OPEN ACCESS

Life Science Leaflets Vol. 182, 2025 pp.21-25.....ISSN: 2277-4297 (online), ISSN:2277-4297(Print)

RUTA GRAVEOLENS L. MEDICINAL PLANT RAISED THROUGH STEM CUTTING INOCULATED WITH ARBUSCULAR MYCORRHIZAL FUNGI

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(RECEIVED ON: 27th APRIL 2025; REVISED ON: 29th APRIL 2025;
Accepted on: 30th April 2025; Published on: 1st JUNE 2025)

ABSTRACT:

Ruta graveolens L., stem cuttings were inoculated with Arbuscular Mycorrhizal (AM) fungi. The observations on plant height, stem diameter, number of leaves, leaf area, percent colonization, spore number, shoot and root biomass were determined. The results revealed that the plants inoculated with *Glomus fasciculatum* performed best in improving plant growth and other morphological parameters of *Ruta graveolens.*

KEYWORDS: *Ruta graveolens, Arbuscular Mycorrhizal, Glomus fasciculatum, Plant height, Dandeli.*

INTRODUCTION:

PLANTS with roots colonized by Arbuscular Mycorrhizal (AM) fungi are more effective at nutrient and water acquisition, less susceptible to disease and can be more productive under certain stressful environmental growing conditions than plants without mycorrhizae. The beneficial effects of AM fungi have been studied by many workers in a number of crops. AM fungi are a greatly beneficial component of soil microbial biomass. This symbiosis benefits

plant growth, practical by enhancing phosphorus, water and mineral nutrient uptake (Pearson & Jackobsent 1993). The concept of using AM fungi in the cultivation of medicinal plants is of recent origin. Several studies have shown that AM fungi colonize several medicinal plants and it is also found to play an important role in the growth and development of many medicinal plants (Hosamani & Lakshman 2011).

Ruta graveolens L., family-Rutaceae is a hardy, shrub-like evergreen plant, which is native to Southern Europe. *Ruta graveolens* can grow in almost any conditions but prefers a semi-sheltered dry environment. The lower part of the stem is woody and the leaves are alternate, bluish-green and either bi- or tripinnate. They have a strong unpleasant odour and a very bitter disagreeable flavour. The plant blossoms from June to September, with greenish yellow flowers. Propagation can be carried out by direct seed planting, stem cuttings or root cuttings. The whole herb is used as for medicinal purposes, the drug consisting of both the fresh and the dried herb and may also be used in cooking in some regions. The shoots are gathered before the plant flowers, with the young shoot tops considered the most valuable. The volatile oil present in the herb is contained in glands distributed over the whole plant, and is distilled from the fresh herb, as are decoctions and infusions. The dried herb has a similar taste and odour, but is less powerful. Its powder is used for making tea. Hence, the present investigation was designed to examine the influence of AM fungi on growth and other morphological parameters of *Ruta graveolens* hardwood cuttings during cutting propagation.

MATERIALS AND METHODS:

AM fungal Spores from the rhizosphere of *Ruta graveolens* L., were isolated using the wet-sieving and decanting technique (Gerdemann and Nicolson,1963). Six centimeters stem cuttings of *Ruta graveolens* L., were collected from the botanical garden of Bangurnagar Arts, Science and Commerce College Dandeli, Uttara Kannada District, Karnataka State, India. Stem cuttings were washed and surface-sterilized with 5%HgCl before they were planted to earthen pots (20 x 20cm) in a completely randomized block design. The isolated AM fungi *Glomus fasciculatum* was multiplied by using onion as host plant. 15 g of air-dried AM inoculum of *Glomus fasciculatum* was given to soil prior to planting of stem cutting. The inoculum was added to the soil as a thin layer two cm below the soil surface. The inoculum consists of 3 g root bits plus 12 g rhizospheric soil of host plant with hyphae and sporocarps (105 Chalmydospore/50 g soil approximately). Half strength Hoagland solution was given to the seedlings at the interval of 15 days. There were two treatments i.e., inoculated and non-

inoculated (control) and were maintained in triplicates. Experimental pots were kept free of weeds and irrigated properly. The seedlings were maintained for 180 days. Plant height, stem diameter, number of leaves, leaf area, percent colonization, spore number, shoot and root biomass were determined.

RESULTS AND DISCUSSION:

In general, mycorrhizal inoculation resulted in a significant increase in plant height, stem diameter, dry weight, percent colonization, spore number and leaf area in *Ruta graveolens* L., cuttings over control (Table.1). However, growth rate of inoculated plants steadily increased after 60 days than that of control. The hyphae, arbuscles and vesicles were predominant sign of infection in inoculated *Ruta graveolens* L., cuttings. However, it was observed that after 120 days of inoculation there was decline in per cent of root colonization with increase in spore number. It was also observed that mycorrhizal infection gradually increased with vegetative growth. Present finding of an increase in leaf area is further suggestive of enhanced chlorophyll content (He *et al*., 1994). The enhanced chlorophyll content corroborates with increased photosynthetic activity and further accumulation of photosynthates in plants. The direct utilization of photosynthates for the mycorrhizal growth and further its contribution in facilitating the plants with increased absorption of nutrients resulted in an increment in vegetative growth. Present study showed the steady increase in growth rate of the inoculated plants after 60 days, thus forming a lag phase of infection after inoculation. Manjunath and Bagyaraj (1981) suggested that lag phase was needed for fungal hyphae to infect the roots and establish a better symbiotic relationship. All the mycorrhizal plants showed higher 'P' content in the shoots over the control in all stages of harvest. Similar observations were recorded by Earanna *et al.* (1999) on *Coleus barbatus* inoculated with six different AM fungi and by Srihari & Sreenivasa (1997) in chilli inoculated with five different AM fungi. The highest shoot P content was recorded in plants inoculated with *Glomus fasciculatum* and the root P uptake was highest in case of *Glomus intraradices* inoculated plants. Mallesha and Bagyaraj (1995) reported Similar results in two varieties of capsicum inoculated with 7 different AM fungi. Overall results in the present study demonstrated that the plants showed better growth when inoculated with *Glomus fasciculatum* than the control.

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Table 1. Plant height, Stem diameter, leaf area, dry weight of shoot and root, per cent colonization, spore number and 'P' uptake as influenced by *Glomus fasciculatum* on *Ruta graveolens* L.

Treatment /duration	Plant height (cm)	Stem diameter (cm)	Leaf area (cm^2)	Dry weight of shoot (g)	Dry weight of root (g)	Percent colonization	Spore No./ 50 g of soil	Percent of 'P' uptake in shoot
60 days								
NM	20.06	0.26	21.00	0.51	0.07	00.00	000.00	0.05
M	29.40*	0.53*	37.00*	0.86*	0.15*	56.66	115.00	0.17*
120 days								
NM	32.96	0.43	22.33	0.58	0.12	00.00	000.00	0.07
M	60.23*	0.66*	45.00*	0.91*	0.17*	72.10	230.00	0.20*
180 days								
NM	56.20	0.56	24.66	0.62	0.14	00.00	000.00	0.12
M	81.20*	0.86*	50.33*	0.98*	0.20*	66.00	315.33	0.25*