Available online at www.ijpab.com

ISSN: 2320 – 7051
Int. J. Pure App. Biosci. **3 (4):** 142-146 (2015)

INTERNATIONAL JOURNAL OF PURE & APPLIED BIOSCIENCE

Research Article

OPEN ACCESS

Impact of Am Fungi and their Growth of *Centella asiactica* L.

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ABSTRACT

The present study was intended to investigate the agronomical characteristics induced by native AMF in Centella asiatica L. Two different indigenous native AM fungi such as Glomus mossea and Gigaspora margarita isolated from the Centella asiatica rhizosphere soils were used either alone or in various combinations for the study. The plants were sampled randomly treated at different AM fungi species and used to analyze the morphometeric, biometric, phosphours and potassium content. The obtained results clearly indicated that the AM significantly influenced in all the morphological and biological parameters when compared to uninoculated control.

Key words: *Centella asiatica L., rhizosphere soil, Glomus mossea and Gigaspora margarita.*

INTRODUCTION

Centella asiatica (Linn.) Urban sys. synonym *Hydrocotyle asiatica* Linn. commonly known as Indian Pennywort, belongs to the family Apiaceae (previously known as Umbelliferae). It is small creeping herb with shovel shaped leaves emerging alternately in clusters at stem nodes, to develop roots. The leaves are rounded to reniform, 2 to 5 centimeters wide, horizontal, more or less cupped, rounded at the tip, and kidney shaped or heart shaped at the base, the rounded lobes often overlapping, and usually bear 3 sessile flowers. It is distributed widely in many parts of the world, including India, Sri Lanka, Madagascar, South Africa, Australia, China, and Japan[4,18,24].

It is one of the chief herbs for treating skin problems, to heal wounds, for revitalizing the nerves and brain cells, hence primarily known as a "Brain food" in India[20]. Centella is also rich in vitamin C, vitamin B1, vitamin B2, niacin, carotene and vitamin A. The total ash contains chloride, sulphate, phosphate, iron, calcium, magnesium, sodium and potassium[3,8] .

The arbuscular mycorrhizal fungi (AMF) are a group of plant growth promoting organisms related to improve the overall growth of various crops. The AM fungal symbiont becomes a major interface and connection between the soil and the plant, and they play an important role in the uptake of nutrients and water. Most of the benefits of the host plant have been obtained in soils where the available P concentration to the plant is low. They are known to enhance plant biomass through better uptake of nutrients, water relations, resistant to drought and increased tolerance to invading plant pathogens[5,11,12,17].

MATERIALS AND METHODS

Preparations of AM fungus inoculums: Onion (*Allium cepa* L) plants were used as host for AM fungal inoculums preparations. Two dominant indigenous AM fungi such as *Glomus mossea* and *Gigaspora*

margarita were used for study. The efficient strains of native AM fungi were isolated from the rhizospheric soil sample of *Centella asciatica* plant. The AMF propagules were obtained from the soil by 'Wet Sieving and Decanting Method'[7]. The initial inoculum of AM fungus (*Glomus mossea* and *Gigaspora margarita*) was raised by 'Funnel Technique'[14] using Onion as host. After 40 days, seedling roots were processed to study AM colonization[15] and soil samples were studied for spore quantification.

Pot and Potting Mixture: Pots of 35×25 cm size were selected for the experiment. Pots were filled with sterilized sand: soil (1: 3). A layer of inoculum consisting of AM colonized root pieces and soil containing spores were spread over the pot mixture. Thirty-day-old surface sterilized *Centella asitica* seedlings raised in sterilized nursery soil bed were transplanted in pots at the rate of three in each pot. Seedlings without mycorrhizal inoculums severed as control. The pots were maintained in a greenhouse for 90 days. The following treatments are:

i. Control (uninoculated plants)
ii. *G. mosseae* alone
iii. *Gigaspora margarita* alone
iv. *G. mosseae + Gigaspora margarita*

Evaluation of agronomical characters: The tested plants were harvested at 90 days after planting and used for measuring various parameter analyses like the shoot (cm), root length (cm), plant height, fresh and dry weight (mg /g), the number of leaves per plant were determined. Biochemical studies such as total chlorophyll (MacKinney's method, 1941), carbohydrates (Dubois *et. al.,* 1956), proteins (Lowry *et al.*, 1951), aminoacids (Jayaraman, 1981), lipids (Sato and Murata 1988) and morphometric parameters such as plant height and plant dry weight were recorded. Phosphorus and potassium content of the shoot and root samples were determined, by the Vanadomolybdate phosphoric yellow colour method (Jackson, 1973) and flame photometeric method respectively.

RESULT AND DISCUSSION

A pot trial was conducted to study the influence of inoculation of efficient native AM fungi on growth and nutrition of *Centella asiatica*. Two isolates of native AM fungi were tested for their symbiolic efficiency in *Centella asiatica.* The morphometeric growth of Vallaari seedlings as inoculated by two different native AM fungi is given in table 1. These results are in accordance with the findings of Ramakrishnan and Selvakumar[16], Karthikeyan *et al.*,[10] in medicinal plants, Sreenivasa *et al*.,[21] in Brinjal; Sreeramulu and Bagyaraj[22] in Cardamom. These parameters were least in uninoculated control plants. Enhanced plant growth and biomass production due to inoculation with native AM fungi had been reported earlier in grasses[2,23]. AM fungi increase the uptake and translocation of not only P but also other nutrients[1,21]. Many workers have reported greater uptake of P, Zu, Cu, Mn and Fe due to mycorrhizal inocuation in grasses[23]. In the present study, higher levels of nutrients in the inoculated plants might have resulted in improved crop growth and leaf yield in seen table 2.

