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SOIL FUNGI ASSOCIATION AND MINERAL ANALYSIS OF MOSSES FROM WESTERN GHATS OF MAHARASHTRA, INDIA

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ABSTRACT

Present attempt emphasizes on report of fungi from rhizosphere soil of *Funaria hygrometrica* Hedw, *Macromitrium sulcatum* Brid, *Brachymenium turgidum* Broth, *Bryum coronatum* Schwaegr, *Hyophila involuta* (Hook.) Jaeg. from Western Ghats of Maharashtra. Seven fungal genera like *Aspergillus niger* Tiegh, *Penicillium islandium* Sopp, *Glomus fasciculatum* (Thaxt.) Gerd and Trappe emend. C. Walker and Koske, *Rhizopus stolonifer* (Ehrenb.) Vuill, *Aspergillus fumigatus* Fresen. Beitr. *Candida albicans* (C.P. Robin) Berkhout, *Penicillium chrysogenum* Thom, *Trichoderma citrinoviride* Bisset, *Fusarium oxysporum* Schlecht, *Aspergillus flavus* Link, *Aspergillus unguis* (Weil and L. Gaudin) Thom and Raper, *Penicillum aurantiogriseum* Dierckx, were reported by serial dilution method from rhizosphere soils. The major elements like N, P, K, Ca, Mg, S, Na and minor elements like Fe, Mn, Cu, Zn were isolated from rhizosphere soils. The accumulation of different macro and micronutrient elements in rhizosphere soils varies from species to species. N and Fe concentration was comparatively higher in soil supporting all moss species and the nutrient elements determined in *Hyophila involuta* is maximum as compared to soil supporting other moss species with few exceptions.

KEYWORDS: Isolation of fungi, Mineral elements analysis, Rhizosphere soil, Mosses, Western Ghats, Maharashtra, India.

INTRODUCTION

The role of bryophytes in nutrient uptake within ecosystems is generally ignored because of their small structure. Weetman and Timmer (1967) showed that the common feather moss *Pleurozium schreberi* (Brid.) Mitt. in a black spruce (*Picea mariana* (Mill.) Britton, Sterns and Poggenburg) forest took up only 23-53% of the N, P, K, and Mg taken up by trees. Kamal and Singh (1970) observed rhizosphere mycoflora of some bryophytes and vesicular arbuscular mycorrhizal fungi study of three mosses like *Sphagnum cymbifolium*, *Polytrichum communae* and *Funaria hygrometrica* (Iqbal et al. 1988). Gjengedal and Steinnes (1990) considered Na^{+} and Mg^{++} in the precipitation may occupy exchange sites and affect the uptake of other ions by this competition and uptake of Zn and Cd were pH dependent increasing temperatures uptake for all four of the metals tested as Ca, Cu, Pb, and Zn. Mycoflora of rhizosphere influence the growth of bryophytes (Tapwal et al. 2004). Studies on fungal association of liverworts and mineral element analysis done in rhizosphere soils of mosses from Western Ghats of Maharashtra. (Kashid and Chavan, 2013).

MATERIAL AND METHODS

The collection of mosses were done from five different localities as Aundh, Sinhagad, Kas pathar (Satara), Lonawala and Mahabaleshwar. The collection of mosses were done along with their rhizosphere soil during the period of July, 2016 to October, 2016 and in July, 2017 to October, 2017.The collected specimens were brought in the laboratory of Department of Botany, Tuljaram Chaturchand College, Baramati, Dist-Pune 413102 and rinsed, cleaned, dried and stored in paper bags at room temperature. Rhizosphere soils of moss species were used for isolation of soil fungi by serial dilution method. In this method 1 gm. rhizosphere soil dispersed in 9 ml sterile water, 1ml of this transfer to second tube containing 9 ml sterile water resulting in 0.01 dilution of the spore mass in the original material the process repeated to yield dilution 0.01, 0.001, 0.0001, 0.00001 or even further if necessary. 1 ml portion from each dilution pipette to a separate test tube. Concentration ranges 10^{-1}, 10^{-2}, 10^{-3}, 10^{-4}, 10^{-5}, likewise 1:10, 1:100, 1:1000, 1: 10,000, 1:1,00,000. Czapek- Dox Agar (CDA) Inoculated plates kept in incubation chamber for 5 to 07days for incubation. During the incubation period

every 2 days of interval observed the fungal colonies in the plates. Fungi were identified and classified using Ainsworth's classification (1973).

