International Journal of Botany Studies
www.botanyjournals.com
ISSN: 2455-541X
Received: 25-09-2021, Accepted: 10-10-2021, Published: 26-10-2021
Volume 6, Issue 5, 2021, Page No. 1472-1474

VA mycorrhizal studies on some fallow land plants at Karnagarh in West Bengal

Pampi Ghosh
Assistant Professor, Department of Botany, Seva Bharati Mahavidyalaya, Kapgari, Jhargram, West Bengal, India

Abstract
Arbuscular Mycorrhizal Fungi (AMF) is a normal component in the rhizosphere soil of many plants and plays a crucial role to improve the ecosystem by many ways. It enhances the growth of host plants through the process of absorption of nutrients from rhizosphere soil. It increases the feeder root system and produce glomalin protein components in soil. It helps plants to remain steady in different stress prone conditions like heavy metals, salt stress, water stress even resist host plants against the attack of several pathogens like nematodes and fungi. As they produce a connection between rhizosphere soil particle and feeder root cortical cells of the host plants, several types of AM fungal structures produced within the living host root cells and outside the roots i.e. within the rhizosphere soil. During monsoon, gregarious vegetative growth of the wild host plants takes place naturally. Fine feeder root system is also highly observed and similarly internal colonization % is highly noticed in this case. This paper reflects only AM colonization % on some wild weed plants in monsoon. Result revealed that highest AM colonization% (99) was found in *Scoparia* and *Jatropha* but lowest (17%) in *Sida* during monsoon.

Keywords: Karnagarh, weeds, am colonization, vesicle-arbuscule ratio

Introduction
Arbuscular mycorrhizal fungi facilitate host plant to grow vigorously under stressful condition by making complex communications between host plants and fungi to enhance photosynthetic rate and other gaseous exchange related traits [1]. It significantly improves nutrient uptake by host plants and host plant's resistance against biotic and abiotic stresses [2, 3]. It also helps to improve salinity tolerance of host plants [4]. VAM is a vesicle and arbuscule producing fungi found in rhizosphere soil of co-habitats. Vesicle is balloon like structure (Fig. 1) and arbuscule (Fig. 2) is a labyrinth form found in rootlets of host plants. Coiled hyphae are the special structure found in rootlets of host plants as it is solenoid (Fig. 3). Southwest Bengal has tropical dry deciduous forests along with degraded lands in continuity with fallow lands. In almost all land habitats exhibit many weed species during monsoon though other seasons the number is minimum. However, no attempt has been made to study the mycorrhizal status and their effect on the growth and survival of the herbaceous weed plants of Southwest Bengal in fallow land. Therefore, the present study has been conducted to understand the actual scenario of VAM status of some dominant weed plants in Karnagarh of Southwest Bengal.

The acid lateritic soil of Southwest Bengal is characterized by low P^H range *i.e.* 5.4 -6.5 [5]. As per the report of Ghosh and Verma [6] iron and aluminium rich lateritic soil of Southwest Bengal is characterized by low P^H where phosphorus is fixed causing deficiency and the total phosphorus (P) is 0.048 percent and available phosphorus only 0.002 percent. Leaching renders the soil poor in nutrients. The survival of plants in such a harsh condition is more mycorrhiza dependent than the normal soil because mycorrhizal activity is augmented in nutrient poor soil [7]. Therefore, incorporation of VAM inoculums in cultural medium is very much essential to enhance the different parameters for better growth and nourishment of plants before planting in any harsh condition. Therefore to know the % of Am colonization on weeds, the present study was taken into account in continuity with monsoon study as preliminary one.

Study Area
Karnagarh of Paschim Medinipur in West Bengal was taken in study during monsoon because during monsoon, good growth of vegetation was found. It is approximately 8 km from Midnapore town and opposite to Bhadutala forest in Midnapore sadar of West Bengal. Fallow land is a bare land in Karnagarh village with no crops at all during monsoon seasons.

Materials and Methods
Field visit in Monsoon from 2020 to 20021 was taken into consideration for AM study. Random sampling was done following statistical method. The root samples were collected from uprooting of study plants was taken and root samples were preserved in FAA for 7-8 days. Samples were stained following certain modifications of original method of Phillips and Hayman [8]. Sample roots were cleaned thoroughly in running tap water and then alkaline hydrolysis of root sample was done with 10 percent potassium hydroxide (KOH) solution. The root samples were then dipped in 10% KOH solution and placed in a water bath at 60 degree centigrade for about 10-15 minutes depending upon thickness of root. KOH solution was decanted and the root was rinsed with water till no brown colour appeared in the water. Roots which were dark coloured even after KOH treatment for 10-20 minutes or until the roots were completely bleached. The roots were then washed with several changes of water thoroughly and then treated with 1 (N) 1% hydrochloric acid for five minutes. Subsequently, roots were stained with 0.1% Trypan blue in lactophenol. 100 small pieces of 1m root length of each was studied and % of colonizatio was recorded following the formula given below:

