Environment & Ecology 29 (2A) : 839—841, 2011
 ISSN 0970-0420

Effect of Different AM Fungal Species on Germination of Jamun (*Syzygium cuminii* Skeels)

Y. SOMI SINGH*, G. S. K. SWAMY, C. P. PATIL AND B. C. DAS

Department of Fruit Science, Kittur Rani Channamma College of Horticulture
University of Agricultural Sciences
Arabhavi 591310, Dharwad 580005, Karnataka, India
E-mail : somifrt@rediffmail.com
**Correspondence*

Abstract

An experiment was conducted to assess the effect of three AM fungi for germination in cultivated and wild jamun. Significantly least number of days for initiation of germination was recorded in wild seeds inoculated with *Glomus fasciculatum* (14.32 days), while significantly maximum number of days for completion of germination was observed in uninoculated wild seeds (58.83 days). Inoculation with *Glomus fasciculatum* (96.66%) recorded significantly highest germination percentage in wild seeds. Wild seeds inoculated with *Glomus fasciculatum* showed significantly highest germination vigor index (4.11) when compared to other treatments. Higher RMD for germination was noticed in *Glomus fasciculatum* (13.20%) and (6.89%) in cultivated and wild seeds respectively.

Key words : *Syzygium cuminii,* AM fungi, Germination, Vigor.

Jamun (*Syzygium cuminii* Skeels) is an underexploited indigenous fruit crops which has gained tremendous importance and recognition in recent past not only because of its hardy nature but also for its uncomparable medicinal and nutritional properties. The seed powder has antidiabetric properties and is a lotion for the cure of ringworm (1). The plant starts its life cycle through the seed with the emergence of radical and plumule. The seeds being recalcitrant losses viability fast due to its small size and thin seed coat. Moreover, fruits are highly season specific in availability and duration is also short. Thus, increasing per cent of germination and vigor within a stipulated time period is of utmost importance.

(We are obliged to the Department of Fruit Science, Kittur Rani channamma College of Horticulture, Arabhavi, University of Agricultural Sciences, Dharwad, Karnataka).

Methods

An investigation was carried out at nursery of Department of Fruit Science, Kittur Rani Channamma College of Horticulture, Arabhavi, taluk Gokak with three replications in factorial completely randomized design. Non-descriptive uniform size jamun seeds (both wild and cultivated type) were sown in polybags (8 × 12 cm) of 300 gauge thickness containing potting mixture of soil, sand and FYM (1 : 1 :1). Cultures of three different AM fungi were obtained from Department of Agricultural Microbiology, Kittur Rani Channamma College of Horticulture, Arabhavi. Am fungi inoculation was done by spreading five grams of inoculum uniformly at five centimetres depth and putting a thin layer of soil above the inoculum. Seeds were placed and covered with soil (2—3 cm). The polybags of respective treatments were labelled and kept apart enough from each other to avoid AM fungal cross contamination.

Germination count was recorded daily till completion after sowing. Appearance of plumule was taken as criterion for germination. Days taken for initiation, 50% and completion of germination were recorded. Germination vigor index (GVI) was computed using the formula.

$$GVI = \frac{x_1}{d_1} + \frac{x_2}{d_2} + \frac{x_3}{d_3} + \ldots + \frac{x_n}{d_n}$$

Table 1. Effect of different AM fungi on days taken for germination and vigour index of jamun seeds. A – Cultivated type, B – Wild type, AB – Interaction effect.

