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Original Research Article

Influence of Different Potting Mixture on Sprouting, Survival, Growth and B:C Ratio of Mango cv. Alphonso Stone Graft

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A B S T R A C T

Potting medium is the most important input for quality planting material production of mango. It is responsible for healthy and uniform growth not only in nursery but also in field. Soil is considered as minor mineral and hence restrictions are for excavation. Considering future need it is essential to evaluate other cheap sources available in the Konkan, coastal mango hub. Hence field experiment was carried out to find the response of mango cv. Alphonso stone grafts in different potting mixture. Studies revealed that the highest sprouting percentage (88.00%) as well as maximum survival percentage (52.00%) was observed in T_6 i.e. soil + cocopeat (1:1) at par with T_2 and T_{10} (50.67%). The treatment T_{10} i.e. cocopeat + leaf manure + compost (1:1:2) was recorded significantly maximum plant height (129.40%), girth (38.08%), number of shoot (1.50), number of leaf (22.70), absolute growth rate (0.1483 cm/day) and relative growth rate (0.0237 cm/cm/day) whereas, maximum leaf area (617.03 cm^2) was obtained in T_5 i.e. soil + leaf manure (1:1). Maximum root length (21.97 cm) and dry weight of root (7.23 g) was obtained in treatment T_9 i.e. cocopeat + leaf manure + compost (1:1:1). Economics involved for different treatments showed that T_{10} i.e. cocopeat + leaf manure + compost (1:1:2) was promoting with highest B:C ratio (1.39) in stone grafting. The media containing cocopeat along with leaf manure and compost was the ideal soilless media for nursery for raising mango grafts.

Keywords

Mango, Alphonso, Soilless media, Cocopeat, Stone grafting

Introduction

Mango (*Mangifera indica* L.) is choicest fruit of all class and masses occupy a unique place among the fruits in world. Due to increasing demand from all parts of world for mango and mango based products, area under plantation is increasing. Farmers are adopting high density planting which creates a huge demand of quality planting material. Media play significant role in quality production of grafts. Konkan is not only supplying mango but also other fruits and spices grafts to all over India. Demand for basic media i.e. soil is very high in this region. The area is also blessed with large forest and coconut plantation through which leaf manure and cocopeat can be prepared which can be used as light weight media by nurseryman. Considering future scope for soilless nursery, the present study was undertaken to evaluate influence of different potting mixture on growth performance and economics of mango stone grafts.

Materials and Methods

The present investigation on effect of different potting mixture survival and growth on mango stone graft was carried out at Department of Horticulture, College of Agriculture, Dr. B. S. K. K. V. Dapoli, Dist. Ratnagiri. The experiment was executed in randomized block design with ten treatments and three replications. The ten treatments consist of Control (i.e. Soil + FYM 3:1), Soil + SSP + Rice husk + Organic mill (55:15:15:15), Leaf manure (100%), Cocopeat (100%), Soil + Leaf manure (1:1), Soil + Cocopeat (1:1), Leaf manure + Cocopeat (1:1), Leaf manure + Cocopeat (1:3), Cocopeat + Leaf manure + Compost (1:1:1) and Cocopeat + Leaf manure + Compost (1:1:2). In this experiment sprouting, survival, morphological parameters and B:C ratio influenced by different potting media was recorded at 15 days interval up to 180 days and were analysed by standard method of analysis of variance as given by Panse and Sukhatme (1995).

Results and Discussion

At the end of the sixth month, all the parameters i.e. sprouting, survival, morphological parameters and B:C ratio were significantly influenced by the different potting media treatments. The data pertaining to the effect of different potting mixtures at 180 days after grafting are presented in the Table 1 and depicted in plate 1 and 2.

Effect of different potting mixture on percent sprouting

At 43 day after grafting, statistically maximum per cent sprouting of grafts was found in treatment T_6 (88.00%) which was at par with T_2 (86.67%), T_{10} (84.00%) and T_3 (84.00%). The minimum sprouting percentage was found in treatment T_8 (78.67%). For sprouting of graft, healing of cambium layer is most important. Temperature and humidity play important role in success of graft union (Hartmann and Kester, 1968). Use of soilless media like cocopeat help for increasing porosity, water holding capacity, low shrinkage, low bulk density and slow biodegradation of the medium (Ragaji, 2017) resulted in higher sprouting per cent in media mixture containing cocopeat. Similar findings were obtained by Rai (1982) in soil + FYM (3:1) media for mango stone grafts, Ragaji (2017) in soil + cocopeat (1:1) and leaf manure: cocopeat (25:75) media for mango stone grafting.

