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Mycorrhizal Association of *Glomus aggregatum* with *Begonia malabarica* Enhances the Growth and Biomass

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Begonia malabarica **was found to be associated with an Arbuscular mycorrhizal (AM) fungus, *Glomus aggregatum*. Pot culture experiments showed that inoculation of *Begonia* with *Glomus aggregatum* caused a two fold increase in growth and biomass production as compared to the control plants. These findings indicate the potential use of AM fungi for improving the production of an important medicinal herb.**

Key words: Mycorrhizal association, *Glomus aggregatum, Begonia malabarica,* Biomass.

Arbuscular Mycorrhizal fungi are soil microorganisms that establish mutual symbiosis with the majority of the higher plants, providing a direct physical link between soil and plant roots (Barea and Jeffries, 1995). About 95% of the world's plant species belong to characteristically mycorrhizal families (Smith and Read 1997). There are several reports indicating the importance of AM fungi increasing the growth, nutrient uptake, resistance, productivity and stress Haymen, 1970 and Sutton and Barron, 1972.

Mycorrhizas are considered essential for the survival and growth of majority of plant species in disturbed and unproductive soils. Mycorrhizal fungi help in the conversion of arid soil to fertile and productive soil and increase plant growth through enhanced nutrient uptake and cycling of phosphorus, nitrogen, zinc, copper and other trace elements (Barea 1991, Raman & Mahadevan 1996).

Begonia malabarica is an important medicinal herb in the area of Anamalai Hills, known for potential cure for arthritis and nutritional values among the tribal communities. This is an altitudinal herb grows in the altitudinal range from 500-2,500 MSL in Western Ghats. In this present study, we report the occurrence of association of the Arbuscular mycorrhizal (AM) fungus, *Glomus aggregatum* with *Begonia malabarica* and its influence on growth and biomass production.

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MATERIAL AND METHODS

Plant selection

15 days old healthy seedlings with equal heights were obtained from state forest nursery, Aliyar. The seedling roots were thoroughly washed with tap water and transplanted to pots for experiments. The experimental setup was prepared as T1 (Control plant) and T2 (inoculated with *Glomus aggregatum*). The charcoal is used as carrier material in the pots inoculated with *begonia malabarica*. The biomass parameters such as no of leaves shoot length and root length were measured in successive intervals (40, 80 and 120 days) for the biomass analysis.

AM fungal & root colonization analysis

The AM fungal were isolated by wet sieving and decanting method (Gerdeman and Nicolson, 1963). The spore population was measured against successive intervals to study the increase in spore population.

The roots were carefully washed, cleared with 10% KOH, stained with trypan blue (Philips and Hayman, 1970), squashed under a cover slip and observed under a light microscope for root colonization percentage.

The experiment had 5 replications. The seedlings planted in sterilized soil served as control plants (T_1). The AM fungal (*Glomus aggregatum*) spores were inoculated with the *Begonia malabarica* (T_2) were analyzed for Biomass analysis.

RESULT S AND DISCUSSION

Effect of growth on biomass production

Begonia plants inoculated with *Glomus aggregatum* when examined after 40 days showed a moderate amount (28%) of colonization (Table 1). No AM was detected in the roots of control plants, since no AM is applied in T_1 plants. The inoculated plants were found to grow

Table 1. The biomass analysis, percentage of colonization and spore population of *Begonia malabarica* after treatment

Parameters	Control Plants T_1			Inoculated plantsT_2		
	40 Days	80 Days	120 Days	40 Days	80 Days	120 Days
Shoot length(Cm)	8 ± 1.00	14.23 ± 0.25	28.67 ± 0.58	11.8 ± 0.29	18.37 ± 0.15	36.33 ± 0.58
Root length(Cm)	2.3 ± 0.26	4.2 ± 0.15	11.10 ± 0.10	4.1 ± 0.29	8.1 ± 0.10	14.10 ± 0.10
Dry weight	0.18	0.352	0.979	0.29	0.491	1.785
No of leaves	3	5	8	4	8	11
% of colonization	-	-	-	28	54	73
Spore population	-	-	-	168	239	351

vigorously than the uninoculated plants. The biomass parameters such as shoot length, root length and no of leaves were comparatively high than the uninoculated plants throughout the study, while the uninoculated control plants showed no significant increase in respective to growth parameters. The maximum shoot length (36.33 ± 0.58**)**, root length (14.10 ± 0.10), number of leaves (11) and dry weight (1.785) were significantly increased after 120 days than the uninoculated plants.

The microscopic examination of the roots of *Begonia malabarica* growing in experimental pots, Showed intensive AM development during the increase in the maturity of the plant. The fungus produced a large number of extrametrical spores. Since the AM was not applied in the T_1 plants there is no trace of association is found either as spores or in the form of infection. The percentage of infection increased as the age of the plant increased. The maximum infection was recorded after 120 days of treatment.

The spore density also increased as the age of the plant increased. The maximum spore density (351) was observed after 120 days of treatment were the spore density was only 239

after 80 days of treatment. In general the biomass, infection and spore density were significantly high after 120 days in the plants inoculated with *Glomus aggregatum* but in the uninoculated plants the growth parameters appear to be minimal.

The results of the present study indicate that the AM fungus *Glomus aggregatum* is a potential tool to increase the growth rate of the medicinal herb *Begonia malabarica*. Koske 1985 also reported that *Glomus aggregatum* has wide distribution and its association is reported in number of plants. The increase in the spore population may be due to the efficiency of the AM fungus, which enhanced the uptake of the nutrients in the soil the earlier workers also suggested the same results (Tinker and Gildon, 1983 and Graham et al. 1982).

The same results, increase in biomass, colonization and density increased as the plant attains maturity was observed by the several workers like Mason, 1964, Haymen, 1970 and Sutton and Barron, 1972 in their study. The present study confirms the increase in growth parameters with respective to the age of the plant and this may be due to the long term association of AM fungus will actively increases the fitness of the plant with respect to nutrient uptake and other physiological functions of the plant. These results are also confirmed by the experiments conducted by Bolan (1991) who reported AM-colonised plants may be able to increase nutrient uptake compared with non-mycorrhizal plants, via the development of a large extraradical mycelium, or via the release of metabolites.

CONCLUSION

The present study indicates that the Glomus aggregatum is an apt tool to develop the growth of the medicinal herb *Begonia malabarica*. This may be used as a biofertilizers to raise the healthy plants in the nursery conditions.

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