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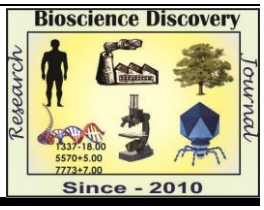

Aeginetia indica L. and *Conyza bonariensis* (L.) Cronq. are new distributional records in Satpuda range of Khandesh region, Maharashtra

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Abstract

Satpuda range of Khandesh region with great diversity of plants. The present paper deals with addition of two new flowering plants records from different parts of the Satpuda ranges of Khandesh region of Maharashtra are new distributional records for the first time. These species are *Aeginetia indica* L. (Orobanchaceae) and *Conyza bonariensis* (L.) Cronq. (Asteraceae) are reported for the first time for Satpuda ranges of Khandesh region of Maharashtra. The study provides a detailed taxonomic description, photographs and relevant information based on fresh collections.

INTRODUCTION

Vegetational and floristic studies have been gained increased importance and relevance in recent years in view of the present need for a thorough, up to date assessment of the natural resources of our vast country. The need for conservation and balanced exploitation of the nation's plant wealth has also been keenly felt. In this context, intensive exploration of limited areas for obtaining an inventory of the floristic elements present and identification of the potential sources of economic importance have become imperative.

Khandesh consist of three districts Jalgaon, Dhule and Nandurbar. Khandesh lies at the Northwestern corner of the Deccan plateau, in the valley of the Tapti river, and is bound to the north by the Satpuda ranges, to the east by the Berar (Vidarbha) region, to the south by the hills of Ajanta, belonging to the Marathwada region of Maharashtra, and to the west by the Northern most ranges of the Western Ghats, and beyond that the coastal plain of Gujarat. Khandesh includes varied topographical features and landscape. It lies between 20^0 8' and 22^0 7' North latitude and 73^0 42' and 76^0 28' East longitude. Khandesh covers a total area of 26,703.36 sq. km. The forest of the Khandesh region is of dry deciduous type. The vegetation varies with the changes in altitude, aspect and rainfall. While working on floristic of Khandesh region of Maharashtra we undertook frequent collection tours in every season to study plants.

Khandesh region though botanically rich in biodiversity have not been explored extensively except a few sporadic reports on floristic of Karnik 1959; Salunkhe 1995; Yadav 2003; Valvi 2006; Khan 2014 and Khan 2015.

MATERIALS AND METHODS

Satpuda ranges, which is one of the major hotspot of plants in Khandesh region of Maharashtra. During botanical exploration of Khandesh region in Maharashtra two interesting species are *Aeginetia indica* L. (Orobanchaceae) and *Conyza bonariensis* (L.) Cronq. (Asteraceae) was collected from hill slopes, open grassy filed, margins of water courses and in moist shady places in forest at high elevations.

The species was identified with the help of pertinent litrature (Verma *et al*., 1993; Mudgal *et al*., 1997 and Singh *et al*., 2001) and the taxa were confirmed by Dr. Milind Sardesai, Department of Botany, Savirtibai Phule Pune University, Pune and by consulting the BSI western Circle, Pune, herbarium as well. The voucher specimens have been deposited in the herbarium of Department of Botany, H. J. Thim College of Arts and Science Mehrun, Jalgaon, Maharashtra.

RESULTS AND DISCUSSION

The genus *Aeginetia* L. about 3 species; Indo-Malesia, E. Asia and Japan and only one species is found in Maharashtra. *Aeginetia indica* L. is new distributional records for Satpuda range of Khandesh region. Detailed description of the specimens is given below:

Aeginetia indica L., Sp. Pl. 632. 1753: Hook. *f*, Fl. Brit. India 4: 320.1884; Cooke, Fl. Pres. Bombay 2: 384.1958 (Repr.); Mudgal *et al*., in Fl. M. P. 2: 247. 1997; Singh *et al*. Fl. Maharashtra St. Dicot. 2: 558. 2001. Gulab-dani. Plate-I.

Leafless herbs, erect, 10-30 cm high, root parasites, purplish green; rhizome tuberous, stolons subterranean, giving out succulent, fibrous roots terminating in haustoria. Scapes purple-brown or violet, slender, embraced by short scales at base. Calyx mauve to purple, 1.5-3 cm long, posteriorly ending in a beak. Corolla dark purple, tubular, curved, 2-4 cm long, obscurely bilabiate; lobes unequal *ca* 0.6 cm long, obtuse, entire to finally crenate. Capsules ovoid-globose, 1.5-2 x 1 cm. Seeds reticulate.

Flowering and Fruiting: July-September

GPS Reading: N 21o 21' 28.12" E 75o 31' 34.36" (Elevation 486m)

Distribution: Occasional. In satpuda ranges grow on sloping forest floor covered with decayed leaves in slopes. In Maharashtra reported from Chandrapur, Kolhapur, Pune, Raigad, Ratnagiri and Sindhudurg.

Specimens examined: Jalgaon Dist., Devjiri forest, TAK 2314; Vaijapur forest TAK 2973; Langdha Aamba, TAK 3397.

The genus *Conyza* Less. about 60 species, mostly in temperate and subtropical and 6 species are found in Maharashtra only from Kolhapur, Pune, Aurangabad and Nagpur. Out of six one is new distributional records for Satpuda range of Khandesh region. Detailed description of the specimens is given below:

Conyza bonariensis (L.) Cronq. in Bull. Torrey Bot. Cl. 70: 632. 1943; Verma *et al*., in Fl. M.P.1: 577.1993; Singh *et al*. Fl. Maharashtra St. Dicot. 2: 200. 2001. *Erigeron bonariensis* L. Sp. Pl. 863. 1753. *E. linifolius* Willd. Sp. Pl. 3: 1955. 1803; Hook.f. Fl. Brit. India 3: 254. 1881. Fleabane, hairy horseweed. Plate-I.

Annual, erect, viscid-pubescent herbs, 30-150 cm high. Leaves narrowly oblong-lanceolate, cuneate at base, acute at apex, coarsely serrate-dentate at margins, 1.5-8.5 x 0.3-1.6 cm, pubescent on both surfaces; upper leaves linear-lanceolate with entire margins. Heads in terminal, white or yellow, 4-4.5 mm in diameter, in long leafy panicles; involucral bracts many seriate 3-4 mm long linear, densely pubescent. Ray florets 3-4 mm long, ligulate; disc florets 2-3 mm long, tubular, 5-lobed. Achenes 1-1.5 mm long, sub-globrous; pappus 33-4 mm long brownish.

Flowering and Fruiting: January-April.

GPS Reading: N 21o 19' 21.55" E 75o 35' 31.50" (Elevation 672m)

Distribution: Rare. In Satpuda ranges at open grassy filed. In Maharashtra reported from Kolhapur, Pune, Aurangabad and Nagpur.

Specimens examined: Jalgaon Dist., Devjiri forest, TAK 2732; Langdha Aamba, TAK 2948; Waghjira forest TAK 3157.

CONCLUSION

We have gone through all pertinent literature (Kshirsagar 2008, Patil 2003) and by consulting the BSI Herbarium Pune. To find out the occurrence, distribution and habitat of these species. We found that, these species were not reported in any flora of the Satpuda range of Khandesh region in Maharashtra. This clearly reveals that, these species are rare to flora of Maharashtra State, even India as a whole. These species are new record to the flora of Satpuda range of Khandesh region of Maharashtra State. The voucher specimens are deposited in the herbarium of Department of Botany, H. J. Thim College of Arts and Science Mehrun, Jalgaon. On close examination of herbarium specimens and detailed scrutiny of literature published till today on these taxa, it can be claimed that these are new records for Satpuda range of Khandesh region of Maharashtra State.

