TP_2)	2	4.17c	15.80d	34.67d	13.33e	382d	223.43d	137.30d	38.45d	14644c
6	(TP_3)	2	4.13c	16.00c	36.00d	14.00c	394d	233.87c	143.87c	44.83b	15345c
7	($TA+TP_1$)	2	4.97a	17.33a	39.67b	15.67b	550a	304.17a	190.82a	48.39a	20353a
8	($TA+TP_2$)	2	4.97a	17.33a	40.67a	16.00a	547a	301.05a	192.50a	48.05a	20527a
9	($TA+TP_3$)	2	4.93a	17.33a	40.33a	16.00a	557a	303.89a	192.30a	48.46a	20509a

Table 2. Effect of Biofertilizers on yield and yield components of Maize (Zea mays L.) Variety Eco-92

Sr.no	Treatments	No. of cob/Plant	Diameter of cob	Length of cob	Horizontal cob lines/cob	Vertical cob lines/cob	No of grain /ear	Cob weight	Weight of grains /cob	100 grain weight	Grain yield kg/ha
0	Control	2	3.93e	15.13e	35.67e	13.33e	489e	218.49e	137.20e	19.69e	14237e
1	(TA_1)	2	4.37d	16.17b	39.00a	16.33b	615b	282.58b	169.44c	33.44c	18072c
2	(TA_2)	2	4.73c	16.17b	38.00b	16.00c	621b	279.85b	185.89b	33.94c	19828b
3	(TA_3)	2	4.77c	16.00c	39.33a	16.33b	623b	272.89c	193.86a	33.91c	20677a
4	(TP_1)	2	4.37d	16.00c	36.67c	14.67d	559d	245.18d	164.38c	30.26d	17524c
5	(TP_2)	2	4.37d	15.66d	36.00d	16.00c	536d	244.95d	156.46d	30.13d	16689c
6	(TP_3)	2	4.40d	16.03c	36.67c	16.00c	521d	245.32d	146.11e	30.48d	15591d
7	($TA+TP_1$)	2	4.83b	17.07a	40.67a	16.33a	623b	294.70a	177.29c	39.08b	18911d
8	($TA+TP_2$)	2	4.87b	17.00a	39.00a	16.33a	650a	307.04a	193.36a	39.30b	20624a
9	($TA+TP_3$)	2	5.10a	17.17a	39.67a	16.33a	668a	308.86a	193.40a	39.99a	20415a





Cob weight: Results showed that, the effect of *Azotobacter* and *Phosphate Solubilizing Bacteria* biofertilizers and interaction between them on cob weight was significant (Table 1 and 2). The comparison of the values of the cob weight for interaction between *Azotobacter* and *PSB* biofertilizers showed that, ($TA+TP_1$), ($TA+TP_2$), ($TA+TP_3$) treatment had the highest (308.8gm)cob weight and control had lowest cob weight(218.4gm)The differences were significant (Table 1 and 2).

Weight of 100 grains: The effect of *Azotobacter* and *Phosphate Solubilizing Bacteria* biofertilizers and interaction between them on cob weight were significant. The comparison of the mean values showed that, ($TA+TP_1$), ($TA+TP_2$), ($TA+TP_3$) treatments had the highest (African tall =48.46gm), (Eco 92 = 30.99gm) 100 grain weight and control (African tall 28.68gm)(Eco 92 =19.09gm) had lowest 100 grain weight and differences were significant.

Grain yield: The effect of *Azotobacter, Phosphate Solubilizing Bacteria* biofertilizers and interaction between them on grain yield were significant. The comparison of the values of the grain yield for interaction between *Azotobacter* and *PSB* biofertilizers showed that, highest grain yield as compaired to control.

