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Graft compatibility of different perennial moringa rootstocks on annual scion

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Abstract

A grafting study was conducted with seven rootstocks viz., MO1 (Moolanur Moringa), MO2 (Karumbu moringa), MO3 (ODC moringa), MO4 (KMU moringa), MO5 (Padasolai local), MO6 (Kallivalasu local), MO7 (Puthupalayam local) and PKM 1 scion was used to assess the graft compatibility and best perennial rootstock for annual moringa cv. PKM 1. Among the rootstocks, MO1 (Moolanur moringa) has taken less number of days for germination of seeds (8.20 days) and showed the highest germination percentage (79.40%) when compared with other perennial rootstocks. Success percentage was more in graft combination of MO1 (Moolanur moringa) rootstock with PKM 1 scion (51.20% and 47.20%) on 20th and 40th day after grafting with lesser number of days to attain graftable size (25.40 days) and graft union (14.20 days).

Keywords: Grafting, perennial rootstocks, graft success, PKM 1 scion

Introduction

“*Moringa oleifera*” is a medium sized tree commonly known as drumstick tree and horseradish tree, belongs to the Moringaceae family, consisting of a single genus *Moringa*. There are 33 species in the Moringaceae family (Ramachandran *et al.*, 1980) [9]. It is considered as one of the most useful trees, as almost all parts of this plant is used for treating various diseases (Kesharwani *et al.*, 2014) [3]. It is a fast growing, drought tolerant and mild frost resistant tree which is native to India (Olson *et al.*, 2016) [4]. It tolerates a wide range of rainfall, with minimum annual rainfall requirements at 250mm and maximum at over 3000mm (Toma *et al.*, 2014) [10]. The most suited soil condition for these trees are dry sandy soil where they grow to their full potential. Various parts of this plants such as leaves, roots, seeds, bark, fruit, flowers and immature pods are having high nutritional value. The leaves are rich source of vitamin C, beta-carotene, protein, calcium, iron and potassium, essential amino acids and antioxidants (Patel *et al.*, 2010) [6].

Extracts from the leaves are used to treat malnutrition, augment breast milk in lactating mothers. It is used as potential antioxidant, anticancer, anti-inflammatory, anti-diabetic and antimicrobial agent. *M. oleifera* seed, a natural coagulant is extensively used in water treatment. The scientific effort of the research provides insights on the use of moringa and fortification of moringa in commercial products (LakshmiPriya *et al.*, 2016). This research explores graft compatibility of perennial genotype with annual scion of “Miracle Tree”.

Materials and Methods

The research was carried out at the Department of Vegetable Science, Horticultural College and Research institute, Tamil Nadu Agricultural University, Coimbatore, during the period of 2019 and 2020 to evaluate the graft compatibility of the grafted moringa plants. Seven graft combinations viz., MO 1 (Moolanur Moringa) rootstock with PKM 1 scion, MO 2 (Karumbu moringa) rootstock with PKM 1 scion, MO 3 (ODC moringa) rootstock with PKM 1 scion, MO4 (KMU moringa) rootstock with PKM 1 scion, MO5 (Padasolai local) rootstock with PKM 1 scion, MO6 (Kallivalasu local) rootstock with PKM 1 scion, MO7 (Puthupalayam local) rootstock with PKM 1 scion was used for the study to assess the best perennial rootstock for annual moringa cv. PKM 1. The experiment was conducted in Completely Randomized Design with three replications. In each treatment, 10 plants were maintained per replication.

Raising of rootstocks and scion

The seeds of diverse moringa ecotypes viz., moolanur moringa, karumbu moringa, ODC moringa, KMU moringa, padasolai local, kallivalasu local and puthupalayam local were collected from native places of Tamil Nadu. Annual moringa PKM 1 seeds were collected from Department of Vegetable Science, HC & RI, TNAU, Coimbatore.