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***Conyza bonariensis* (L.) Cronq.**

***Aeginetia indica* L.**

Plate-I

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ANTIMICROBIAL ACTIVITY OF *CAESULIA AXILLARIS* ROXB AND *PSORALEA CORYLIFOLIA* L

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ABSTRACT

Caesulia axillaris Roxb. and *Psoralea corylifolia* L.are commonly occurring plant and known for their folk medicinal value among the local peoples. It was recorded in ancient literature that different part were used to treat disease related to bacterial and fungal pathogen. On this aspect current antimicrobial were carried out in different plant part like Leaves, Seed and Stem in different solvent like Hexane, Chloroform and Methanol. All tests were designed in many replicate against fungal and bacterial pathogen to find out their control activity. Zone of inhibitions in mm were recorded after 24 hrs of inoculation. It was found that methanol extract of leaves in both concentration (2% and 4%) were showing best significant result among all in both plant case. Results indicate that plant having active antimicrobial activity in appropriate concentration and solvents.

KEYWORDS: Antimicrobial, Antifungal, Antibacterial activity, Medicinal important, Solvent and Extraction.

INTRODUCTION

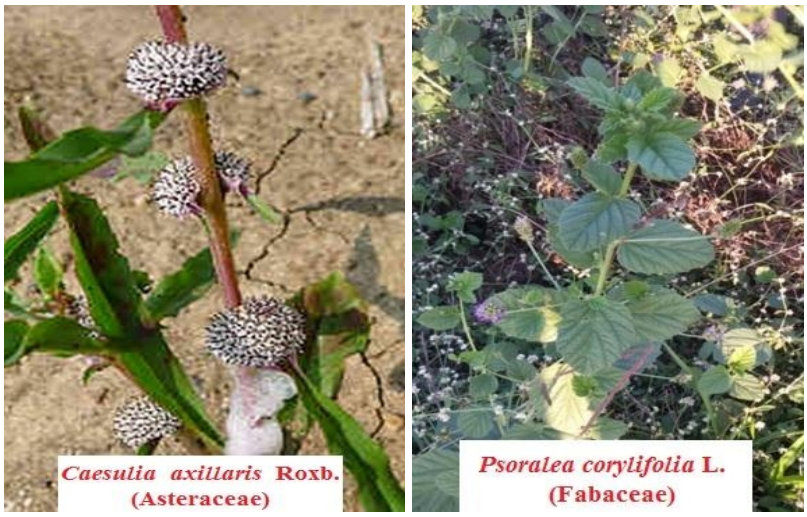
Plants are considerably useful and economically important for all mankind. They may due to their food value or by means of their active constituents that are used in the treatment of many human diseases. Plants contain hundreds or thousands chemicals and metabolites make them medicinally important.[3] Medicinal and aromatic plants a gift of nature are being used against various infection and diseases in the worlds since past history. It represents extraordinary reservoir novel molecules.

About 43% of total plants from Indian subcontinent (approximately 7,500 species) are reported to have medicinal value.[8] In recent years there has been a gradual revival of interest in the use of medicinal plants because herbal medicines have been reported to be safe and without any adverse side effects.[1] Much work has been done on ethno medicinal plant in India. Interest in a large number of traditional natural products has increased for finding their phytochemical and antimicrobial activity. It has been also suggested that aqueous and ethanol extracts from plants used in allopathic medicines are potential sources of antiviral and antimicrobial agents.[5] That's leads to finding of antimicrobial potential among the local and wild plants.

Herbal raw material is highly susceptible to fungal infection during post harvest processing and storage in tropical and sub tropical countries.[12] Most of these fungi are toxemic in nature producing micro toxin, therapy, affecting the quality of herbal raw materials as well as the herbal formulation.[2] This is one of the major reasons for decline of Indian share in the global herbal market[2,5] which can be control by even by such plant those having antimicrobial activity which include activity against pathogenic fungi as well as bacteria. The effects of plant extracts on fungi and bacteria have been studied by a very large number of researchers in different parts of the world with positive results. Antibacterial activity were recorded in various plant Against *S. aureus*, *S. epidermis*, *B. cereus* etc.[5] Antioxidants act as repository of anti-inflammatory, antifungal, antibacterial and anti-carcinogenic.[10] Various plant materials are believed to have antifungal activity and many essential oils have been reported to have antifungal activities with no side effects on humans and animals.[11] Current work has been done by considering folk medicinal values of *Caesulia axillaris* Roxb. and *Psoralea corylifolia* L. to find out their anti microbial activity against pathogen in lab condition.

C.axillaris Roxbfrom family Asteraceae is known to cure baldness and goitre in traditional Indian system of Medicine. The plant is a common weed abundantly growing in paddy fields in India and showed appreciable yield of EO. Its essential oil has been reported against some insect's pests causing deterioration of food commodities. *Axillar is* have been tested for its efficacy as aflatoxin B1 suppressor and against fungi deteriorating herbal raw materials. Besides, the safety profile of the oil has been observed through animal trails so as to find out its efficacy as a preservative of herbal raw materials. However in the present investigation for the first time the chemically characterised oil of C. The main objective of the present investigation was screening of fungi responsible for biodeterioration of the stored raw

materials of *Andrographics paniculata* Nees, *Terminala bellirica* Roxb. and *Tinosporacordifolia* (Thunb.).[9]



P. corylifolia is a medicinally important plant, belongs to Fabaceae family. It is well recognized in Indian folkloric medicine. Seeds were used for many decades as traditional medicinal system.[9] The seeds are used in indigenous medicine as laxative, aphrodisiac, and diaphoretic in febrile conditions. And it also specially recommended for treatment of leucoderma leprosy and inflammatory diseases of the skin.[4]

MATERIALS AND METHODS

To find out the antibacterial and antifungal activity, suitable scientific technique was applied on both plants. Dry parts of plant were initially subjected to the drift net extraction procedure in different solvents. The factors affecting the choice of solvent are quantity of phytochemical with the rate of extraction, diversity of different compounds extracted, diversity of inhibitory compounds extracted, ease of subsequent handling of the extracts etc (Khan and Patil 2016), to avoid practical error different solvent were used with soxhlet extractions methods form both experimental plant.

Leaves Stem and Seeds of both plant has been collected from Jalgaon local forest area of Maharashtra. Plant material further allowed for shed dry and makes fine powder before using it extraction. For anti microbial analysis each plant sample was extracted in Hexane, Chloroform and Methanol with soxhlet extraction. To find out fungal strain Lactophenol and Cotton blue activity were used. For the growth of fungal strain SMKY Medium, Nutrient Agar, CDA and PDA media were used.For growth of fungus 10 gm of each plant material

added in 90 ml of sterile distill water with shaking for 15 min and then dilutions were made on Potato Dextrose Agar Plate, which allowed for incubate for 7 days at 37° C. Growth of fungus were observed for4-5 days on plate and further identified by mold colonies in subculture.

Antifungal Activity was tested on PDA media with saline suspension of fungus (*Streptomycin*). Different dilutions of plant material were used and observed Zone of Inhibition after 24 hrs of incubation.

Antibacterial Activity was tested on nutrient agar media by *E. coli.*Serial dilution of extraction of plant part's were used to control the growth and Incubate for 24 hrs followed by observation of Zone of inhibition.

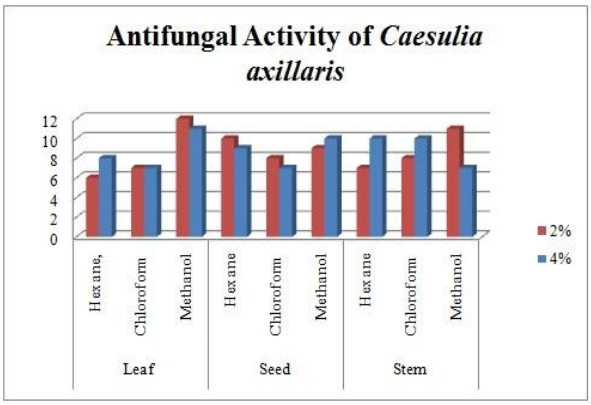
RESULTS

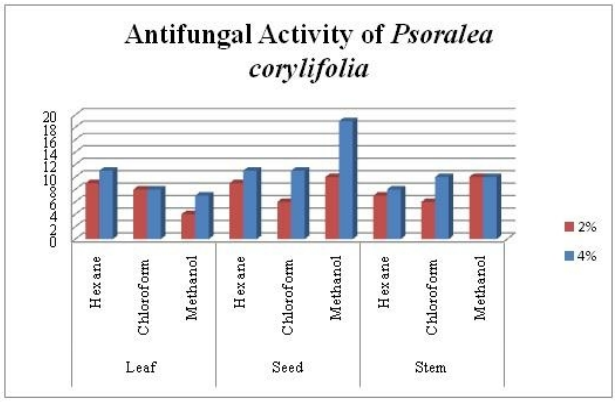
Antimicrobial activity of the both experimental plant for their different parts has been carried out against suitable pathogen and result were recorded in zone of inhibition among different solvent extract.