% of colonization = (no. of root segments having AM infection/no. of root segments studied) x 100

Results and Discussion

Ten weed plants under six families and ten genera were studied at Karnagarh fallow lands in West Bengal for VAM status study (Table 1). Except two plants, other eight plants showed more than 40% AM fungal colonization. *Scoparia dulcis* L. and *Jatropha gossypifolia* L. showed highest infection % during monsoon i.e. 99%. Plant like *Ludwigia perennis* L. showed deep stained hyphal structure within its root cortical cells and infection was 95%. The lowest percentage of colonization was observed in case of *Sida acuta* Burm. f. (17%) during monsoon in the study area. AM fungal root colonization on weed species at Karnagarh ranged between 17 to 99% during monsoon. So, there is a great variation in AM colonization % (Fig. 4). Mycorrhizal fungi produce hyphal structure and colonize roots of many plants even if they belong to different family, genus, species and results into a common mycorrhizal network which significantly affect different terrestrial plant community and ecosystems.

Table 1: AM fungal colonization and arbuscule-vasicle ratio in Karnagarh, W.B.

Sl. No.	Host species	Colonization %	Arbuscule/vesicle ratio	Host Family
1.	*Atylosia scarabaeoides* (L.) Benth.	42±0.08	1:2	Fabaceae
2.	*Sida acuta* Burm. f.	17±0.08	1:2	Malvaceae
3.	*Tephrosia purpurea* (L.) Pers.	67±0.05	1:2.76	Fabaceae
4.	*Scoparia dulcis* L.	99±0.0	1:0.28	Scrophulariaceae
5.	*Triumfetta rhomboidea*Jack.	70±0.06	1:0.86	Tiliaceae
6.	*Clereodendrum infortunatum* L.	60±0.04	1:0.42	Lamiaceae
7.	*Anisomeles ovata* R.Br.	42±0.04	1:0.15	Lamiaceae
8.	*Jatropha gossypifolia* L.	99±0.05	1:1.47	Euphorbiaceae
9.	*Ludwigia perennis* L.	95±0.08	1:0.2	Onagraceae
10.	*Crotalaria pallida* Aiton	20±0.02	1:0.25	Fabaceae

