



## INFLUENCE OF ARBUSCULAR MYCORRHIZAL FUNGI ON GROWTH OF ANTI HIV PLANT *ANDROGRAPHIS PANICULATA*

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### ABSTRACT:

*Andrographis paniculata* Nees belongs to family Acanthaceae, an annual erect herb, is known for its broad range of pharmacological properties. The primary medicinal component of *Andrographis paniculata* is andrographolide, a diterpene lactone. It is very bitter in taste, colorless, crystalline in appearance, and has a ring-like structure. This study reports the effect of different arbuscular mycorrhizal (AM) fungal inocula on plant growth of *Andrographis paniculata*. The study revealed a significant increase in growth in all the treatments and unsterilised soil (control) compared with sterilised soil (control). Plants grown in unsterilised soil (control) and inoculated with Arbuscular mycorrhizal fungi enhanced plant height, number of branches, number of leaves/plant, and leaf area significantly compared with other treatments and unsterilised control. *Andrographis paniculata* revealed high mycorrhizal efficiency when grown in unsterilised control and Arbuscular mycorrhizal fungi.

**Keywords:** Arbuscular mycorrhiza, *Andrographis paniculata*, Growth parameters.

### INTRODUCTION:

Due to beneficial effects of medicinal plants on health and wellness, these plants are used since ancient times around the world as medicine. In general, derived compounds from the secondary plant metabolism are responsible for the efficacy of medicinal plants (Raei and Weisany 2013). The term of mycorrhiza describes symbiotic associations between plants and fungi. These associations are assumed to play an important role in the land colonization by plants due to the ability of the symbiotic organisms in acquiring nutrients unavailable to non-mycorrhizal individuals (Simon et al. 1993; Smith and Read 2008). The roots of many plant species live in symbiosis with certain soil fungi via establishing what are known as mycorrhiza. Mycorrhiza symbioses are essential for the sustainable management of agricultural ecosystems. The name 'arbuscular' is derived from characteristic structures, the arbuscules which occur within the cortical cells of many plant roots and also some mycothalli colonized by AM fungi. Together with storage vesicles located within or between the cells, these structures have been considered diagnostic for AM symbioses.

The genus *Andrographis* belongs to family Acanthaceae, which consists of about 40 species essentially distributed in tropical Asia. *A. alata* and *A. paniculata* out of nineteen species available in India are medicinal. *Andrographis paniculata* (Burm. f.) Wall. ex. Nees is also called as 'The Kalmegh of Ayurveda'. It is an erect annual herb, extremely bitter in taste in each and every part of the plant body. The primary medicinal component of *Andrographis* is andrographolide, a diterpene lactone. It is very

bitter in taste, colorless, crystalline in appearance, and has a ring-like structure.

*Arbuscular mycorrhizal* (AM) fungi are considered important in growth and development of plants. This is brought about by enhanced uptake of phosphorus (Sanders and Tinker, 1971) and also other diffusion-limited elements like Zn, Cu etc. (La-Rue et al. 1975) by increasing the nutritional status of the host. AM fungi are also involved in increasing the uptake of water (Allen, 1982) and in protecting the plants from phytopathogenic fungi, bacteria and parasitic nematodes invading the roots (Bagyaraj, 1984). A recent study conducted at Bastyr University, USA confirms anti-HIV activity of andrographolide. Among the various medicinal plants cultivated in the state of Maharashtra, it is in pressing demand because of its anti-HIV property.

The current day emphasis is on sustainable agriculture, which uses less of chemical inputs like fertilizers and pesticides having adverse effect on soil health, fertility and environment. Thus, use of microbial inoculants play an important role in sustainable agriculture. AM fungi are known to improve the nutritional status, growth and development of plants, protect plants against root pathogens and offer resistance to drought and salinity. Hence, in the present investigation, it will be envisaged to screen and select an efficient AM fungus for inoculating kalmegh for its cultivation.

