Bulletin of Environment, Pharmacology and Life Sciences
Bull. Env. Pharmacol. Life Sci., Vol 7 [11] October 2018 : 130-133

Online ISSN 2277-1808
Journal's URL:http://www.bepls.com
CODEN: BEPLAD
Global Impact Factor 0.876
Universal Impact Factor 0.9804
NAAS Rating 4.95

ORIGINAL ARTICLE **OPEN ACCESS**

Influence of Growing media on Germination, growth and survival of jamun (*Syzygium cumini* L. Skeels)

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ABSTRACT
The experiment was conducted at Horticulture Complex, Department of Horticulture, College of Agriculture, JNKVV, Maharajpur, Jabalpur (M.P.). The experiment was laid out in a Randomized Block Design with factorial concept with three replications. The treatments comprised of four growing media i.e. M_0 (Soil), M_1 (Soil + FYM), M_2 (Soil + Vermicompost) and M_3 (Soil + FYM + Vermicompost). Significantly minimum days taken to start germination (11.92), days taken to 50 % germination (14.67), highest germination percentage after 30 days (90.00 %), shoot height (33.42 cm), maximum number of leaves (23.83), girth of stem (5.78 mm), highest root length (30.68 cm), No. of roots (101.75), fresh weight of shoot (11.71 gm) and root (5.53 gm), dry weight of shoot (2.70 gm) and root (1.34 gm) and germination percentage (88.47 %) was recorded in M_3 (Soil + FYM + Vermicompost). The physiological parameter such as high leaf area index (2.20), leaf area duration (11510.67), energy intensity (0.72), chlorophyll content (67.90) and lowest light transmission ratio (43.25) was also noted in M_3.
Key word: jamun, growing media, germination, survival , physiological parameter

Received 18.07.2018 Revised 24.08.2018 Accepted 11.09.2018

INTRODUCTION

Jamun (*Syzygium cumini* L. Skeels) possesses commercial importance as a minor fruit in tropical and subtropical countries and it is native of India.. It is a versatile fruit crop of both food and medicinal value. Fruit have high demand for table purpose, for preparation of a wide variety of products and also for their medicinal value. Jamun is known by different names such as java plum; black plum, kalajam, phalinda and Ra jamun. There is no organised orcharding of jamun in India. It is grown in parks, roadsides as avenue trees and as windbreaks. Generally jamun is propagated by seed and it has no dormancy, hence fresh seeds are sown immediately after extracting from fruits. Seed can be sown 4-5 cm deep in the nursery. Studies revealed that seed extraction of jamun after heaping the fruits for a single day was better for getting good quality seeds in comparison to the extraction of seeds immediately after collection. To increase the productivity, there should be availability of good planting material along with proper management practices. So, Media is one of the important factors, which plays an important role in growth and survival of seedlings. Several growing media or their combinations are being used for raising the seedling. Different growing media like soil, farm yard manure (FYM) and vermicompost either alone or in different proportion have been found beneficial to influence germination and growth of seedling. A good growing media provides sufficient anchorage or support to the plant, serves as a reservoir for nutrients and water, allows oxygen diffusion to the roots and permits gaseous exchange between roots and the atmosphere outside root substrate. Here less research work can be done about growing media on jamun. Hence the present study was undertaken to find out the effect of different growing media on seed germination, growth and survival of jamun.

MATERIAL AND METHODS

The experiment was carried out at Horticulture Complex, Maharajpur, JNKVV, Jabalpur during the year 2015-2016. It was laid out in randomized block design (RBD) with factorial concept with three repetitions. The experiment was conducted to find out the influence of growing media on germination, growth and survival of jamun seedlings. For experiment purpose fresh seed of jamun are collected and extracted. After extraction the seed was sown immediately because it loses the viability quickly. The seed are sown in different growing media which act as treatment such as M_0 (Soil), M_1 (Soil + FYM), M_2 (Soil + Vermicompost) and M_3 (Soil + FYM + Vermicompost). Seed of jamun were sown in polythene bags of 15 X 10 cm size filled in different mixture and its combinations on 17thJuly 2015. One seed per poly bag was sown at 1-1.5 cm depth. Watering was done using rose can regularly. Necessary plant protection measures were taken. Five representative plants from each treatment were selected and observed for different growth characters and physiological parameter.