Table 1: Values of nutrient elements from non-rhizosphere soils of moss species from various localities of Western Ghats, Maharashtra. (Mg / g).

Locality	N %	P %	K %	C %	Na	$CaCO_3$	E.C	pH
Aundh	14.2	473	0.62	0.61	**3.76**	1.00	6.30	1.49
Sinhagad	**62.3**	14.02	**742**	0.26	0.97	4.23	2.28	6.51
Kas-Satara	2.82	**314.10**	4.27	**1.83**	1.67	0.32	5.93	1.86
Lonawala	55.4	15.03	207	0.23	1.0	3.76	**7.64**	7.15
Mahabaleshwar	133	12.2	457	0.87	3.6	**5.21**	0.89	**7.35**

Table 2: Fungal genera and species isolated from rhizosphere soils of moss species.

Moss species	Name of fungi	Number of fungal species
Brachymenium turgidum Broth	*Aspergillus niger, Penicillium chrysogenum* and *Glomus fasciculatum*	03
Bryum coronatum Schwaegr	*Rhizopus stolonifer, Aspergillu flavus, Penicillium islandium* and *Aspergillus fumigatus*	04
Funaria hygrometrica Hedw	*Aspergillus niger, Penicillium chrysogenum Glomus fasciculatum* and *Aspergillus unguis*	04
Hyophila involuta (Hook) Jaeg	*Aspergillus niger, Rhizopus stolonifer, Candida albicans* and *Trichoderma citrinoviride*	04
Macromitrium sulcatum Brid	*Aspergillus niger, Penicillium aurantiogriseum* and *Fusarium oxysporum*	03

Table 3: Macronutrient analysis of Rhizosphere soil (Mg /g).

Sr. No.	Moss species	N	P	K	Ca	Mg	S	Na
1	*Brachymenium turgidum* Broth	22.2	0.3	2	8.7	4.7	1.1	1.5
2	*Bryum coronatum* Schwaegr	**25.2**	**0.49**	2	7.5	4.9	1.1	1.5
3	*Funaria hygrometrica* Hedw	18.4	0.8	2	10.5	5.7	0.9	**2.5**
4	*Hyophila involuta* (Hook) Jaeg	24.0	0.39	**3**	**34.1**	**7.3**	**1.2**	1
5	*Macromitrium sulcatum* Brid	13.4	0.6	2	9.1	5.3	0.6	1

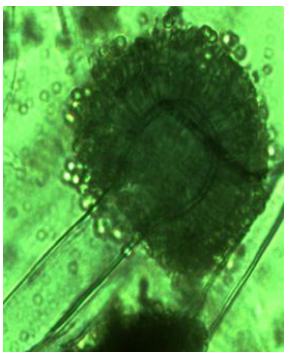
Table 4: Micronutrient analysis of Rhizosphere soil (µg /g).

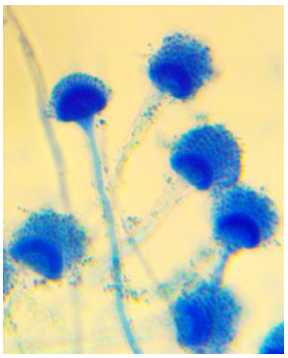
Sr. No.	Moss species	Fe	Mn	Zn	Cu
1	*Brachymenium turgidum* Broth	1411	257	49	26
2	*Bryum coronatum* Schwaegr	1289	96	35	07
3	*Funaria hygrometrica* Hedw	1407	200	**80**	37
4	*Hyophila involuta* (Hook) Jaeg	**1493**	**356**	57	**57**
5	*Macromitrium sulcatum* Brid	1404	198	76	35