Note: Mean ± SD value

Photo Plates

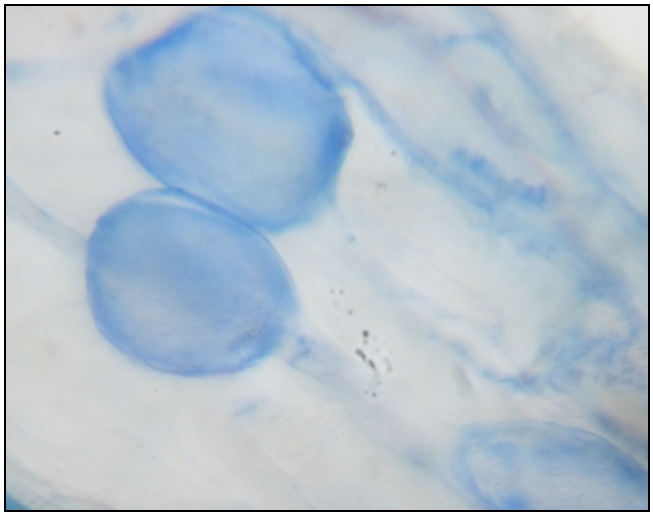

Fig 1: Vesicles on host rootlet

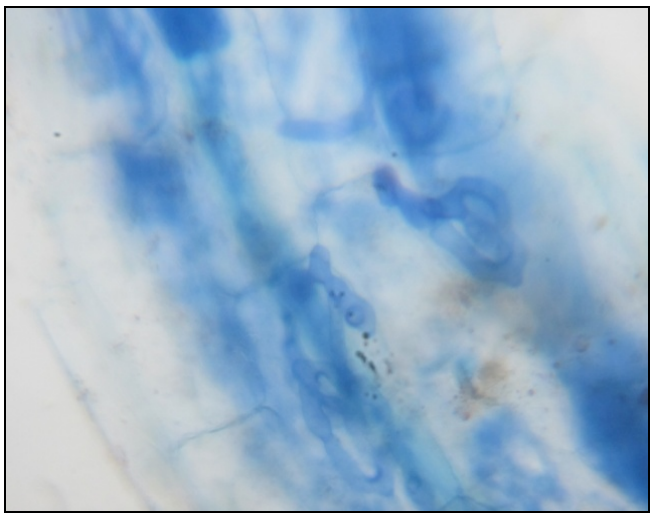

Fig 3: Coiled hyphae on rootlets

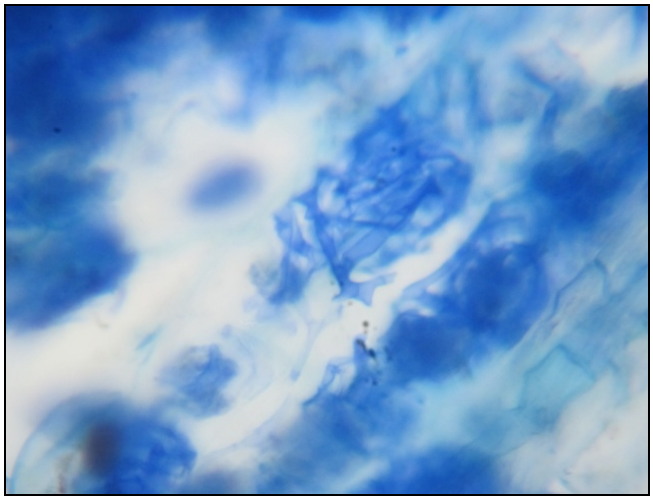

Fig 2: Arbuscules on rootlet

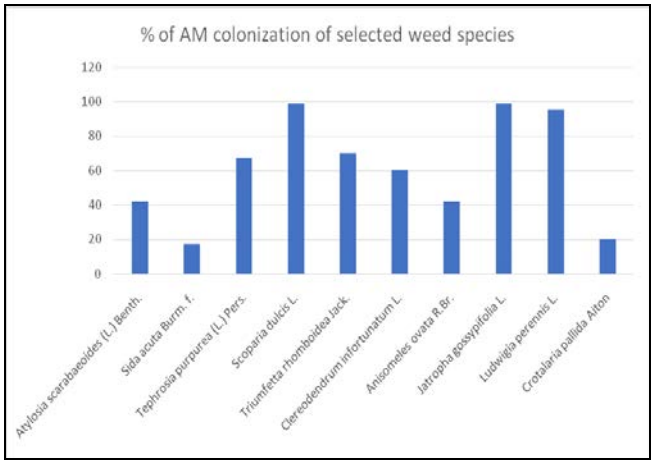

Fig 4: Colonization % of selected weed species during monsoon in Karnagarh of West Bengal, India.

Conclusion

Red lateritic belt is dry during winter and in summer. Soil and intact root sample collection is very tough work during winter and in summer. Highest spore density has been recorded by many authors from field during winter at other places. This need study during post monsoon and winter to know the spore density on such weeds in field. As arbuscules of mycorrhizae are major site of exchange of nutrients with the host plants during monsoon most of the plants show highest number of arbuscules in the studied segments in compare to vesicles. Vesicles develop thick wall layers in older roots and are storage organ of lipids also function as propagules of mycorrhizae hence more in number during winter. In the present study 4 plants showed more vesicles compared to arbuscules. So, more study is essential on many samples in the study area. Not only selected weeds, a big project may be made in future to study in details on a large number of weeds in the study sites round the year.

Acknowledgements

I convey my sincere thanks to my supervisor, Prof. (Dr.) N K Verma, Retd. Prof, Department of Botany & Forestry, Vidyasagar University, Midnapore, W.B. for his help as and when required. Thanks to local people for their help during sample and soil collection from field during lockdown.

Conflict of interest statement

I declare that I have no conflict of interest.

References

1. Birhane E, Sterck F, Fetene M, Bongers F and Kuyper T. Arbuscular mycorrhizal fungi enhance photosysthesis, water use efficiency and growth of frankincense seedlings under pulsed water availability condition, *Oecologia*,2012:169:895-904.
2. Sun Z, Song J, Xin X, Xie X, Zhao B. Arbuscular mycorrhizal fungal proteins 14-3-are involved in arbuscule formation and responses to abiotic stresses during AM symbiosis, *Front. Microbiol*,2018:5:9-19.
3. Diagne N, Ngom M, Djighaly PI, Fall D, Hocher V, Svistoono S. Roles of AMF on plant growth and performance: Importanc in biotic and abiotic stressed regulation, *Diversity*, *MDPI*,2020:12:70. doi.: 10.3390/d12100370
4. Klinsukon C, Lumyong S, Kuyper TW, Boonlue S. Colonization by arbuscular mycorrrhizal fungi improves salinity tolerance of *Eucalyptus* (*E. camaldulensis*) seedlings, *Scientific reports*,2021:11:4362. doi.: https://doi.org/10.1038/s41598-021-84002-5
5. Sengupta D, Verma NK, Ghosh BC. Effect of lime on VAM *Rhizobium-Arachis hypogoea* tripartite association, *Nat. Bot. Soc*,2001:55:19-23.
6. Ghosh S, Verma NK. A preliminary report on Va-Mycorrhizal status of some common weeds, trees and aquatic plants of Southwest Bengal, *Sci. & Cult*,2002:68(5-6):155-157.
7. Mosse B. 1973. Advances in the study of Vesicular arbuscular mycorrhiza, *Ann. Rev., Phytopathol*,1973:11:171-196.
8. Hayman DS. *Endogone* spore numbers in soil and vesicular-arbuscular mycorrhiza in wheat as influenced by season and soil treatment. *Trans Br. Mycol Soc*,1970:54:53-63.