DISCUSSION

According to the data of table 1 and2, the effect of *Azotobacter* and *phosphate solubilsing bacteria (PSB)* biofertilizers were evaluated positively, there were an increase in plant height, ear weight, and number of grain per ear, grain yield and biomass yield. Statistical analysis was performed on the effect of nitrogen and phosphate biofertilizer treatments on plant growth, grain yield in variety African tall and Eco-92.The means were compared according to Duncan multiple range test (DMRT).Maize grain and biomass yield increasing was reported with the biofertilizer application which account important benefit to the maize producers and maize production. It may be concluded that photosynthetic capacity of plants treated with phosphors-solubilizing microorganism's increases due to increased supply of phosphors nutrition. Seed weight also increases due to better transfer of photosynthetic substances. Use of these biofertilizers as environment friendly helps to reduce the much expensive chemical fertilizers. Phosphorus and nitrogen biofertilizers could help to increase the availability of accumulated phosphate (by solubilization) efficiency of biological nitrogen fixation and increase the availability of Fe, Zn etc., through production of plant growth promoting substances. The research of various other studies has demonstrated that mixed treatments increase plant vegetative growth, resulting in increased yield in crops and legumes under farm conditions. The result showed that treatments of biofertilizers in the form of N-fixing *Azotobacter* and *phosphate solubilsing bacteria (PSB)* enhanced increase yield with positive effects on measured plant height ,number of cob, diameter of cob, cob weight, grain yield. Given the significant enhancement in growth and yield of maize taking place mainly N-fixing *Azotobacter* and *phosphate solubilsing bacteria (PSB)* under environmental condition, the mechanism for this beneficial effect could be due to more balanced nutrition and improved absorption of nitrogen and other nutrients by the corn. Interaction between N and P showed that the comparison of the values of the grain yield for interaction between *Azotobacter* and *PSB* biofertilizers showed that, highest grain yield as compaired to control and differences were significant. In the final results of this study revealed that, the application of nitrogen and *phosphate solubilsing bacteria* (*PSB*) biofertilizers increased yield and yield components of maize under environmental condition.

Conclusion

It is concluded that, the treatment of biofertilizer increase the yield and yield components more effectively than the control. The use of biofertilizer influenced the Maize variety Eco-92 and African tall positively. Biofertilizer as a source in agricultural production, decreases environmental pollution and leads to economic savings for farmers.

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Women Empowerment?-"They Already Are Empowered!!!"

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Abstract

JaquesLacan, a famous theorist says, "Women are the victims of 'identity crisis' under 'the law of father'. This expression clearly indicates that women are offered little opportunities in the stable male society to play active role in almost all fields. Women are inherently equal to men and deserve equal rights and opportunities.

'Feminism' is a doctrine that advocates equal rights for women. The different feminist movements against male domination in political affairs, historical context of patriarchy and oppression, gender discrimination show the awareness of women in this regard. However, all these feminist movements have resulted into the wave feminism which may possibly be called 'Post-Feminism' which lays an emphasis on individual woman's inner freedom and awakening on resolving the issues and problems raised by feminism and understanding the relationship of interdependence between man and woman. What is important is man and woman should have dialogue with others and with themselves which will lead to proper communication between them.

Introduction

Early Pioneers like Plato, Greek philosopher, Mary Wollstonecraft, author of 'A Vindication of the Rights of Women', Mary Shelley, English novelist, George Sand, French novelist, John Stuart Mill, English thinker and Women's Rights Advocate were the major feminists of first-wave Feminism. Jane Adams, Elizabeth Blackwell, Sarah Grimke, Virginia Woolf, Clarina I. H. Nichols, Simone de Beauvoir, Oprah Winfrey, Carol Downer, Susan Faludi, Betty Freeman, Kate Millet were second-wave Feminists and Margaret Atwood, Melisa Benn, Judith Butler, Susie Bright, Corin Tucker were the third-wave feminists. The male writers have mostly reduced women as inferior and weak. Aristotle for example, remarks, "The female is female by virtue of a certain lack of qualities" and that "we should look upon them as it were a deformity - one which occurs in the ordinary course of nature." Nietzsche, the German philosopher, declares, "Woman is the source of all folly and unreason" and that she is 'God's second mistake.' All these statements by these great philosophers direct toward the conclusion that for them men are the 'superior or stronger sex' and the women 'inferior or weaker sex'. Men are considered as logical, rational and objective whereas women are presumed as emotional, inconsistent intuitive, subjective and lacking self-confidence. Men should be extrovert, competitive, bold brave dominating and aggressive but women should be submissive, well-behaved, polite, soft-spoken, supportive, cooperative and sympathetic.

Simone de Bouvir, a revolutionary woman activist fought throughout her life for the freedom of women, and not for their happiness. Her book 'The Second Sex' (1949) is the

Bible on Feminism in which she expresses the attitude of looking towards men & women with equal status. She wanted to lessen the gap in inequality and handle the situation without being emotional. Man- woman equality is to be maintained with mutual understanding between them. The women all over world may be different on economic, religious, cultural, educational level, but still they all are labeled with the secondary position, inferiority. Similarly male community is always seen biased about women; their behaviour with the women is of superiority over women. Expectations of women from men are those of equality without any difference, but it's rather difficult in the male- dominating society. As a result women are living all the time on the subordinate position.

Objectives of research

All over the world there is a lot of discussion on women empowerment which sometimes has also become the subject for sarcasm. And that actually what I dislike. So I thought that it would be better to pose my views about the sustenance and not about empowerment because in my opinion what women need is self-confidence about doing every positive thing the way they like. So the objective of my research paper is support strongly the women who have given huge contribution in this regard and ultimately build a path for those women who can follow it and become successful in their goal of life.

