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Effect of *Glomus Species* on Success and Survival of *Jamun* Grafts in Relation to Chlamydospores and Percent Root Colonization

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ABSTRACT

An experiment was conducted to assess the effect of three *Glomus* species on the percent success and survival of *jamun* grafts in relation to the chlamydospores and root colonization behavior. A factorial completely randomized design experiment was conducted by the soil inoculation of three *Glomus* species fungi namely *Glomus fasciculatum*, *Glomus leptotichum* and *Glomus intraradices* to *jamun* seeds (cultivated and wild) sown in polybags at five grams per polybag. The chlamydospores count and percent colonization at two stages i.e. one month after sowing and grafting stage was done from the soil and expressed in numbers per 50 grams and percentage respectively. Cultivated *jamun* rootstocks inoculated with *Glomus fasciculatum* exhibited significantly maximum spore population in the rhizosphere of one month old rootstocks (242.00) and at grafting stage (519.00), while significantly minimum spore population was recorded in uninoculated rootstocks at one month after sowing (23.33) and at grafting stage (91.00).Wild *jamun* rootstocks inoculated with *Glomus fasciculatum* recorded significantly maximum spore population in the rhizosphere of one month after sowing (175.66) and at grafting stage (421.33). Higher root colonisation was observed in my corrhiza inoculated seedlings compared to uninoculated seedlings. Wild *jamun* rootstocks inoculated with *Glomus fasciculatum* recorded significantly higher root colonisation at one month after sowing (80.00%) and at grafting stage (82.00%) which was on par with rootstock inoculated with *Glomus leptotichum* at one month after sowing (78.20%) and at grafting stage (80.00%). Zero root colonisation was recorded in uninoculated seeds one month after sowing (0.00%) and at grafting stage (5.50%).

Key words : *Syzygium cuminii*, AM fungi, Per cent root colonization

INTRODUCTION

The *jamun* (*Syzygium cuminii* (L.) Skeels), a member of family Myrtaceae is one of the important underutilized fruits widely distributed throughout tropic and subtropics as stray plantation or avenue. It is native to India or East Indies. In India, the maximum number of *jamun* trees is found scattered throughout the tropical and subtropical regions. It also occurs in the lower ranges of the Himalayas up to an elevation of 1300 m and in the Kumaon hills up to 1600 m.

The modern horticulture largely depends upon use of high cost inputs such as chemical fertilizers, pesticides, herbicides, improved seeds, assured irrigation, scientific management and labour saving with energy intensive farm machinery. The application of such high input technology has undoubtedly increased the production but there is a growing concern over the adverse effect of use of chemicals on soil productivity, microbial community and environmental quality.

To revive the soil health and microorganisms which support to achieve sustainable

production system, the soil environment need to be made congenial for living of useful microbial population responsible for continuous availability of nutrients from natural sources. Experiencing the adverse effects of synthetic input dependent agriculture, the concept of organic / sustainable / natural farming is gaining momentum. In these systems, the production is based in synergism with nature, which makes systems of unending life, *i.e.*, sustainable. In this context, the experiment was conducted using arubuscularmycorrizae fungi to check their root colonization ability which in turn will enhance the graft success and survival percentage.

MATERIALS AND METHODS

An investigation was carried out during 2009 in the Department of Agricultural Microbiology, Kittur Rani Channamma College of Horticulture, Arabhavi with three replications in factorial completely randomized design. Extra matricalchlamydospores produced by AM fungi were determined by using wet sieving and decanting method as per Gerdemann and Nicolson (1963). Fifty grams of representative soil samples drawn from each treatment in each replication was suspended in sufficient quantity of water and stirred thoroughly. It was allowed to stand for ten minutes undisturbed before decanting onto the sieves. The suspension was passed through a set of sieves with mesh size 850 µ, 300 µ, 250 µ, 150 µ which were arranged in descending order. The spores collected in 250 µ and 150 µ were transferred to watch glass. Spore count was done using stereomicroscope and expressed as number of chlamydospores per 50 g of soil.

Percent root colonisation was determined using the method as detailed by Phillips and Hayman (1970). To know the per cent AMF (Arbuscular mycorrhiza Fungi) occupancy in whole root, the whole root were taken and fixed in FAA (Formalin: Acetic acid: Alcohol in the ratio of 5: 5: 90) for 24 hours. The roots were then cleared by autoclaving with 10 per cent KOH for one hour in pressure cooker. The alkalinity due to KOH was neutralised by adding one per cent HCl for five minutes. Then roots were treated with alkaline H_2O_2 treatment for 20 minutes. Staining was done by simmering the roots in 0.05 per centtryphan blue in lactophenol for 10 minutes. Excess stain was decanted and stained roots were stored in lactophenol. The roots were arranged on slides covered and pressed slightly with cover slips for the presence of AMF (*Arbuscular Mycorrhiza* Fungi) mycelium, vesicles and arbuscles. The average of per cent root colonisation was finally calculated.

$$\text{Per cent root colonisation} = \frac{\text{Number of root bits positive for colonisation}}{\text{Total number of root bits observed}} \times 100$$

RESULTS AND DISCUSSION

The perusal of data (Table 1) on number of chlamydospores per 50 g of soil revealed that cultivated *jamun* rootstocks inoculated with *Glomus fasciculatum* exhibited significantly maximum spore population in the rhizosphere of one month old rootstocks (242.00) and at grafting stage (519.00), while significantly minimum spore population was recorded in uninoculated rootstocks at one month after sowing (23.33) and at grafting stage (91.00).