Table. 1: Antimicrobial Activity for Caesulia *axillaris* and *Psoralea corylifolia* in different solvent.

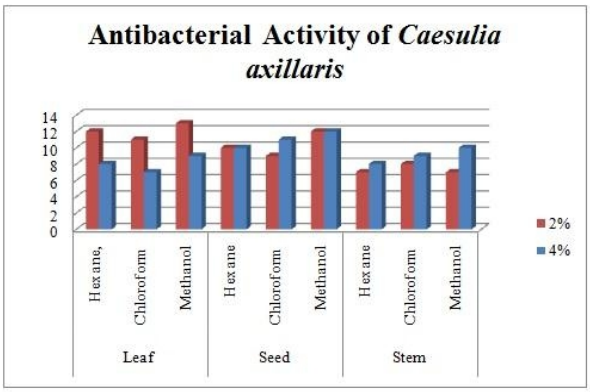
Name and Part of Plant	Antifungal Activity			Antibacterial Activity	
	Extract	Zone of inhibition (mm) After 24 hr			
		2%	4%	2%	4%
***Caesulia axillaris*leaf**	Hexane,	6	8	12	8
	Chloroform	7	7	11	7
	Methanol	12	11	13	9
***Caesulia axillaris* seed**	Hexane	10	9	10	10
	Chloroform	8	7	9	11
	Methanol	9	10	12	12
***Caesulia axillaris* stem**	Hexane	7	10	7	8
	Chloroform	8	10	8	9
	Methanol	11	7	7	10
***Psoralea corylifolia* leaf**	Hexane,	9	11	8	9
	Chloroform	8	8	7	8
	Methanol	4	7	12	11
***Psoralea corylifolia* seed**	Hexane	9	11	5	6
	Chloroform	6	11	4	7
	Methanol	10	12	7	8
***Psoralea corylifolia* stem**	Hexane	7	8	7	9
	Chloroform	6	10	8	8
	Methanol	10	10	7	7

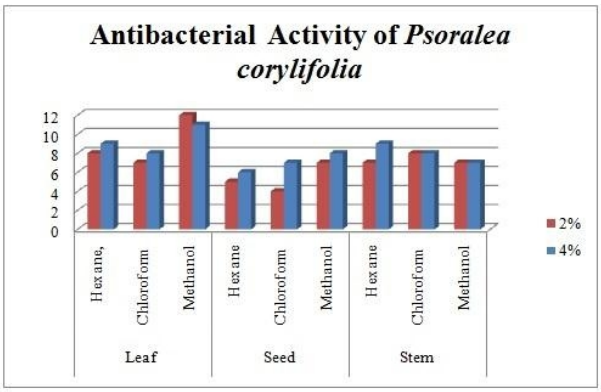
Antifungal activity of Caesulia *axillaris* leaf in methanol extract shows significant maximum control among other plant parts and solvent for 2% concentration (then 4%) (Graph1). were it was recorded that *Psoralea corylifolia* seed in methanol extract shows significant maximum control among other plant parts and solvent for 4% concentration (then 2%) (Graph2). Antibacterial activities were maximum recorded in metabolic extract of *Caesulia axillaris and Psoralea corylifolia* leaf for 2% of concentration in both plant. In contrast other extract in both plants for all three plant parts were shows least significant among all three extract (Table 1) (Graph 3 and 4).





Graph. 1: Antifungal Activity of *Caesulia axillaris* Graph 2. Antifungal Activity of *Psoralea corylifolia.*





Graph. 3: Antibacterial Activity of *Caesulia axillaris* Graph 4. Antibacterial Activity of *Psoralea corylifolia.*

DISSCUSSION

Antimicrobial screening of *Caesulia axillaris* and *Psoralea corylifolia*for their Leaf, Seed and Stem in different solvent like hexane, Chloroform and Methanol against suitable pathogen reveals that there is best control of pathogen actvity in methanolic extract. That were tested in different concentration in both 2% and 4% concentration of extract that help to control

antifungal and antibaterail activtity with respect to different pathogen. Hence, it's important conclusion that for future aspect for result of current work will be the best approach to control antimicrobial activity and also proves that both plant have significant and positive activity in their parts.

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Research Article (Open access)

Evaluation of Proteolytic Activity of Some Euphorbian Garden Plants

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ABSTRACT- Most of the Euphorbian plants secrete fluid which contain a proteolytic enzyme for defensive role against insects, pests and hence eco physiological inheritance to sustain vegetation eventually in adverse environmental conditions. Evaluation has been carried out on twenty five Euphorbian garden plants for their proteolytic activities using casein as a substrate. Out of these, *Euphorbia nerifolia, Euphorbia milli, Euphorbia tirucalli, Euphorbia lactea, Synadenium granti, Jatropha curcas, Euphorbia nivulia, Euphorbia antiquoram*, *Pedilanthus tithymaloides*, *Euphorbia viguieri, E. heterophylla* and *E. leucocephala* are the good enzyme source. Moderate activity found in *Jatropha integerrima, Jatropha multifida, Jatropha podagrica, Euphorbia pulcherrima,* and *Dalechampia scandens*. While different tissues of *Acalypha hispida, Acalypha wilkesiana, Breynia nivosa, Cicca acida, Codiaeum variegatum, Drypetes roxburghii* are devoid of proteolytic activity. This paper describes in detail about name of plants, habitat and presence of proteolytic enzyme in them. Results show that the out of twenty five plants 50% plant tissue synthesize protease in appreciable amount, while 10% are not able to produce it. However 40% plants demonstrate only detectable amount of protease. A comparative account of proteolytic activity reveals some promising plants good source of enzyme. Some plants produce combination of cysteine and serine proteases. A single plant i.e. *Euphorbia nerifolia* latex contains cysteine, serine, metallo-protease and aspartic proteases. In turn, these proteases may be used in various industrial uses in general and cheese production in a particular.

Key-words- Garden Euphorbian plants, Cysteine and serine protease, *E. leucocephala, Euphorbia viguieri*

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INTRODUCTION

Botanical plants are considered as god's gift to human being in the form of natural medicine. Euphorbiaceae comprises more than 2000 species. Some of Euphorbian plants are cultivated as ornamental/garden plants in national and international gardens. Due to rich cultural heritage and relatively rich flora, a wealth of knowledge on traditional and folk medicine has been accumulated in India [1]. An exhaustive and a comprehensive review on proteolytic enzyme of biological sources appeared in literature which includes study on properties of various proteases with mechanism of action of proteolysis of protein [2].

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The used parts of Euphorbian plant species include latex, roots, seeds, stem bark, wood, leaves and whole plant [3-5]. The plants in the family Euphorbiaceae are known for chemical diversity of secondary metabolites and have various curative properties against different ailments [6]. Most of member of this family synthesis proteases in different tissues for defensive purpose [7-9]. A good source is latex and juices. Lynn described occurrence, properties of different proteases of Euphorbiaceae family [7]. An excellent article is appeared in literature stating importance of a chemotaxonomic marker of Euphorbia species pertaining presence of proteolytic activity in the latex of Euphorbian genera [9]. This aspect is confirmed recently in next year in the form of review of Euphorbiaceae family and its medicinal features [10]. Further such study is extended for the production of plant proteases *in vivo* and *in vitro* [11]. A scientific article on research into Euphorbia latex and various ingredients is published [12]. Very recently, article entitled a study on plant latex, a rich source of proteases and cutting edge for disease invasion is appeared in literature mentioning that,

out of the 35 latex bearing plants, 16 plants possess proteolytic activity belongs to family of Euphorbiaceae [13]. Very very recently, a very good article entails medicinal importance and biochemistry of latex of certain Euphorbian taxa [8]. In our laboratory, we mentioned 13 industrial bio-applications of proteases of some Euphorbian wild and weed plants [14]. In this communication, we report here studies on proteases in garden Euphorbian plants aiming to search a vegetable rennin source for production of cheese and some allied industrial applications.