Methodology

To prove my point of view I have presented the representative women in this field of work who have become milestones on the way of empowerment and helped other millions of women to proceed forward. These women have presented their feminist attitudes for the upliftment of women all over the world. So with the guidelines of feminist theories they have presented, I have tried put my views in this paper.

Feminism in Western Countries

Feminism has altered predominant perspectives in a wide range of areas within Western society, ranging from culture to law. Feminist activists have campaigned for women's legal rights for women's right to bodily integrity and autonomy, for abortion rights, and for reproductive rights; for protection of women and girls from domestic violence, sexual harassment and rape;for workplace rights, including maternity leave and equal pay; against misogyny; and against other forms of gender-specific discrimination against women. Although the terms "feminism" and "feminist" did not gain widespread use until the 1970s, they were already being used in the public parlance much earlier; for instance, Katharine Hepburn speaks of the "feminist movement" in the 1942 film Woman of the Year. Some Postcolonial Feminists, such as Chandra TalpadeMohanty, are critical of Western feminism for being ethnocentric Black feminists, such as Angela Davis and Alice Walker, share this view.

Before going to women empowerment it's necessary to discuss about the freedom of women which was and is rejected to women for centuries. Women all over the world were and are suffering from the same problem that they are denied freedom. The reason behind this acceptance of submissive position is that they never needed it as their field of work was limited only up to kitchen. Whatever they needed was provided to them and they were happy. So they never thought of freedom which also is necessary for them. They didn't have any kind economic freedom or freedom of decision-making which is also essential for their satisfaction. They were not aware about all these things. These things were happening all over the world [illegible]

But when there were clashes on the demand of the economic freedom or freedom of decision-making. This, in fact, became the huge hurdle in the development of women and, though to a less extent women started opposing to such monopoly of men.

The real- life portrayal of women's sufferings could be seen in the literature of many women authors and critics. However, it is most noteworthy that the men have their greatest contribution to fight for the rights of women. In India there is age-old tradition of men like Raja Ram Mohan Roy, MaharshiDhondoKeshavKarve Mahatma JyotiraoPhule who fought for the reason of giving women their rights. They all have gone beyond gender distinction and worked selflessly for the betterment of women because they knew very well that any society cannot progress unless the women in that society are respected and paid attention to. Freedom of Women and mutual understanding and co-operation together can survive the society.

The term 'feminism' has its origin from the Latin word 'femina' meaning 'woman'. It refers to the advocacy of women's rights, status and power at par with men on the grounds of 'equality of sexes' and relates to the belief that women should have the same social, economic cultural and familial rights as men. It challenges the age-long tradition of gender differentiation. Women's voices in literature have hardly been given due recognition and veneration. But the modern woman has raised her voice against the atrocity and injustice done to her. The female voice is heard with special heed. The focus of the literature studies shifted to women's writing with a view to re-reading, re-visioning and re-interpreting it in the light of long-existing gender bias.

Feminism in India:

In India, women's literary culture can be traced far back in the ancient times. In the pre-Vedic and the Vedic Ages women enjoyed considerably high status and freedom of thought and expression. They were skilled in music and various other arts. They were held in high esteem. The matriarchal system of the pre-Vedic times, however, began to lose its appeal in the Vedic era itself. The marriage implied male control over female. And again under the influence of Buddhism many women found a passage to emancipation and redemption. The nuns found freedom from their bondage to marital relationship or from confinement to household chores. Some of the women poets in Sanskrit have expressed candidly both the spiritual quests and the sensual desires. As for instance, 'Vidya's poem' speaks about love making and feminine sexuality.

The most prominent Indian women poets Toru Dutt and Sarojini Naidu were writing in English. Toru Dutt, the first Indian woman poet writing in English rendered authenticity to the Indian English verse with her innovative style, representing extensively the Indian tradition in a foreign language. It contained transcreations of some popular Indian myths and legends like "Savitri", "Dhruva", "Sita" "Lakshman", and besides her original poems like "The Lotus", "Our Casurina Tree". Sarojini Naidu's main themes were nature, love, devotion, God, spirituality, life and death and they are well expressed in her poems like "The Golden Threshold", "The Bird of Time", "The Broken Wing" and "The Feather of the Dawn."

The new Indian women poets of India writing in English expressed their minds and responded to their urges of body, heart and soul. Kamala Das, especially, emerged as a staunch rebel against the customary patriarchal system in the Indian society. "Summer in Calcutta", The Descendents", The Old Playhouse" and "Collected Poems." Many other women poets like

SunitiNamjoshi, Meena Alexander, GouriDeshpande, and ImtiazDharkar have dealt with the themes like irony and paradox of man-woman relationship, a sense of alienation and isolation and strife for identity.