### MATERIALS AND METHODS :

Authentic seeds of *Andrographis paniculata* were obtained from National Research Centre for

Medicinal and Aromatic Plants, Boriavi, Gujarat. The investigation was carried out under nursery conditions. Soil used for the experimentation was prepared by mixing soil, farmyard manure and sand in 3:1:1 ratio. This soil, farmyard manure and sand mixture was autoclaved at 120 lbs pressure for 20 minutes, cooled overnight and then filled in plastic pots of uniform size, which comprised 8 kg soil/pot. Healthy and disease free seedlings were selected for cultivation.

The pots were then filled with the mixture of mycorrhiza from the pot culture. The soil mixture used for pot culture included the species of *Acaulospora appendiculata*, *A. gerdmanni*, *Glomus convolutum*, *G. fasciculatum* and *Scutellispora calospora*. For each treatment three replicates were maintained. The pots were placed under shade net and irrigated with normal water. Thirty day old kalmegh seedling raised in sterilized nursery soil beds were transplanted to the pots. One seedling was maintained per pot. The treatments were T1 Control (without AM fungus) T2: 55 AM Spores, T3: 110 AM Spores T4: 165 AM Spores were prepared for the present study. The mycorrhizal inoculum applied to the planting hole at a depth of about 5 cm just before transplanting. Each pot was containing the substrate, with or without AM inoculum, as per the treatment planted with one kalmegh seedling. Each treatment with four replications was maintained and watered regularly. The experiment was laid out in randomized complete block design. The total leaf area of all the leaves for each plant was calculated with the help of leaf area meter. Plant height, number of leaves and number of branches was measured and recorded.

## RESULT & DISCUSSION :

The effect of *Arbuscular mycorrhizal* (AM) fungi on growth parameters of *Andrographis paniculata* such as plant height, number of branches/plant, number of leaves/plant, leaf area/plant was studied in pot culture experiment. All the growth parameters of plant were increased significantly due to the treatment of *Arbuscular mycorrhizal* (AM) fungi (Fig, A,B,C,D). Similar results were found by Touati et al. (2014) in *Arundo donax*, *Spartium junceum*, *Atriplex halimus*, *Lavandula dentata*, *Medicago arborea*, *Coronilla emerus*, *Vetiver nigriflora*, *Chamaerops humilis*, and *Retama monosperma* by the application of *Arbuscular Mycorrhizal Fungi*. AM fungi enhancing the activity of beneficial soil organisms, like nitrogen fixers and phosphate solubilizers with consequential beneficial effect on plant

growth has been reported (Lindermann, 1992, Jayanthi et al. 2003). AM fungi are known to improve the plant growth through better uptake of water and the nutrients, particularly Phosphorus (Brundrett, 2009, Kothamati et al. 2001, Sowmya et al. 2004 and Tejavathi et al. 2011).

*Arbuscular mycorrhizal* (AM) fungi are considered important in growth and development of plants. This is brought about by enhanced uptake of phosphorus (Sanders and Tinker, 1971 ) and also other diffusion-limited elements like Zn, Cu etc. (La-Rue et al. 1975) by increasing the nutritional status of the host. AM fungi are also involved in increasing the uptake of water (Allen, 1982) and in protecting the plants from phytopathogenic fungi, bacteria and parasitic nematodes invading the roots (Bagyaraj, 1984). AM fungi enhancing the activity of beneficial soil organisms, like nitrogen fixers and phosphate solubilizers with consequential beneficial effect on plant growth has been reported (Lindermann, 1992). Recently it was found to enhance the activity of AM fungus and hence was designated as Mycorrhiza Helper Organism (MHO) (Jayanthi et al. 2003). Recently, it was reported that dual inoculation with *Glomus mosseae* and *Trichoderma viride* increased the yield and forskolin content in *Coleus forskohlii* (Boby and Bagyaraj, 2003).

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**Fig: Effect of AM Fungi on growth parameters of *Andrographis paniculata***