Effect of different potting mixture on survival percentage

At 180 DAG, the statistically maximum per cent survival of grafts was recorded in treatment T_6 (52.00%) which was at par with T_2 (50.67%), T_{10} (50.67%) and T_4 (49.33%). The higher survival per cent was observed in media having cocopeat along with soil which helped in growth of graft by maintaining equilibrium in water and nutrient supplied. The minimum survival per cent observed in T_3 (36.00%) might be due to drying of leaf manure at very fast rate causing shock to the roots of the graft. Similar finding were reported by Dengale (1980) in soil + FYM (3:1) and Ragaji (2017) in soil + FYM (3:1) followed by soil + cocopeat (1:1) media for stone grafts of mango.

Effect of different potting mixture on morphological character

At the end of experiment at 180 days, the per cent increase in plant height was found higher in T_{10} (129.40%) at par with T_9 (120.64%) which was found superior over rest of the treatments. The lower per cent increase in

plant height was recorded in T_1 (105.03%). Similarly, significantly highest per cent increase in plant girth was found in T_{10} (38.08%) which was at par with T_6 (37.19). The lowest per cent increase in plant girth was found in T_5 (23.83%). Grafts containing media mixture with proper aeration, moisture and substantial amount of nutrients, facilitate root absorption for formation of photosynthets. It helped in cell division, cell elongation and adequate water supply resulted in increase in per cent of girth of grafted plants. The statistically maximum number of shoot was recorded in T_{10} (1.50). The minimum number of shoot was recorded in T_4 (1.27). This was due to availability of moisture and nutrient through media (Ikram *et al.*, 2012) resulted in increasing morphological characters like height, girth and number of shoot. The T_9 was recorded maximum number of nodes (2.20) which was found superior over rest of the treatments and the minimum was recorded in T_1 (1.45). Soilless media is light in weight and porous (Wilson, 1983) with low salt content, good water holding capacity and ion exchange capacity with optimum pH produced maximum number of nodes. Similarly, the leaf area was recorded maximum in T_5 (617.03 cm^2) and the minimum in T_1 (538.55 cm^2). The highest number of leaves was observed in T_{10} (22.70) while the lowest number of leaves was observed in T_1 (15.22). The mixture of cocopeat, leaf manure and compost with or without soil contained proper equilibrium of nutrient, moisture and aeration resulted in faster physiological activity in successful grafts. The driving force for cell elongation and multiplication was favored by soil moisture, humidity and temperature which produced favorable effect on number of leaves on scion and leaf area (Bodkhe and Rajput, 2010). At 180 DAG, AGR on height basis was highest in T_{10} (0.1483 cm/day) while lowest AGR was recorded in T_9 (0.0048 cm/day). The highest RGR on height basis was obtained in T_{10} (0.0237 cm/cm/day) whereas lowest RGR was obtained in T_1 (0.0208 cm/cm/day). The highest root length was recorded in T_9 (21.97) which were at par with T_2 (20.20 cm). The lowest root length was recorded in T_5 (14.57). The maximum dry weight of root was obtained in the T_9 (7.23) which were at par with T_{10} (6.85) and T_2 (6.12). The minimum dry weight of root was obtained in T_3 (2.69) which were at par with T_4 (3.74). Easy availability of nutrient, aeration leads to proper gas exchange by maintaining sufficient oxygen supply to the root. Simultaneously removal of respiratory CO_2 helped in root elongation (Heikanen, 1993). Similar findings were reported by Bachubhai (2005) for mango seedling in soil, sand and FYM (2:2:1), Waseem *et al.,* (2013) in soil + leaf mold + coconut husk (33:33:33), Kelkar (2016) in top soil + FYM + Vermiphose media for mango and Ragaji (2017) for mango stone grafting in soil + leaf manure (1:1) in media.