MATERIALS AND METHODS

Plants are procured from campus of Moolji Jaitha College, Jalgaon and plant nurseries of Jalgaon city, Maharashtra, India. Dr. Tanveer taxonomist, identified plants for study. Different parts of plant such as leaf, stem, root, flower, and latex of the garden Euphorbian plants was collected from during June 2014 to December 2015. The cuttings of leaf stalks with capillary tubes into glass container and was kept in ice. The latex was a white thick fluid with pungent odour brought to laboratory and kept in refrigeration till use. Experiments were conducted at department of Biotechnology, PGCSTR, Jalgaon, India. A photo plate of some promising Euphorbian garden plants is given in Fig. 1.

Fig. 1 Photo plates of 10 Euphorbian garden plants

Enzyme Isolation

The freshly collected latex was diluted with 5 volumes of ice cold phosphate buffer pH 7.4 and centrifuged at 10,000 rpm for 20 minutes in high speed refrigerated centrifuge and supernatant was collected and stored at 4^0C. The pellet containing the white insoluble gum was discarded. All the experiments on the crude preparation were carried out using freshly collected latex and preserved in refrigerator at 4^0C. From other parts 10% homogenate was prepared in phosphate buffer at pH 7.4 and centrifuged and supernatant was used as a source of enzyme.

Screening and Selection of Garden Euphorbian Plant Proteases

Protease Activity

Proteolytic activity of different plant tissues was determined by the colorimetric assay using 1% casein as a substrate as described by [15]. The protease activity was expressed as amount of enzyme required to produce peptide equivalent to µg of tyrosine/min/mg protein at 37^0C and protein content was determined according to Lowry's method [16] using Bovine serum albumin as the standard protein.

Enzyme Unit

One unit of protease activity is defined as the amount of enzyme to release 1 µg of tyrosine per minute at 37^0 C. A tyrosine standard curve was calibrated (10 to 100 µg/ml) using Folin Phenol reagent. Specific activity of the proteolytic enzyme is expressed as the number of units per milligram of protein.

RESULTS AND DISCUSSION

Proteases are distributed widely in different biological sources namely plants, animals and microbial sources. In Euphorbian plants protease are present in virtually every part i.e. stem, fruit, flower, leaf, root, gum and latex. We have communicated presence of proteolytic activity in various parts of plant indicated, plant latex is the richest source of protease [14,17]. Table 1 summarizes habitat of some Euphorbian plants. They are grouped into three category i. Wild, ii. Weed, and iii. Garden. The distribution of wild, weed and garden is 47%, 22%, and 31% respectively. The order of occurrence of protease in garden Euphorbian plant is serine< cysteine< serine and cysteine < metallo protease<aspartic protease (Fig. 2). This finding is good in agreement and supports our findings as results reported by number of authors [9-10, 18-19] pertaining to the occurrence and distribution of proteolytic enzymes.

Table 1: **List of Some Euphorbian Plants**

Wild (A)	Weed (B)	Garden (C)
Acalypha ciliate	*Acalypha malabarica*	*Acalypha hispida*
Acalypha indica	*Chrozophora prostrate*	*Acalypha wilkesiana*
Baliospermum raziana	*Chrozophora rottleri*	*Breynia nivosa*
Bridelia airy-shawii	*Euphorbia hirta*	*Cicca acida*
Cleidion spiciflorum	*Euphorbia indica*	*Codiaeum variegatum*
Croton bonplandianum	*Euphorbia notoptera*	*Drypetes roxburghii*
Emblica officinalis	*Euphorbia prostrate*	*Euphorbia milii*
Euphorbia clarkeana	*Euphorbia prunifolia*	*Euphorbia pulcherrima*
Euphorbia cristata	*Euphorbia thymifolia*	*Euphorbia tirucalli*
Euphorbia fusiformis	*Phyllanthus airy-shawii*	*Jatropha integerrima*
Euphorbia nerifolia	*Phyllanthus amarus*	*Jatropha multifida*
Euphorbia nivulia	*P. maderaspatensis*	*Jatropha podagrica*
Euphorbia pycnostegia		*Pedilanthus tithymaloides*
Homonoia riparia		*Synadenium granti*
Jatropha curcas		*Dalechampia scandens*
Jatropha gossypifolia		*Euphorbia viguieri*
Kirganelia reticulate		*Jatropha podogrica*
Mallotus philippensis		*Euphorbia nerifolia*
Manihot esculenta		*Euphorbia nivulia*
Micrococca mercurialis		*Euphorbia* species 1
Phyllanthus urinaria		*Euphorbia* species 2
Ricinus communis		
Securinega leucopyrus		
Securinega virosa		
Tragia plukenetii		

The life form of above plants ranging from small herbs, herbs, shrubs, small tree and tree. Some of them are seasonal and perennial.

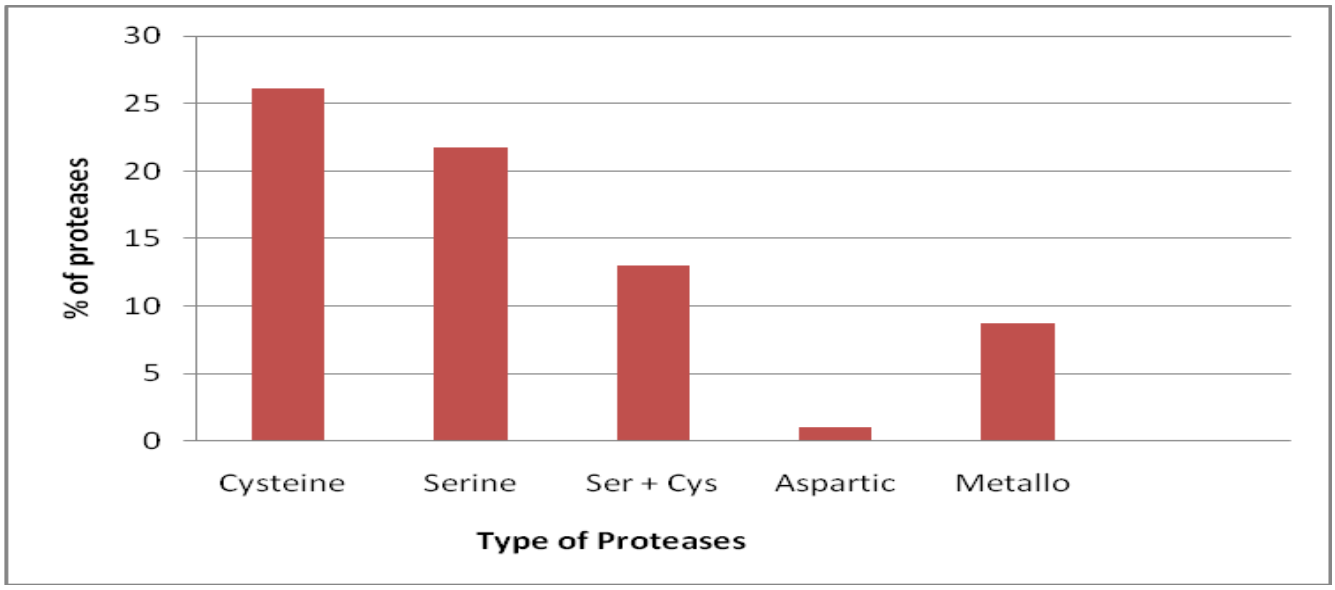

Fig. 2 Occurrence of protease of Euphorbian garden plants

Table 2: Studies on Proteases from Garden Euphorbian Plants

Plant Name	Type of Protease
Acalypha hispida	NR
Acalypha wilkesiana	NR
Breynia nivosa	NR
Cicca acida	NR
Codiaeum variegatum	NR
Drypetes roxburghii	NR
Euphorbia milii	Serine & Cysteine
Euphorbia pulcherrima	Serine & Cysteine
Euphorbia tirucalli	Serine
Jatropha integerrima	NR
Jatropha multifida	NR
Jatropha podagrica	NR
Pedilanthus tithymaloides	Cysteine
Synadenium granti	Serine
Dalechampia scandens	NR
Euphorbia lactea	Serine
Euphorbia antiqourum	Cysteine
Euphorbia heterophyll	Cysteine
Euphorbia nerifolia	Serine,cysteine, metallo, aspartic
Euphorbia tirucalli	Serine, cysteine
Euphorbia nivulia	Cysteine
Euphorbia prunifolia	Serine
Jatropha curcas	Cysteine
E. leucocephala	Serine & Cysteine
E. viguieri	Serine

NR- *Not reported*

Table 2 indicates 8.6% of plant tissue are able to synthesis both Cysteine and serine proteases, whereas 47.8% of them produce either Cysteine or serine proteases. Whereas 43.4% plant tissues are free of any detectable enzyme.