Treatments	Number of days taken for Initiation of germination	50 per cent germinatiom	Completion of germination	Germination Percent	Vigor index
T_1 (Cultivated control)	18.16	23.50	58.82	83.33	3.30
T_2 (Cultivated + *Glomus fasciculatum*)	15.49	20.24	50.65	96.00	3.97
T_3 (Cultivated + *Glomus leptotichum*)	16.32	21.15	51.66	92.00	3.61
T_4 (Cultivated + *Glomus intraradices*)	17.16	23.32	54.01	92.00	3.38
T_5 (Wild control)	16.01	23.12	58.83	90.00	3.36
T_6 (Wild + *Glomus fasciculatum*)	14.32	20.33	48.82	96.66	4.11
T_7 (Wild + *Glomus leptotichum*)	14.82	21.50	50.50	94.66	3.94
T_8 (Wild + *Glomus intraradices*)	15.15	22.16	56.32	94.00	3.58
SE ± A	0.003	0.003	0.003	0.076	0.013
B	0.004	0.004	0.004	0.108	0.018
AB	0.006	0.006	0.006	0.153	0.025
CD (5%) A	0.036	0.035	0.034	0.893	0.149
B	0.026	0.025	0.024	0.631	0.105
AB	0.018	0.018	0.017	0.446	0.074

Where $x_1, x_2, x_3, \ldots \ldots, x_n$ are the number of seeds germinated on $d_1, d_2, d_3, \ldots \ldots, d_n$ days taken for germination, respectively.

Relative mycorrhizal dependency (RMD) was computed as follows.

$$\text{RMD (\%)} = \frac{\text{Parameter with AM fungi} - \text{parameter without AM fungi}}{\text{Parameter with AM fungi}} \times 100$$

Results and Discussion

Arbuscular mycorrhizal fungi significantly influenced the response of jamun seed for germination. Significantly least number of days for initiation of germination was recorded in wild type seeds inoculated with *Glomus fasciculatus* (14.32 days). Among the different AM fungi inoculated to seeds, cultivated type seeds inoculated with *Glomus fasciculatum* took significantly least number of days (20.24 days) for attainment of 50% germination. Significantly minimum days of 48.82 for completion of germination was registered in wild seeds inoculated with *Glomus fasciculatum* (Table 1), whil uninoculated wild seeds took significantly more number of days (58.83 days).

The influence of AM fungi on germination was found to be significant (Table 1). Inoculation with *Glomus fasciculatum* (96.66%) recorded significantly maximum germination percentage in wild seeds which was followed by *Glomus fasciculatum* (96.00%) in cultivated seeds. Significantly minimum germination percentage (83.33%) was noticed in uninoculated cultivated seeds.

Wild seeds inoculated with *Glomus fasciculatum* had shown highest germination index of 4.11 (Table 1) and significantly lowest value was recorded in uninoculated cultivated seeds (3.30).

Higher RMD for germination was noticed in *Glomus fasciculatum* (13.20%) and (6.89%) in cultivated and wild seeds respectively. Higher RMD in terms of height of rootstock was recorded in *Glomus fasciculatum* (20.11%) and (22.61%) in cultivated and wild rootstock respectively. RMD in terms of stem girth and number of leaves were maximum in *Glomus fasciculatum* (27.77%, 35.66%) and (18.09%, 13.87%) in cultivated and wildrootstocks. The least RMD in terms of germination and stem diameter was noted in *Glomus intraradices* (4.26% and 1.01%, respectively) in wild jamun rootstock. The least RMD in terms of rootstock height (6.66%) was recorded in rootstock inoculated with *Glomus intraradices* in cultivated rootstock. The least RMD was recorded in rootstock inoculated with *Glomus leptotichum* in terms of num-

Table 2. Relative mycorrhizal dependency with respect to germination percentage, height of rootstock, diameter of rootstock, diameter of rootstock and number of leaves on rootstock. T_1 – Cultivated type + control, T_2 – Cultivated type + *Glomus fasciculatum*, T_3 – Cultivated type + *Glomus leptotichum*, T_4 – Cultivated type + *Glomus intraradices,* T_5 – Wild type + control, T_6 – Wild + *Glomus fasciculatum*, T_7 – Wild + *Glomus leptotichum,* T_8 – Wild + *Glomus intraradices*.

Treat-ments	Relative mycorrhizal dependency (%) Germi-nation	Rootstock height	Stem diameter	Leaves
T_1	–	–	–	–
T_2	13.20	20.11	27.77	35.66
T_3	9.42	15.42	22.13	28.12
T_4	9.42	6.66	17.28	19.65
T_5	–	–	–	–
T_6	6.89	22.61	18.09	13.87
T_7	4.92	16.68	9.22	5.06
T_8	4.26	9.26	1.01	5.70

ber of leaves on rootstock (5.06%) in wild in wild rootstock (Table 2).