Table 1: Details of moringa rootstocks and scion material

Rootstocks	Source
MO1 (Moolanur moringa)	Moolanur, Erode
MO2 (Karumbu moringa)	Moolanur, Erode
MO3 (ODC moringa)	Kanyakumari
MO4 (KMU moringa)	Kumbakonam
MO5 (Padasolai local)	Kolli hills
MO6 (Kallivalasu local)	Dharapuram
MO7 (Puthupalayam local)	Dharapuram
Scion	Source
PKM 1	Dept. of vegetable science, TNAU Coimbatore

The seeds were treated with GA3 200 ppm, potassium dihydrogen orthophosphate one per cent to overcome dormancy and enhance the germination percentage. The treated seeds were sown in polybags filled with media containing soil, sand and coir pith in the ratio of 2:1:1 and bio fertilizers such as Azospirillum, phosphobacteria and Vesicular Arbuscular Mycorrhiza. The seedlings of rootstocks and scion were watered as and when required.

Grafting

The grafting was performed in 25 days old seedlings by using cleft or wedge method of grafting. The rootstock and scion of equal thickness were taken for grafting. Rootstocks were beheaded at top and a slit of 2.5 cm was made at the centre for inserting the scion. Top portion of scion were taken and a wedge cut of 2.5 cm was made at the bottom portion and inserted into the slit of the rootstock. After inserting the scion into the rootstock, the union was kept in position tightly together with grafting clips. The scions were covered with polythene cover to keep the scion fresh until the union is complete. Seven days after grafting, the polythene cover was removed and the graft was placed inside the mist chamber under darkness for fifteen days with 95 per cent relative humidity and 25-30 °C temperature. For proper acclimatization, relative humidity was reduced and the graft was transferred to greenhouse for hardening. The clip was removed from the graft union after union of scion and rootstock (Dhivya, 2014; Priyanka *et al.*, 2019) [1, 8].

Statistical analysis

The data on days to germination, seed germination per cent, number of days for graftable size, number of days for graft union and grafting success percentage were found significant when analysed using SPSS software (Nei, 1978).

Results and Discussion days to germination

Among the seven rootstocks used, MO1 rootstock has taken less number of days for germination (8.20 days) than other perennial rootstocks *viz.*, MO7 (8.60 days), MO3 (8.80 days), MO5 (9.00 days), MO6 (10.00 days), MO4 (11.00 days), MO2 (12.00 days) respectively (Table 2). Seeds of annual moringa scion var. PKM 1 was germinated in 6.00 days, which is similar to report given by Priyadarshini *et al.* (2015).

Germination percent

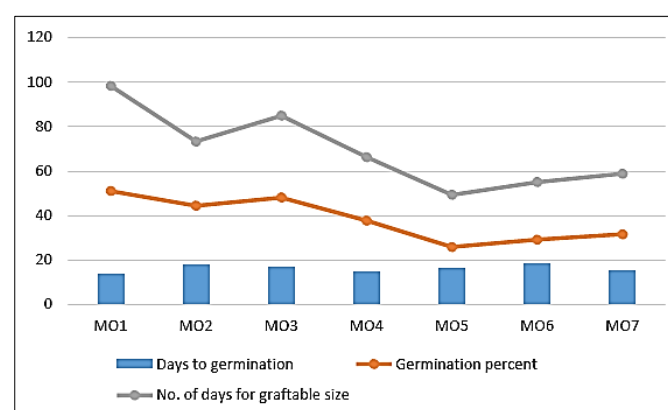
Among the seven rootstocks used, MO1 rootstock has recorded maximum germination percent (79.40 days) followed by MO3 (78.60 days), MO2 (69.70 days), MO7 (67.80 days), MO5 (55.40 days), MO6 (53.90 days), MO4 (48.30 days) respectively (Table 2) and PKM 1 scion recorded highest germination per cent (85.20 days), which is similar to report given by Priyadarshini *et al.*, (2015)

Days for graftable size of rootstocks and scion

Among the seven perennial moringa rootstocks, MO1 has taken less number of days for attaining graftable size (25.40 days) followed by followed by MO4 (26.50 days), MO7 (27.30 days), MO5 (28.20 days), MO6 (29.60 days), MO3 (31.10 days) and MO2 (32.30 days) respectively (Table 1), which is similar to report given by Priyadarshini *et al.*, (2015)