RESULT AND DISCUSSION

Mycoflora diversity in rhizosphere soils of mosses from Western Ghats, Maharashtra is depicted for their analytical study. Seven fungal genera with 11 species were identified from rhizosphere soils of five moss species are as *Aspergillus flavus*, *A. fumigatus*, *A. Niger*, *A. unguis*, *Candida albicans*, *Fusarium oxysporum*, *Glomus fasciculatum*, *Penicillium aurantiogriseum*, *P. chrysogenum*, *P. scandium*, *Rhizopus stolonifer*, *Trichoderma citrinoviride*. The major nutrients are N, P, K, Ca, Mg, S, Na and minor nutrient like Fe, Mn, Cu, Zn.

The accumulation of different macro and micronutrient elements in rhizosphere soils varies from species to species. As rhizosphere soil rich in organic matter with sufficient amount of Carbon and Nitrogen are favorable for growth of bryophytes (Kashid and Chavan, 2011). concentration was comparatively higher in soil supporting all moss species and the nutrient elements determined in *Hyophila involuta* is maximum as compared to soil supporting other moss species with few exceptions.


Aspergillus niger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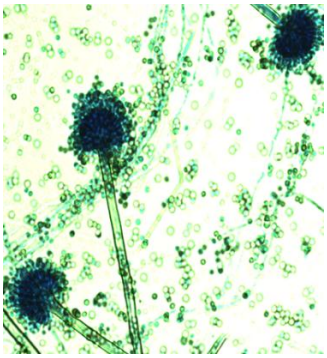
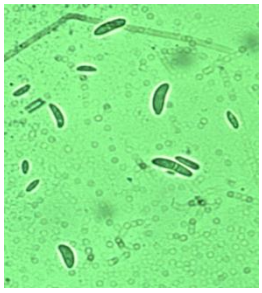

Aspergillus fumigatus

Aspergillus unguis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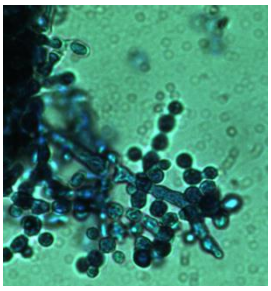
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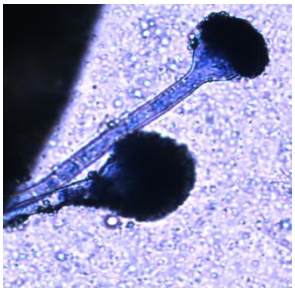
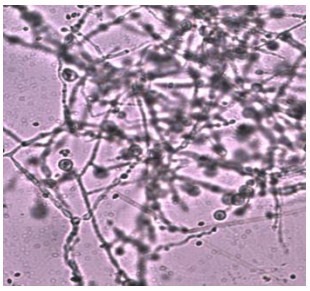
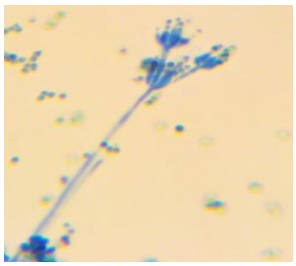

Rhizopus stolonifer


Glomus fasiculatum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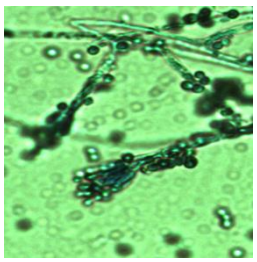
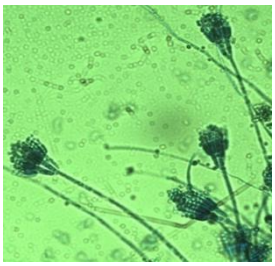
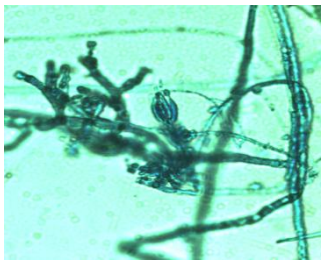