Wild *jamun* rootstocks inoculated with *Glomus fasciculatum* recorded significantly maximum spore population in the rhizosphere of one month after sowing (175.66) and at grafting stage (421.33), while significantly minimum spore population was recorded in uninoculated rootstocks per 50g of soil at one month after sowing (18.33) and at grafting stage (56.33).

Interaction effect between cultivated and wild *jamun* rootstocks for AM fungal chlamydospores (number/50 g soil) in the rhizosphere of jamun rootstocks was found to be significant. Significantly maximum number of chlamydospores was recorded in cultivated *jamun* rootstock inoculated with *Glomus fasciculatum* (242.00) one month after sowing and at grafting stage (519.00), while significantly maximum spore population in the rhizosphere of wild *jamun* rootstocks was recorded in *Glomus fasciculatum* inoculated rootstocks (175.66) one month after sowing which was on par with rootstocks inoculated with *Glomus leptotichum* (167.33) and at grafting stage (421.33). The uninoculated wild *jamun* rootstocks recorded significantly minimum spore population one month after sowing (18.33) and at grafting stage (56.33), where uninoculated cultivated rootstocks (23.33) was on par with uninoculated wild rootstocks one month after sowing.

The data presented in Table 1 revealed that there was no significant result among different type of *jamun* seedlings. However, higher root colonisation was observed in mycorrhiza inoculated seedlings compared to uninoculated seedlings.

Cultivated *jamun* rootstock inoculated with Glomus fasciculatum recorded significantly highest colonization of root at one month after sowing (83.25%) and at grafting stage (86.00 %), which was followed by cultivated rootstock inoculated with *Golmus leptotichum* at one month after sowing (80.15 %) and at grafting stage (83.00 %).

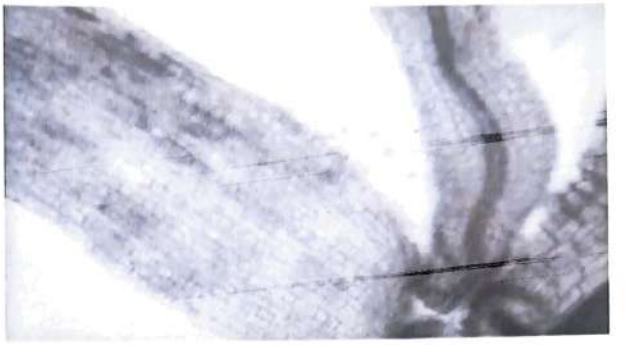
Wild *jamun* rootstocks inoculated with *Glomus fasciculatum* recorded significantly higher root colonisation at one month after sowing (80.00%) and at grafting stage (82.00%) which was on par with rootstock inoculated with *Glomus leptotichum* at one month after sowing (78.20%) and at grafting stage (80.00%). Zero root colonisation was

Table 1. Effect of different AM fungi on chlamydospores and per cent root colonizationin cultivated and wild *jamun*

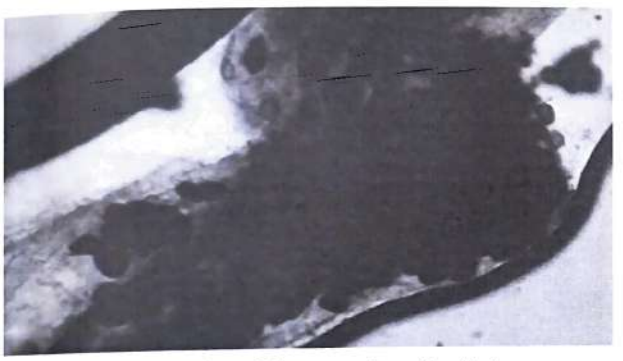
Treatment	Chlamydospores (No./50 g soil)		Per cent root colonization	
	One month after sowing	Grafting stage	One month after sowing	Grafting stage
T1 (Cultivated control)	23.33	91.00	0.00	7.00
T2 (Cultivated+*Glomusfasciculatum*)	242.00	519.00	83.25	86.00
T3 (Cultivated+*Glomusleptotichum*)	216.33	441.00	80.15	83.00
T4 (Cultivated+*Glomusintraradices*)	169.00	296.33	52.25	67.00
T5 (Wild control)	18.33	56.33	0.00	5.50
T6 (Wild+*Glomusfasciculatum*)	175.66	421.33	80.00	82.00
T7 (Wild+*Glomusleptotichum*)	167.33	359.33	78.20	80.00
T8 (Wild+*Glomusintraradices*)	154.66	261.33	65.00	69.00
S.Em± A	1.53	1.93	1.14	1.49
B	2.17	2.73	1.61	2.12
AB	3.07	3.87	2.28	2.99
CD (5%) A	4.60	5.76	NS	NS
B	6.50	8.10	4.80	6.32
AB	8.96	11.28	NS	NS