Table 2: Days to germination, germination percent and number of days for graftable size of rootstocks and scion

Rootstocks and Scion	Days to Germination	Germination Percent	No. of Days for Graftable Size
MO1	8.20	79.40	25.40
MO2	12.00	69.70	32.30
MO3	8.80	78.60	31.10
MO4	11.00	48.30	26.50
MO5	9.00	55.40	28.20
MO6	10.00	53.90	29.60
MO7	8.60	67.80	27.30
PKM 1	6.00	85.20	20.50
C.D.	0.54	3.77	1.60
SE (d)	0.25	1.76	0.75

**Fig 1:** Days to germination, germination percent and number of days for graftable size of rootstocks and scion

Days for graft union

The days taken for graft union of annual moringa scion vary with different perennial moringa rootstocks. Number of days taken for graft union with MO1 rootstock was 14.20 days followed by MO4 (15.30 days), MO7 (15.80 days), MO5 (16.50 days), MO3 (17.40 days), MO2 (18.10 days) and MO6 (18.60 days) respectively (Table 3). Similar results was reported by Garcia *et al.*, (2004) [2] when tomato scion cv. fanny grafted on rootstock cv. AR-9704.

Graft success percentage

Graft success percentage was recorded on 20th, 40th days after grafting. The grafted plants were kept under mist chamber for 15 days and success percentage was recorded on 20th day. Success percentage was higher on 20 days after grafting when MO1 used as rootstock (51.20%) followed by MO3 (48.30%), MO2 (44.60%), MO4 (37.90%), MO7 (31.80%), MO6 (29.40%), MO5 (26.10%) respectively (Table 3), which is similar to report given by Priyadarshini *et al.*, (2015).

After the successful union of grafts, the grafted plants were transferred to hardening chamber and success percentage was observed on 40 days after grafting. Graft with MO1 rootstock showed the highest success percentage of 47.20 per cent followed by MO3 (36.70%), MO2 (28.80%), MO4 (28.50%), MO7 (27.20%), MO6 (25.80%), MO5 (23.40%) respectively

(Table 3), which is similar to report given by Priyadarshini *et al.* (2015).

Table 3: Days for graft union and graft success percentage at different intervals

Rootstocks	Days for Graft Union	Success Percentage	
		20 Days	40 Days
MO1	14.20	51.20	47.20
MO2	18.10	44.60	28.80
MO3	17.40	48.30	36.70
MO4	15.30	37.90	28.50
MO5	16.50	26.10	23.40
MO6	18.60	29.40	25.80
MO7	15.80	31.80	27.20
C.D.	0.97	2.30	1.78
SE (d)	0.45	1.06	0.82

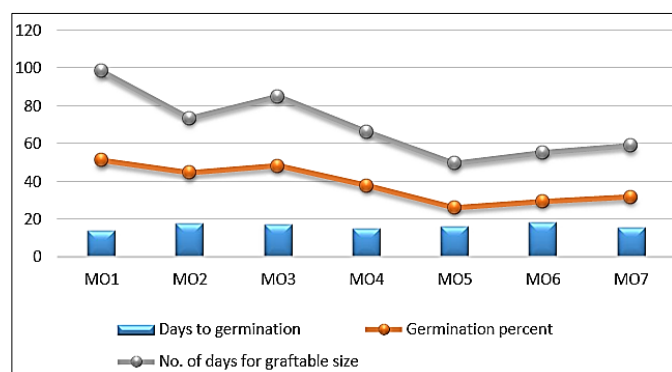


Fig 2: Days for graft union, graft success percentage at different intervals

Conclusion

In the present investigation, MO1 rootstock showed superiority over other perennial rootstock *viz.*, MO2, MO3, MO4, MO5, MO6 and MO7 in the traits *viz.*, days taken for seed germination, percentage of seed germination at 30 days, days taken for rootstocks and scion to attain graftable size, days taken for graft union and percentage of grafting success. From this experiment it can be concluded that perennial moringa ecotype MO1 (Moolanur moringa) is the best rootstock for successful grafting with annual moringa scion var. PKM 1. The study will be continued to assess the field performance of the grafted plants.

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