Table 3: Evaluation of Protease Activity of Some Garden Euphorbian Plants

Plant Name	Proteolytic Activity
Acalypha hispida	-
Acalypha wilkesiana	+
Breynia nivosa	+
Cicca acida	-

Codiaeum variegatum	+
Drypetes roxburghii	-
Euphorbia milii	+++
Euphorbia pulcherrima	++
Euphorbia tirucalli	+++
Jatropha integerrima	+
Jatropha multifida	+
Jatropha podagrica	-
Pedilanthus tithymaloides	+++
Synadenium granti	+++
Dalechampia scandens	-
Euphorbia lactea	-
Euphorbia antiqourum	-
Euphorbia heterophyll	-
Euphorbia nerifolia	+++
Euphorbia tirucalli	+++
Euphorbia nivulia	+++
Euphorbia prunifolia	+++
Jatropha podogrica	+
Euphorbia species 1	++
Euphorbia species 2	++

+ : Less activity , ++: Moderate activity, +++ : Highest activity, - : No activity

Out of the 25 garden plants 32% show highest proteolytic activity and 40% plants have no proteolytic activity, while contribution of moderate and less activity plant is same i. e. 12% (Table 3). Our observations are good in agreement with comparative total proteolytic activity in plant lattices [14,17-19]. In contrast to this presence of serine in each laticiferous plant is reported [9]. Surprisingly, while collection of plants we noted occurrence of some weed garden plants such as *E. hirta, E. indica, Phyllanthus amarus* and *E. heterophylla*. Among them *E. hirta* and *E. heterophylla* are good source of enzyme [17]. A seen from Table 4, some very common plants though appeared in literature as reported by earlier investigators for their proteolytic activity; we have taken them for validation of our experiments and comparison.

Table 4: Caesinolytic Activity of Some Promising Garden Euphorbian Plants

Name of Plant	Proteolytic activity (U/gram tissue)
Euphorbia milii	17.76 ±5.24
Euphorbia tirucalli	26.56±2.78
Euphorbia lactea	22.56±3.25
Euphorbia nivulia	15.87±5.35
Synadenium granti	20.48±1.85
Euphorbia nerifolia	30.15±2.05
Euphorbia viguieri	10.58±4.85
Jatropha curcas	8.48±3.15
Pedilanthus tithymaloides	48.89±4.68
E. leucocephala	16.18±4.67

±: SD of 6 observations

In our previous communication, we have reported various aspects of our study which has been carried out in our laboratory based on economic importance of Euphorbian plants. Here we focused ethanomedicinal importance of laticiferous plants used by tribal people of North Maharashtra, India to treat various diseases [1,3,6]. Also we extended our study on phytochemical investigation of some laticiferous plants belonging to khandesh region of Maharashtra, India. [6] Latex is a rich in secondary metabolites like sterols, glycosides, alkaloids, and enzymes specifically proteases, amino oxidases, esterases and lipases. A report on proteolytic enzyme of some

laticiferrous plants belonging to khandesh region of Maharashtra, India which include plants from other families like Moraceae, Asclepidaceae and Apocynaceae and Caricaceae is published [3]. Economical importances of forty ethnobotanical Euphorbian plants of North Maharashtra region include their applications in various diseases along with some industrial uses [4-5]. In this article, emphasis is given for the most promising Euphorbian garden plants to evaluate potential of them. The morphological features are shown in Fig. 1.

Richest source of proteolytic enzyme is latex, followed by seed, leaf, stem, root, fruit, and flower [14,17]. Out of above twenty five Euphorbian garden plants, *Euphorbia nerifolia* occupy the first rank as it possesses combination of four proteases namely serine, cysteine, metalloprotease and aspartic proteases, four plants namely *Euphorbia milli*, *Euphorbia tirucalli*, *E. leucocephala, Euphorbia pulcherrima* do have serine and Cysteine proteases. A single protease is observed in rest of the plant. It is interesting to note, no threonine protease is recorded in any Euphorbian plant. Presence of proteases of latex along with secondary metabolites like diterpene, and alkaloids exhibit defensive properties against the pest. Additionally latex possesses the medicinal as well as agriculture applications [9-10,14,17]. We would like to put here worthiness of Euphorbian plants for their medical importance and enzymes of these plants as biomarkers. Such statements are hold true for earlier findings of different investigators [9-10,12].

CONCLUSION

In a nutshell, on evaluating proteolytic activity of 25 Euphorbian garden plants, 10 plants are found promising activity, out of them 2 plants namely *E. leucocephala, E. viguieri* are not yet explore for such finding. Three plants namely *E. pulcherrima*, *E. species* 1 and *E. species* 2 have moderate activity, followed by six plants exhibit less activity, whereas remaining plants are devoid of any activity**.** The presence of proteolytic activity of the latex of *E. viguieri* and *E. leucocephala* motivated to us to analyze biochemical characterization of enzymes with their possible bioapplications of commercial use.

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Research Article

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Primary phytochemical study of *Psoralea corylifolia* L. and *Caesulia axillaris* Roxb.

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ABSTRACT

Psoralea corylifolia Linn. (Leguminoseae) and Caesulia axillaris are a medicinal plant and having various therapeutic applications. In the present investigation both the plants has been evaluated for their phytochemical constituents. Phytochemicals are direct sources of pharmaceutical's important and so need to be evaluate the information from it. In concern with this, phytochemical study were designed for some secondary metabolites of Psoralea corylifolia L. and Caesulia axillaris Roxb, with Hexane, Chloroform and Methanol as a solvent system. Result of different plant parts that is Leaves(L), Stem(St) and Seed(S). Preliminary phytochemical study reveals that flavonoids in each plant part are present irrespective to solvents, while alkaloids are not detected in current experiments. Qualitative work is done for phytochemical information's of these two medicinal important plant.

Key words: Phytochemicals, *Caesulia axillaris*, Medicinal properties, secondary metabolites.

INTRODUCTION

Plant and its products has been used as medicine and it get incorporated into traditional and allopathic system of medicine for curing various diseases. As per WHO report 80% of world population, uses plant and its products as medicines for some aspect of primary health care [1]. They act as valuable life line for rural population in tribal's remote areas. These wild plants area are good resources for human life in many aspects [2]. *Psoralea corylifolia* Linn. Belonging to family of Leguminoseae is a well known herb known for its medicinal value in Siddha system of medicines to treat various diseases and commonly known as babchi, bearing yellow or bluish purple flowers and found throughout Indian plains, Pakistan, Srilanka, Burma and China [3]. Roots of *Psoralea corylifolia* Linn. are useful in dental caries, fruits are laxative, aphrodisiac, and are used for the treatment of leucoderma, leprosy and in inflammatory diseases of the skin and leaves are good for the treatment of diarrhea [4,5,6]. The most important biological constituent of plant alkaloids, tannins, flavonoids and phenolic compound [7]. A huge classes and type of phytochemicals belonging to several plant family and species have been shown to have inhibitory effects on many types of microorganisms [8]. This Knowledge of the phytochemical constituents of plants is important to design new drug's from such information and also value for synthesis of complex chemical substances [9]. The essential oils of *Caesulia axillaris* shows the fumigant activity in the management of biodeterioration of stored wheat samples by *Aspergillus flavus* and the insect pests, *Sitophilus oryzae* and *Tribolium castaneum*, at 1300 and 600 ppm, respectively. The oils also controlled the blue mould rot of oranges caused by *Penicillium italicum*. It is act as a

postharvest fungicides of higher plant origin. There is no literature found on phytochemistry of *Caesulia axillaris* [10].