Increased enhancement of germination by AM fungal inoculatin had also been recorded in citrus (2), mango (3, 4), papaya (5), aonla (6) and charodi (7). During the early phase of germination, the inhibiting seeds release several compounds including amino acids, organic acids, inorganic ion sugars, phenolics and proteins (8). This solute leakage influences detection of the seed by soil microflora and fauna (beneficial and pathogenic) during ermi. These solute may keep AM fungal propagules to germinate early. Certain solutes synthesised in the appropriate hosts are reported necessary to initiate mycorrhizal association (9). Probably, the differences observed in the efficacy of germination by the different AM fungal species could be attributed to leached solutes from the appropriate or preferred host. Thus, leachats/exudates might play a prominent role in early propagation of endomycorrhiza contributing to improve efficiency and early seed germination (10). AM fungi are known to secrete plant growth regulators like gibberellins (11), auxins and cytokinins (12).

The present study revealed that jamun is responsive to inoculation of AM fungi as evident from enhanced germination and vigor. *Glomus fasciculatum* was recorded to be more preferred species for jamun.

References

1. Dastur J. P. 1952. *Medicinal plants of India and Pakistan*. 2nd edition. D. B. Taraperevala Sons. Bombay, India.
2. Venkat 2004. Exploitation of Rangpur lime as a rootstock for different citrus sp. M.Sc. (Hort.) thesis. Univ. Agric. Dharwad, India.
3. Santosh 2004. *Enhancement of germination, growth, graft-take and stress tolerance of mango rootstocks using bioformulations*. M. Sc. (Hort.) thesis. Univ. Agric. Sci. Dharwad, India.
4. Bassanagowda 2005. *Synergetic effect of AM fungi in combination with bioformulations on germination, graft-take, growth and yield of mango.* M.Sc. (Hort.) thesis. Univ. Agric. Sci. Dharwad, India.
5. Durgannavar M. P., C. P. Patil, P. B. Patil, G. S. K. Swamy and M. B. Sidaramayya . 2004. Combined effect of *Glomus fasciculatum* and GA_3 treatment on papaya seed germination. *13th Southern Reg. Conf. on Microb Inoculant*s. 3—5 Dec. 2004. College of Agric., Bijapur, India. 29 pp.
6. Swamy G. S. K., P. B. Patil and S. I. Athani. 2005. Effect of organic and inorganic substances on germination of amla seeds. Pp. 65—67. *In Amla in India*. S. S. Mehta and H. P. Singh. Aonla growers association of India, Salem, Tamil Nadu. India.
7. Kareddy S. 2003. *Survey, evaluation and propagation of charoli (Bachanania lanzan Spront.)*. M. Sc. (Hort.) thesis, Univ. Agric. Sci. Dharwad, India.
8. Simon E. W. 1984. Early events in germination. *In Seed Physiology*. Acad. Press, New York, USA. 2 : 77—115.
9. Xie Z. P., C. Starhelin and H. Vierheilig. 1995. Rhizobial nodulation factors stimulate mycorrhizal colonization of modulating and non-modulating soyabeans. *Pl. Physiol.* 108 : 1519—1525.
10. Cruz A. F., T. Ishii, I.I. Matsumotto and K. Kodoya. 2003. Evaluation of the mycelial network formed by arbuscular mycorrhizal hyphae in the rhizosphere of papaya and other plants under intercropping system. *Braz. J. Microb*. 34 : 17—21.
11. Allen M. F., T. S. Moore and M. Christensen. 1980. Phytohormone changes in Bouteloua gracillis infected by vesicular arbuscular mycorrhizal cytokinin increase in the host plant . *Canad. J. Bot.* 58 : 371—374.
12. Edriss M. H., R. M. Davis. and D. W. Burger. 1984. Influence of mycorrhizal fungi on cytokinin production in sour orange . *J. Am. Soc. Hort. Sci*. 109 : 587—590.