Effect of different potting mixture on Benefit: Cost (B:C) ratio

The highest net profit was recorded in T_{10} with highest B:C ratio (1.39). Treatment which was used as regular nursery practice T_2 recorded B: C ratio (1.17). Lowest B:C (1.00) ratio was reported in T_1 control followed by T_7 and T_8 (1.03).

In conclusion, potting mixture had significant effect on sprouting, survival, growth parameters and B:C ratio of mango grafts. Locally available leaf manure, cocopeat, compost can be used as media as alternative to soil is possible in near future. Grafts filled with soilless media reduced weight of bag to one fourth of weight of bags filled with soil and compost.

Table.1 Effect of different potting mixture on sprouting (%), survival (%), various growth parameters and B: C ratio of mango stone grafts

Treatments	Per cent sprouting 43 DAG	Per cent survival 180 DAG	Plant height	Girth of graft	Number of shoot	Number of Node	Number of leaves	Leaf area	Absolute growth rate	Relative growth rate	Root length	Dry weight of root	B:C ratio
T_1	81.33 (64.40)	37.33 (37.66)	25.68 (105.03)	7.90 (29.78)	1.45	1.45	15.52	538.55	0.0496	0.0208	18.20	4.73	1.00
T_2	86.67 (68.58)	50.67 (45.38)	26.38 (115.90)	8.46 (32.37)	1.33	1.70	18.07	585.58	0.0648	0.0223	20.20	6.12	1.17
T_3	84.00 (66.42)	36.00 (36.87)	27.43 (106.08)	7.69 (26.07)	1.30	1.78	16.92	565.62	0.1089	0.0209	16.80	2.69	1.16
T_4	81.33 (64.40)	49.33 (44.62)	26.61 (107.46)	7.73 (27.14)	1.27	1.67	17.33	564.02	0.0849	0.0212	19.20	3.74	1.14
T_5	82.67 (65.40)	46.67 (43.09)	28.25 (115.90)	8.27 (23.83)	1.37	1.60	18.32	617.03	0.1383	0.0223	14.57	5.68	1.23
T_6	88.00 (69.73)	52.00 (46.15)	26.39 (116.48)	7.88 (37.19)	1.47	1.73	18.13	570.03	0.0658	0.0225	18.53	5.69	1.28
T_7	82.67 (65.40)	37.33 (37.66)	25.95 (111.03)	8.09 (26.61)	1.42	1.53	16.53	608.58	0.0082	0.0216	18.03	5.17	1.03
T_8	78.67 (62.49)	41.33 (40.01)	27.89 (116.86)	8.57 (33.38)	1.48	2.02	16.17	610.17	0.1253	0.0222	16.37	4.69	1.03
T_9	81.33 (64.40)	42.67 (40.78)	28.15 (120.64)	8.23 (29.29)	1.38	2.20	17.98	576.59	0.0048	0.0228	21.97	7.23	1.17
T_{10}	84.00 (66.62)	50.67 (45.38)	29.77 (129.40)	8.69 (38.08)	1.50	1.95	22.70	595.61	0.1483	0.0237	19.53	6.85	1.39
Mean	**83.07**	**44.40**	**114.58**	**30.38**	**1.390**	**1.763**	**17.77**	**583.18**	**0.0799**	**0.0220**	**18.34**	**5.29**	-
S.E.±	**1.34**	**0.68**	**3.33**	**1.28**	**0.011**	**0.024**	**0.20**	**12.31**	**0.00**	**0.00**	**0.64**	**0.42**	-
C.D. @5%	**3.90**	**2.04**	**9.89**	**3.81**	**0.034**	**0.072**	**0.59**	**36.57**	**0.00**	**0.00**	**1.92**	**1.25**	-

(Figures in parenthesis indicate arcsine transformed values for sprouting and survival and per cent increase for plant height and girth)

Plate.1 Comparison of growth of mango grafts raised in different potting media at 180 DAG

Plate.2 Comparison of roots of mango grafts raised in different potting media at 180 DAG

The media containing cocopeat along with leaf manure and compost (1:1:2) was the ideal soilless media for nursery for raising mango grafts. It will also help to reduce mortality and transport cost to the farmer.

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