A = Cultivated type **B**= Wild type **AB**= Interaction effect
NS= Non-significant

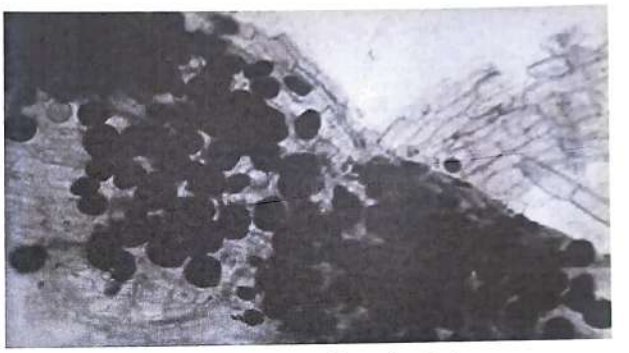
Cultivated control



Wild control

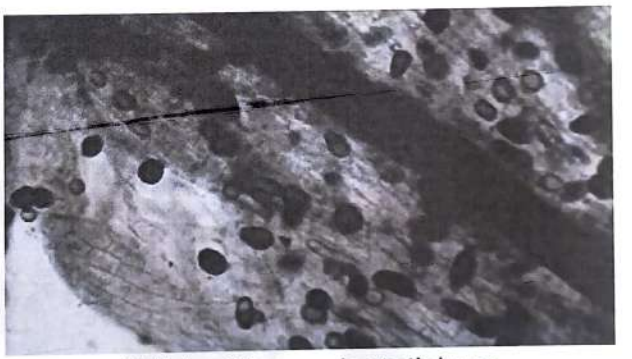


Cultivated + *Glomus fasciculatum*

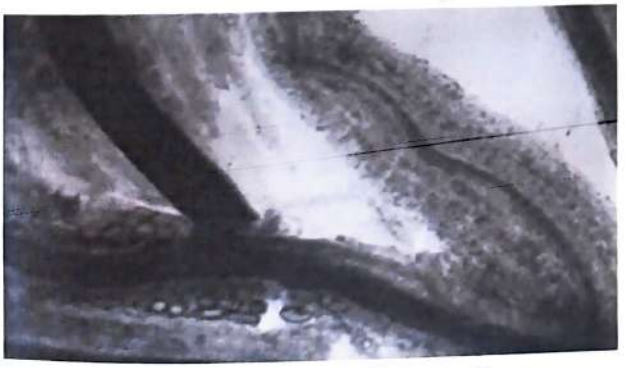


Wild + *Glomus fasciculatum*

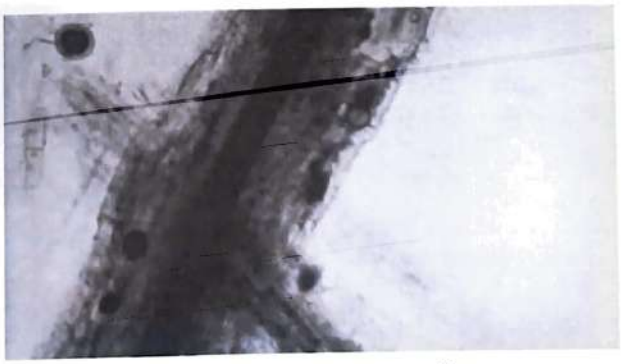
Cultivated + *Glomus leptotichum*



Wild + *Glomus leptotichum*



Cultivated + *Glomus intraradices*



Wild + *Glomus intraradices*

Plate 1. Effect of different AM fungi on per cent root colonization in cultivated and wild *jamun*

recorded in uninoculated seeds one month after sowing (0.00%) and at grafting stage (5.50%) (Plate1).

Interaction effect between cultivated and wild jamun rootstocks for per cent root colonisation was found to be non-significant.

In the present investigation *Glomus fasciculatum* registered significantly highest root colonization per cent and number of chlamydospores in cultivated *jamun* and wild *jamun* (Table 1). Many workers reported similar results in different fruit crops like citrus [Kleinschmidt and Gerdemann, (1973), Usha *et al.*, (2004) and Venkat *et al.*, (2004)], mango [Santosh (2004) and Bassanagowda (2005)], papaya [Adivappar *et al.*, (2004) and Duragannavar (2005)] and banana [Balakrishna (2003) and Sabarad *et al.*, (2004)] and *jamun* (Devachandra *et al.*, 2008).

CONCLUSION

From the above investigation it can be concluded that cultivated and wild type *jamun* rootstocks inoculated with *Glomus fasciculatum* exhibited significantly maximum spore population in the rhizosphere while significantly minimum spore population was recorded in cultivated and wild uninoculated rootstocks. Moreover, cultivated and wild type *jamun* rootstocks inoculated with *Glomus fasciculatum* recorded significantly higher root colonisation, which will subsequently increase the growth and development of the *jamun* rootstock.

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