EXPERIMENTAL SECTION

Plant Material

Fresh plant materials that is Leaves, stem and Seed of *Psorolia corylifolia* L. and *Caesulia axillaris* Roxb, were collected from different regions Jalgaon city side area. Collected plant materials were taxonomically identified and authenticated by botanical expert. The plant materials were shade dried until all the water molecules evaporated and plants became well dried for grinding. Dry plant material separately grind to a fine powder and stored for further experiment with proper labels.

Preparation of Extract

Dried powder of Leaves (L), Stem (St) and Seed (S) powder for each experimental plant was exhaustively extracted successively in soxhlet apparatus using Hexane, Chloroform and Methanol respectively. The solvents were removed by distillation and the last traces of solvent being removed under reduced pressure. The extracts were weighed and their percentage value was recorded and thereafter, was stored in refrigerator for further experimental work [11, 12].

Phytochemical analysis

The extractions was tested for the presence of bioactive compounds by using following standard methods [13, 14].

- **Test for alkaloids**: Crude extract was mixed with 2ml of 1% HCl and heated gently. Mayer's And Wagner's reagents were then added to the mixture. Turbidity of the resulting precipitate was taken as evidence for the presence of alkaloids [15].

- **Test for glycosides:**

Liebermann's test:Crude extract was mixed with each of 2ml of chloroform and 2ml of acetic acid. The mixture was cooled in ice. Carefully concentrated H_2SO_4 was added. A colour change from violet to blue to green indicated the presence of steroidal nucleus, i.e., glycine portion of glycoside.

Salkowski's test: To the 2 ml chloroform and 0.5 ml extract, concentrated H_2SO_4 was added from sides of the test tube to form lower layer, reddish–brown coloration at interface reveals the presence of steroids [14].

- **Test for flavonoid:** When dilute sodium hydroxide was added to 0.2 ml of extract creates intense yellow colour, which on addition of HCl turns colourless suggests presence of flavonoids [16].

- **Test for tannins:** Crude extract was mixed with 2ml of 2% solution of $FeCl_3$. A blue-green or black coloration indicated the presence of tannins [14, 17].

- **Test for phenolic:** Formation of intense green, purple, blue or black colour with addition of 1% ferric chloride solution to the extract [18].

- **Test for steroids**: 200mg plant material was taken in 10 ml chloroform and then filtered. In 2ml filtrate, 2ml acetic anhydride and small amount of H_2SO_4 was added, appearance of blue green ring indicates presence of steroids [19].

RESULTS AND DISCUSSION

The phytochemical composition of three different solvent and six test of two studied plant is summarized in table. Present investigation indicate that the leaves of the three study plants contain alkaloids, glycoside, flavonoids, tannins, steroids and phenols. These phytochemicals are known to be of therapeutic importance since they have active medicinal importance in pharmaceuticals. Observations indicate that the flavonoid is more prominently present in *Psoralea corylifolia* L. in all three solvent system followed by steroids and glycoside for leaves, stem and seed powder. *Caesulia axillaris* Roxb shows flavonoid in all three plant part in each solvent but least in methanolic solvent, while glycosides is absent except hexane solvent for leaves and stem. Alkaloids are absent in both plant test irrespective to different solvents system.

Table.1

Plant	***Psoralea corylifolia* L.**									***Caesulia axillaris* Roxb.**								
Extract	Hexane			Chloroform			Methanol			Hexane			Chloroform			Methanol		
Parts	**L**	**St**	**S**	**L**	**St**	**S**	**L**	**St**	**S**	**L**	**St**	**S**	**L**	**St**	**S**	**L**	**St**	**S**
Alkaloids	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Glycoside	+	+	+	+	+	+	-	-	+	+	+	-	-	-	-	-	-	-
Flavonoids	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	-	+	-
Tannins	+	-	-	+	+	-	-	+	-	+	-	-	+	+	+	+	+	+
Phenols	+	+	+	+	-	-	+	-	+	+	-	+	-	-	-	+	-	+
Steroids	+	+	-	+	+	+	+	+	-	+	+	+	-	+	+	+	+	+

For any important pharmaceutical inventions and discovery of novel drugs, the essential information's regarding the chemical constituents are generally provided by the qualitative phytochemical screening of plant extracts. In the present study, qualitative tests for Psoralea *corylifolia* L. and *Caesulia axillaris* Roxb for six different secondary metabolites shows significant indication about the presence of active components. . Steroid and flavonoid were found to be present in the extracts of the leaves, stem and seeds of both the plants. While alkaloids, glycoside and others could not be detected in the extracts. These findings of phytochemicals were good enough to reflect its importance of these plant species. Both these plants can be used for further phytochemical analysis to inventions of new therapeutically valuable compounds.

CONCLUSION

Profiling of plant extracts in different solvent system confirms the presence of diverse group of phytochemicals. Authors revealed that the phytochemical composition varies with the solvent used within same sample. Hence, its important conclusion that based on work of interest, it is necessary to use the appropriate solvent for extraction and isolation of phytochemicals. This should be a critical step in further studies on the phytochemical study for further reporting of therapeutic importance.

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Diversity of Genus *Plagiochasma* in Satpuda Range of Khandesh Region, Maharashtra, India

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Satpuda range

ABSTRACT

Satpuda range of Khandesh region is an-ignored geographical area by Indian bryologist. Hence, very little information is available regarding bryoflora of this range. In this study attempt was made to find out the status of genus Plagiochasma in this region. Out of 35 species of *Plagiochasma* only 8 are validly reported from the Indian subcontinent. In present study three species of *Plagiochasma* viz., *Plagiochasma rupestre* Forst, *Plagiochasma pterospermum* Mass, *Plagiochasma appendiculatum* Lehm. & Lindenb. have been reported for the first time from Satpuda range of Khandesh region of Maharashtra. The morphotaxonomical details along with their distribution in India have been given in present paper.

Introduction

Khandesh region consists of three districts Jalgaon, Dhule and Nandurbar. Khandesh lies at the Northwestern corner of the Deccan plateau, in the valley of the Tapti river, and is bounded in the north by the Satpuda ranges, in the east by the Berar (Vidarbha) region, in the south by the hills of Ajanta, belonging to the Marathwada region of Maharashtra, and in the west by the Northern most ranges of the Western Ghats, and beyond that the coastal plain of Gujarat. Khandesh has varied topographical features and landscape. It lies between 20^0 8' and 22^0 7' North latitude and 73^0 42' and 76^0 28' East longitude. For administrative purposes, it is distributed over sixteen sub-divisions, with an average area of 1669.12 sq. km, 215 villages and 64,290 inhabitants. Khandesh covers a total area of 26,703.36 sq. km stretching nearly 257.44 Km along. The river Tapti traverses the length of Khandesh from 112 to 144 Km. Khandesh forms

an upland basin of the most northerly section of the Deccan table land. Along the whole northern frontier, the district is bounded by the Satpuda ranges, a mountainous tract from 48.27-64.36 km wide.

Khandesh region though botanically rich in biodiversity have not been explored extensively except a few sporadic reports on floristic of Yadav et al. (2003), Kshirsagar and Patil (2008) and Patil (2003). During bryoflora explorations of Khandesh region of Maharashtra state, 03 interesting specimens belonging to *Plagiochasma* were collected from wet hill slope and margins of water courses. Close examination with the help of literature and specimens reveal that they were not recorded earlier from Khandesh region. All of them have been identified as *Plagiochasma rupestre* Forst, *Plagiochasma pterospermum* Mass, *Plagiochasma appendiculatum* Lehm. & Lindenb., which proved to be first report for Satpuda range of Khandesh region of Maharashtra. Identification of all these taxa is confirmed by Bryology Unit (Department of Botany, University of Lucknow), who confirmed the identity of the species.