Total protein, total carbohydrate, Aminoacid, Lipid and chlorophyll contents were also increased in dual inoculation of *G. mosseae* and *Gigaspora margarita* then other treatments. The results were observed in table 3 and Fig I-IV. The chlorophyll content increased significantly reported in *G. fasciculatum* + *G. diazotrophicus* inoculated plants[13].

Table 1: Morphometeric analysis on 90th days interval

S.No.	Test name	Control	*G. mosseae* alone	*Gigaspora margarita* alone	*G. mosseae + G. margarita*
1	Shoot length (cm)	4	4.8	4.8	5.1
2	Root length (cm)	2	3	3.2	4.9

3	Plant height (cm)	6	7.8	8.0	10.0
4	No.of leaves (Nos)	2	4	4	8
5	No.of roots (Nos)	3	5	4	6
6	Leaf area (cm^2)	4	6	5.8	7.3
7	Fresh weight (mg)	0.4	0.9	1.0	1.4
8	Dry weight (mg)	0.03	0.1	0.1	0.3

Table 2: Effect of native AM fungi on nutrition of *Centella asiatica*

S.No.	Treatments	Phosphorus content mg / plant	Potassium content mg/plant
1.	Control	3.22	11.8
2.	*Glomus mosseae alone*	3.27	12.1
3.	*Gigaspora margarita alone*.	3.76	12.2
4.	*G. mosseae + Gigaspora margarita*	4.20	12.5

Table 3: Effect of native AM fungi on chlorophyll content of *Centella asiatica*

S.No.	Treatments	Chlorophyll (a) (mg/g)	Chlorophyll (b) (mg/g)	Total Chlorophyll (mg/g)
1.	Control	0.132	0.137	0.269
2.	*G.mosseae*	0.158	0.176	0.332
3.	*Gigaspora margarita*.	0.157	0.154	0.311
4.	*G. mosseae + Gigaspora margarita*.	0.172	0.233	0.405

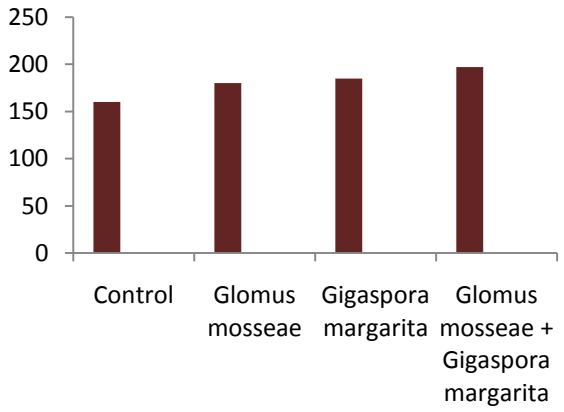

Fig. 1: Effect of AM fungi on Total Carbohydrate in (µg/g)

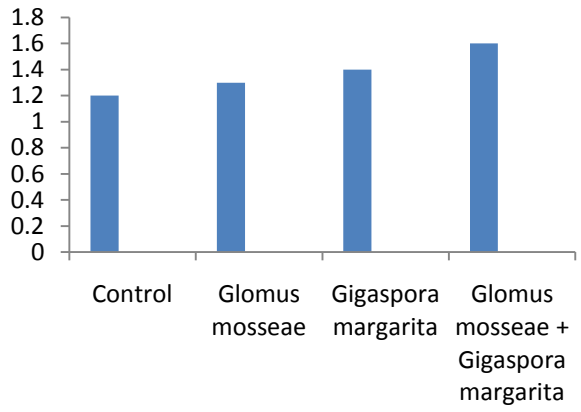

Fig. 2: Effect of AM fungi on Total Protein in (µg/g)

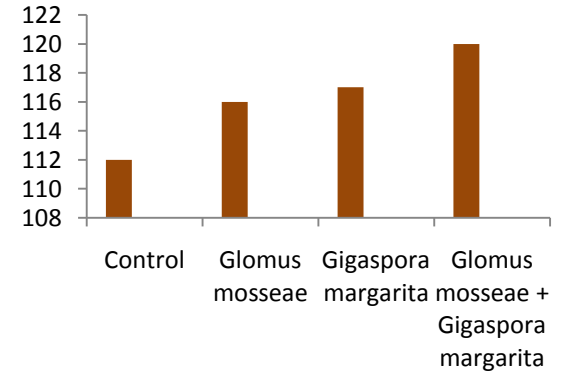

Fig. 3: Effect of AM fungi on Total Amino Acid in (µg)

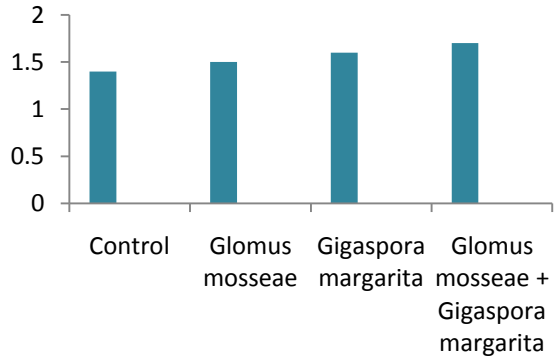

Fig. 4: Effect of AM fungi on Total Lipid in (µg/g)

Acknowledgement

The authors wish to thankful of Mardupandiyar College, Vallam, Thanjavur, for extending the facilities to carry out the laboratory studies.

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