Penicillium islandium


Penicillium aurantiogriseum


Trichoderma citrinoviride

SUMMARY AND CONCLUSION

All species are tested analytically to their major nutrients N, P, K and minor nutrient like Ca, Mg, S, Fe, Mn, Zn, Cu and Na. Values of nutrient elements studied in moss species from various localities and shows correlation with plant extracts.

Mineral nutrition was investigated in mosses and overall inorganic elements like Nitrogen, Calcium, Sulphur, Phosphorus, Magnesium, Manganese and Potassium, Sodium, Iron, Copper, Zinc content accumulated in mosses.

Soils of different locality indicates low carbon indicates more nitrogen and potassium, high carbon indicates less nitrogen and potassium. p^H of soil indicates high potassium at Aundh and Kaas talav locality.

Highest 'P' content is recorded in *Funaria hygrometrica* Broth. this gives clear idea of receiving adequate quantity of 'P' from soil and thereby maintaining its normal metabolic activity.

Accumulation of '**Ca**' in mosses take part in regulation of water flow across plant membranes thereby helps in stomatal movement to reduce water loss. Magnesium content is more in *Hyophila involuta* high '**Mg'** content in shoot helps in 'K' translocation. Sulphur content is higher in *Hyophila involuta* (Hook.) Jaeg. and minimum in *Macromitrium sulcatum* Brid. The bitterness attributed to this moss may be also the effect of high sulphur content.

Fe content is recorded more in *Hyophila involuta* (Hook.) Jaeg. and Iron is important element in oxido-reduction reactions in plants it's performance justifies normal healthy growth of this weed in even dry arid regions.

REFERENCES

1. Ainsworth, G.C. The fungi vol. IV B, Academic press, 1955.
2. Alexopoulos C.J Mims, C.W. and Blackwell, M. introductory mycology. John Wiley and Sons (Asia) Pvt. Ltd., Singapore, 2002.
3. Bates, J. W. Retention of added K, Ca and P by *Pseudoscleropodium purum* growing under an oak canopy. J. Bryol, 1989; 15: 589-605.
4. Crous &Summerb. *Phaeoacremonium krajdenii* L. Mostert, Gjengedal, E. and Steinnes, E. Uptake of

metal ions in moss from artificial precipitation. Environ. Monitor. Assess, 1990; 14: 77-87.
5. Iqbal, S. H., Nasim, G., and Shahjahan. Vesicular arbuscular mycorrhizal fungi associated with three mosses (*Sphagnum cymbifolium*, *Polytrichum commune*, and *Funaria hygrometrica*). Biologia (Lahore), 1988; 34: 269-273.
6. Kamal and Singh, C. S. Rhizosphere mycoflora of some bryophytes. Ann. Inst. Pasteur (Paris), 1970; 119: 752-755.
7. Kashid J. K. and Chavan, S. J. Fungal Association of Liverworts at Western Ghats of Maharashtra, Adv. Plant Sci., 2013; 26(1).
8. Kashid, J. K. and Chavan, S. J. Nutrient contents in the rhizosphere of thalloids at Western Ghats, Maharashtra., Bioinfolet, 2011; 8(4): 407-408.
9. Kashid, J. K. Kanade, M. B. Telave, A. B. Deokule, S. S. and Chavan, S. J. Thalloid liverworts and their rhizosphere soil mycoflora from hill forts of Western Ghats, Maharashtra. Geobios, 2010; 37(4): 253-256.
10. Weetman, G. F. and Timmer, V. Feather moss growth and nutrient content under upland black spruce. Woodlands Research Index, Pulp and Paper Research Institute of Canada, Pointe Claire, P. Q., Canada, 1967; 138: 1-38.