Materials and methods

Satpuda ranges, which is one of the major hotspot of plants in Khandesh region. While working on a floristic study of Khandesh region of Maharashtra State, frequent collection tours in every season was undertaken to collect plants. The outcome of the collection tour was the 03 new taxa of bryophytes that are *Plagiochasma rupestre* Forst., *Plagiochasma pterospermum* Mass., *Plagiochasma appendiculatum* Lehm. & Lindenb.

All taxa have been identified with the help of available literature. The voucher specimens are deposited at the Department of Botany, H.J. Thim College of Arts and Science Mehrun Jalgaon, Maharashtra. The *Plagiochasma* species have been described with their Latin names, followed by author's citations. Detailed descriptions of the taxa are given.

Results and discussion

While exploring the study area 3 species of *Plagiochasma* have been collected from satpuda range of Khandesh region detailed descriptions are given below:

Plagiochasma rupestre (Forst.) Steph. *Plagiochasma* subgen. *Micropylum* Bischl., Rev. Bryol. Lichenol. 43: 63-109 (1977); *Plagiochasma*. (*Micropylum*) *rupestre* (Forst.) Steph., Spec. Hep. 1:80 (1899); Alam et al., Indian J. Forestry 32(4): 624 (2009); *Aytonia rupestris* Forst. Char. Gen. Pl: 148 (1776); *Plagiochasma nepalense* (Lehm. et Bisch.) Steph., Spec. Hep. 1: 81 (1898); *Plagiochasma simlense* Kash. (*P. simlensis*) J. Bombay. Nat. Hist. Soc. 25: 279 (1917). Fig. 1 (A-B).

Thallus dark green 10-12 × 4-5 mm, simple, with apical innovations, edges purple, more or less broad, entire or slightly crenulate. Midrib distinct with closely arranged pores, pores simple, minute, not raised over the surface, about 14 -20 µm in diameter with a concentric ring of 6 cells. Ventral scales purple-red, appendages broadly triangular 1-2.6 × 1-1.3 mm, covering the entire ventral surface, narrowly arranged in 2 rows, one on each side of the midrib, with an elongated appendage, 3 - 6 × 0.08 - 0.1 mm. Air chambers compact not very distinct, thallus differentiated into assimilatory and storage zone, cells of assimilatory zone thin walled parcnchymatous containing chloroplast. Storage zone cells thin walled and compactly arranged.

Dioicous. Male receptacles sessile, horse-shoe shaped, dorsal, present near the apex of thallus lobe. Female receptacle in median part of thallus all along the midrib, covered with hyaline (0.50-1.7 × 0.30-0.40 mm) receptacular scales at base. Disc of female receptacle usually three lobed. Sporophyte horizontally placed. Capsule wall single layered, cells 20-26 × 17.2-20.0 µm, thickened at corners only Spores brown-dark brown, 80-90 µm in diameter, polar, distal face with numerous polygonal areas or alveoli, proximal faces with distinct triradiate mark. Elaters simple or branched, 200-280 × 10-16 µm, bi-tri spirate, yellowish or reddish brown.

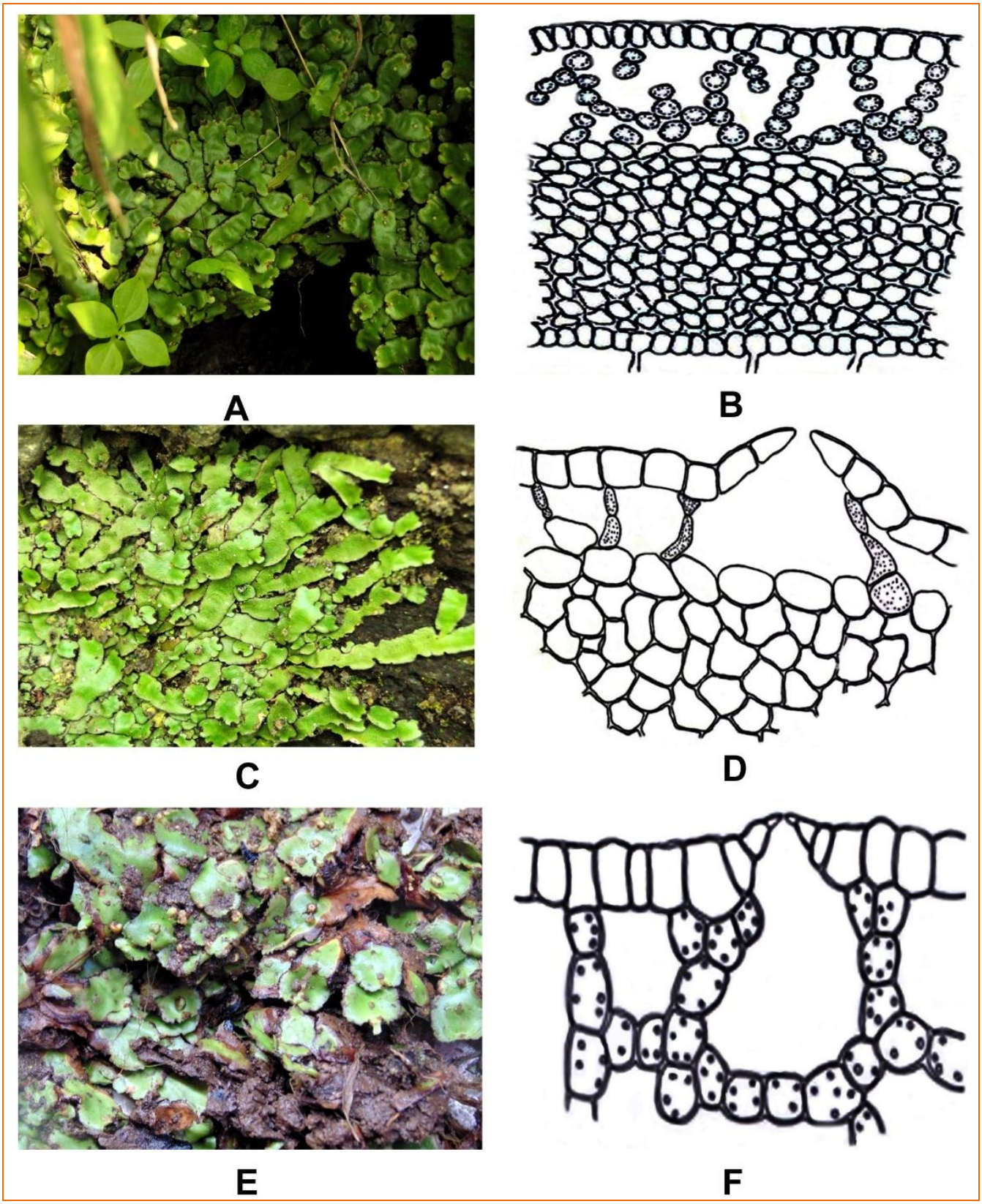

Fig. 1: A-B, *Plagiochasma rupestre* (Forst.) Steph. **A:** Plant dorsal view; **B:** T. S. of thallus; **C-D**, *Plagiochasma pterospermum* Mass. **C:** Plant dorsal view; **D:** T. S. of thallus; **E-F**, *Plagiochasma appendiculatum* Lehm. **E:** Plant dorsal view; **F:** T. S. of thallus;

Distribution: Occasional. In Satpuda ranges. On gravelly, rocky substrate or on rocks along hill slopes.

GPS reading: N 21˚20'46.30" E 75˚19'28.59" (Elevation 332.6m)

Specimens examined: Jalgaon Dist., Devjiri, *TAK* 19. Nandurbar Dist., Amlibarighat *TAK*31; Molgi, *TAK* 47.