Modern Feminism

The recent writing by women writers indicates a total change in it. This writing considered as 'post-feminism' has brought a new dimension in their attitude. The feminist wave in political field against male domination, against the patriarchy where women are not given importance about decision-making or any other kind of freedom another wave challenges the gender description and attempts to find a rationale for the identities of masculinity and femininities separating men and women. One more wave feminism may possibly be the term for the post-modern feminism and may be called 'post-feminism' which lays an emphasis on individual woman's inner freedom and awakening on resolving the issues and problems raised by feminism and on understanding the relationship of interdependence between man and woman. In my opinion post-feminism refers to the rejection of feminist thought. It seeks the equality of sexes and denies the patriarchal system, but in a cool, calm and composed manner with a sane and serene approach. Susan Faludi's "Backlash: The Undeclared War Against American Woman" which won National Book Critics Circle Award for general non-fiction is a study of the media's assault on feminism and another book "Stiffed"; The Betrayal of the American Man" is an effort to understand the other side of the "Backlash" against feminism specifically she wanted to understand why the men who opposed women's progress were so angry.

Other Dimensions of Man-Woman Relationship

A new thought will certainly make us think that caring and the mother-daughter relationship are certainly central to the development of the female self, but other powerful Influences play a crucial role in their inter-subjective world, when the 'self' forms relationship with others. One of the most significant of these relationships is the man-woman relationship that provides impetus towards self-recognition. This relationship is the most prominent theme in literature. Almost all the novels have focused on the emotional need of the companion. Fiction has religiously emphasized the theme of man-woman relationship-the relationship between brother and sister, father and daughter, the theme of social awareness.

True that the women throughout the world now have got their freedom of thought and their rights in the fields they are working, nobody can deny the fact that man and woman both need each other for the health of the family and society. Mutual understanding, trust, compassion and above all, support expected from each other will certainly lead to authenticity in a relationship and concretize it. Ganga in 'Difficult Daughters", Mammachi in "The God of Small Things","Karuna's mother in "Socialite Evenings", Kamala in "The Dark Holds No Terror", Devi's grandmother and Uma in "The Thousand Faces of Night" mutely embrace their lot without voicing their discontent.

"Socialite Evenings" portrays the picture of the contemporary 'wasteland', where the institution of marriage – which was meant to answer the needs of human race, crumbles due to the unbridled sexual relations. The married couples' relationship is more of a contract, based on materialism than an intimate, emotional bonding laced with apt understanding. One looks for security in marriage-it is a search of physical, financial, psychological, and emotional safety. Another basic need is the urge to share intimate thoughts and feelings with someone one

trust. The message we receive through such writing is that it is high time now to think seriously over these things in order the healthy relationship by extending due respect to each other showing concern for the feelings of others. Utter lack of communication may suck the sap of love which will prove to be disastrous for the society.

In order to do away with the historical injustice done to women, there is need to bring about a radical change in the society. This change is required in terms of one's mental awareness and inner awakening to one's rights and duties, along with human dignity and respect. Therefore, there is need is to simplify the things and not to over-complicate them. The need is to deconstruct and unlearn all theories and isms, and think afresh in terms of 'human beings' because the truth of nature is that 'men and women' together form the humanity. The need is to look at it with a newer insight.

In the present age when women are as free as men–academically, economically, and professionally- feminism seems to have lost its purpose. All the rights are given to them by birth; only thing is to make use of them properly. Misuse of it would certainly prove disastrous. Post-feminism would certainly find out certain constructive ideas for the various issues raised by feminism. The 'post' phase of feminism would hopefully fill up the gaps between one human being and the other. "Rethinking Feminism" in this regard will certainly make us think in order to take a step ahead in this direction.

Major findings

The women have become conscious about their rights to certain extent. The well-educated women are aware of their status and they know how maintain it. But at the grass root level they still are lagging behind. Perhaps it's the patriarchal system that they are used to live in and so don't oppose the existing system. So for centuries the evils in the society have been dominating over them. Illiteracy to some extent also is responsible for this drawback. Their condition will never improve unless they become aware of their status the society has offered them.

Conclusions

Women should themselves try to realize the situation of their own in the society. If they think that they are not properly treated by the society they must fight for their status. The sensible thing is that they must fight for their rights and then only they will earn the respectable position and will be able to live with self-confidence. They have to help themselves in stead of waiting for someone else to help them.

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a) Objectives of research,b) methodology used, c) major findings, d) conclusions and e) references