Plagiochasma pterospermum Mass., Mem. Acad. Agrie Verona 73: 46 (1897); Alam et al., Indian J. Forestry 32(4): 631 (2009); *Plagiochasma articulatum* Kashyap, New Phytol. 13: 320 (1914). Fig. 1 (C-D).

Thallus dark green, 8-32 × 5-10 mm, edges purple, extremely undulate, apex notched. Midrib distinct. Dorsal surface of thallus with distantly arranged pores, pore about 28.2 - 30.6 µm in diameter, slightly raised, with 3-4 concentric rings of cells, inner most ring made up of 8 cells each. Ventral scales purple, closely arranged, sometimes imbricate, in two rows, one on each side of midrib, with 1 to 5 cells wide 1-3 linear appendages (1.5-2.0 × 0.5-0.9 mm). Assimilatory zone having air chambers in 5-6 rows at midrib and 2 rows at margins without assimilatory filaments. Storage zone confined to the midrib region.

Monoicous. Male receptacles sessile, horse shoe-shaped, dorsal, present near the apex of thallus lobe, with small papillae over the disc. Female receptacle dorsal on thallus, shortly stalked, surrounded by large number of linear receptacular scales; receptacular scales 2.5-5.5 × 1-1.5 mm, 3-5 cells in width at base. Stalk without rhizoidal furrow. Disc of female receptacle 3-4 lobed, sporophyte horizontally placed. Capsule wall single layered, cells 15-38 × 15-22 µm with trigones. Spores tetrahedral, 70-87 × 80-90 µm, distal face with irregularly distributed lamellae. Proximal face with distinct triradiate mark and lesser number of lamellae. Spore surface yellowish brown in colour giving an appearance of wing at the periphery. Elaters 140-280 × 9-18 µm, branched, bi - tri spirate, brownish in colour.

Distribution: Rare. In wet patches, besides water streams, along hill slopes.

GPS reading: N 21˚22'37.25" E 75˚45'24.97" (Elevation 753.6m)

Specimens examined: Jalgaon Dist., Langdha Aamba, *TAK* 63. Nandurbar Dist., Toranmal, *TAK* 79; Kalapani, *TAK* 92.

Plagiochasma appendiculatum Lehm. & Lindenb. in Lehmann, Novarum et minus cognitarum stirpium pugillus quartus: 14 (1832); Gottsche et al.: 517 (1844-1847); Steph.: 782 (1898); Kashyap: 318 (1914); Perold in Bothalia 25, 1: 13-29 (1995). Fig. 1 (E-F).

Thallus large, flat with edgesinfrequently curved somewhat downwards or upwards, largely ligulate. bright green, shiny surface, with fine purple edge along margins, pores observable, small and slightly elevated, when wet: thallus margins incurved or inflexed, revealing shiny, reddish purple transversely striate and wrinkled underneath of wings, not covered by scales, when dry; in crowded, gregarious patches, simple or once. Branches 12-18 x 5-7 mm. 710-900 µm thick over midrib, laterally thinning out into attenuate wings; apex notched, with reddish or partly hyaline scale appendages recurved over edge in 2 layers: margins acute, thin, somewhat undulate: edges sloping, obliquely, reddish or purple: ventral face medianly keeled, green, with row of purple red scales on either side. Dorsal epidermal cells unistratose, hyaline, rectangular to polygonal. 20-40 × 15-25 µm. walls thin and thickened at angles, in transverse section 28-35 µm thick, smooth superficially, along margins 2 or more rows of cells, rectangular, up to 20 x× 10 µm or shorter than broad, 10 × 20 µm; air pores not so many, 100-200 µm distant from each other, somewhat elevated, simple, 7-9 µm wide, enclosed by an innermost ring, 2 µm wide, of minute collapsed cells and then by 2, concentric rings of larger cells, 5 or 6 inner ones transversely oval or round. 10-14 × 13-18 µm, partly covering outer row of 5 bluntly triangular cells, 20 × 30 µm across widest part, radial walls

not thickened. Assimilation tissue 350-450 µm thick, air chambers vacant, in many layers, upper ones ±20 µm wide, lower down wider, ± 60 µm wide, cells in bounding walls 35-48 × 20-35 µm. with a brown oil body. 20-30 µm wide: storage tissue occupying ventral 1/2 of thickness of thallus, cells angular, up to 40 µm wide; rhizoids also smooth. 12-25 µm wide. Scales red. Appendages typically decolorate, arranged in 2 forwardly directed ventral rows, one on either side of midrib, asymmetric, obtusely triangular with flatly arched base, progressively tapering above, deeply constricted and folded where joined with large, orbicular appendage, the latter up to 700 µm long, 500 µm across widest part in middle. 310-365 µm wide at base, at margin 1 rows of small rectangular cells 10-16 × 7-12 µm. alternating with slightly larger cells, in the centre of appendage toward base, cells large, rectangular. ± 75 × 37 µm enclosed by numerous rows of irregularly shaped cells; body of scale up to 1200 µm long. 11µm across base, cells rectangular. ± 60 × 20 µm. 5 or 7 smaller, scattered ones with remains of oil bodies. ± 26 × 20 µm: at margins cells small, ± 24 × 12 µm. walls thin, curved, irregularly with long, projecting papillae.

Monoicous, however male and female receptacles frequently on separate plants. Androecia in sessile cushions, oval, horseshoe or heart-shaped. 1.4-2.6 × 2.0 mm. on leading branch medianly. near apex, proximally partially enclosed by narrow curved groove in thallus. Base encircled by blunt, hyaline or partly purple paleae. 540-570 × 120-170 µm. cells rectangular. ± 56 × 20 µm. toward apex smaller, quadrate. ± 23 × 24 µm. near to base margins with some projecting papillae. 24 × 12 µm. Archegoniophores single or several in acropetal sequence medianly along main branch, firstly surrounded by arching hyaline paleae. ± 800 × 100 µm, lower cells typically rectangular. 35-48 × 20 µm, toward peak smaller. ± 18 × 14 µm and at margin 14 × 23 µm, missing papillae. Carpocephala 2 × 2 mm when 4 lobes present, elevated on stalk, 1.2-2 mm long, ± 70 µm in diameter, in transverse section 1 or 2 rows of cortical cells, 16-26 × 16-28 µm, medullary cells angular, up to 36um wide, thin-walled. Spores 70-80 µm diameter, triangular-globular, polar, pale brown, translucent, wing ± 8 µm wide, margin undulate, minutely crenulate.

GPS reading: N 21o 40' 26.09" E 74o1' 29.68" (Elevation 726.7m)

Distribution: Occasional. In Satpuda ranges grow on moist hill slopes.

Specimens examined: Jalgaon Dist., Jamnya, *TAK* 107. Nandurbar Dist., Dab, *TAK* 121; Dadgaon, *TAK* 147.

All pertinent literature were gone through, notably Perold (1995), Alam and Srivastava (2009) and consulted with Dr. Afroz Alam, Department of Bioscience and Biotechnology, Banasthali University Rajasthan. In Khandesh region only floristic surveys other than bryoflora have been done so far by Yadav et al. (2003), Patil (2003), Kshirsagar and Patil (2008), Khan and Chaudhari (2014), and Khan et al. (2015). There is no literature available regarding bryoflora of Satpuda range in the Khandesh region of Maharashtra. It was found that, these species were not reported in any of the Khandesh region. These species are new record for the Satpuda range of Khandesh region of Maharashtra State. The specimens are deposited in the herbarium of Department of Botany, H.J. Thim College of Arts and Science Mehrun Jalgaon. On close examination of specimens and detailed scrutiny of literature published till today on these taxa, it can be claimed that these are new records for Satpuda range of Khandesh region of Maharashtra.

Conclusion

Plagiochasma rupestre Forst, *Plagiochasma pterospermum* Mass, *Plagiochasma appendiculatum* Lehm. & Lindenb., are to be first report for Satpuda range of Khandesh region of Maharashtra. Data available about these species are meager but field surveys will play important role to enhance knowledge about the Indian Bryology, particularly in Maharashtra.

Conflict of interest statement

Authors declare that they have no conflict of interest.

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