RESULT AND DISCUSSION

The data presented in Table-1 revealed that the seed subjected to media having Soil + FYM + Vermicompost were recorded minimum days taken to start germination (15.73), Days taken to 50 % germination (18.83) and percentage of germination at 30 days after sowing (79.17 %). Whereas, maximum days taken to start germination (18.42), Days taken to 50 % germination and percentage of germination at 30 days after sowing (68.33 %) was recorded in soil (M_0). Media shows significant effect towards the seed germination. The probable reason may be that the medium M_3 has relatively high content of humus-like compounds, active micro organisms, enzymes as well as physical and nutritional condition of media which increased the physiological activities of seed and initiate the early germination. This finding is similar to Parasana *et al*. [4].

The vegetative parameter, survival percentage and seed vigour index of jamun were presented in Table-2. The maximum shoot height (28.92 cm) noted under M_3 (soil + Vermicompost + FYM) at 150 DAS and it was significantly superior over rest of the media. However, minimum shoot height of 25.59 cm was recorded under M_0 (only soil) at 150 days after seed sowing, respectively. The increase in shoot height could be due to the presence of some growth-promoting substances in worm-processed material (vermicompost) and FYM. The vermicompost and FYM also contained a considerable amount of some essential plant micronutrients e.g. Cu (0.973 mg/kg), Fe (8.68 mg/kg), Mn (13.64 mg/kg and Zn (16.91 mg /kg) that might be responsible for better plant growth. Significantly, maximum number of leaves (18.75 leaves per seedling) was recorded respectively, when seed sown in growing media comprising soil + vermicompost + FYM (M_3) and showed significant superiority over rest of the treatment at 150 days after seed sowing. However, minimum number of leaves (17.83) per seedling was recorded under M_0 (Soil). The finding is supported with Vachanni *et al*. (2014) as he reported that soil media comprising of soil, FYM, vermicompost, paddy husk in the composition 6:2:1:1 gives in higher no of leaves.

Maximum increment in stem girth (4.67 mm) was recorded under M_3 (soil + FYM + vermicompost). Whereas, minimum stem girth (4.08 mm) was recorded under M_0 (Soil) at 150 days after sowing. Girth of stem was slightly better in the treatments having FYM over their respective vermicompost treatments. The probable reason may be that the medium M_3 has high anchorage or support to the plant, water retention capacity, allows oxygen diffusion to the roots and permits gaseous exchange between roots and the atmosphere outside root substrate. The findings are supported by Taiwo [6] and Parasana *et al.,* [4].

The maximum seedling height (54.98 cm) recorded at 150 days after sowing under M_3 which showed significant superiority over rest of treatments and minimum height (49.29 cm) was recorded under M_0. Probable reasons may be that the media M_3 creates sufficient porous space to let the excess water drain away and pertaining adequate aeration for the better seedling growth. The excellent plant growth in vermicompost and FYM was possibly due to some plant growth promoters in worm casts which increase physiological activities of seed, essential for cell division, cell enlargement or both. This may be attributed to general improvement in the physical and chemical properties of the rooting medium [2].

Maximum root length (26.73 cm) at 150 days after sowing was recorded under M_3 which showed significant superiority over rest of treatments. Likewise, minimum root length was recorded under M_0 (18.60 cm). It might be due to media having soil + vermicompost + FYM that create sufficient porous space to permit adequate aeration, water holding capacity, improved soil texture and structure, maintained soil temperature and improved soil health and nutrient status of medium for better root growth. Application of vermicompost and FYM enhances the activity of some microbial populations which increase the level of N. This was due to higher N fixer in experimental plot than control. Incase of number of roots, M_3 recorded maximum number of roots per seedling (88.17) at 150 days after sowing followed by M_3 (79.83) whereas, minimum number of roots per seedling was recorded under M_0 (76.83). The excellent plant growth in vermicompost and FYM was possibly due to the presence of some plant growth

promoters. This improvement of vegetative growth might be due to the role of vermicompost and FYM in improving the soil's physico-chemical structure, it but also promotes biological properties of soil, increasing soil ventilation by increasing the porosity and a big source of nutrient elements especially nitrogen and phosphorus. The findings are supported by Chopde *et al.,* [1]. Significantly, maximum fresh weight of shoots (9.73 g) was recorded under treatment M_3 which was significantly superior over rest of the treatments and minimum fresh weight of shoots (8.31 g) was noted under treatment M_0. Likewise, maximum dry weight of shoot (2.34 g) was recorded under treatment M_3 which was found to be significantly superior over rest of the treatments and minimum dry weight of shoot (2.00 g) was noted in treatment M_0. Whereas, maximum fresh weight of roots (4.39 g) was recorded under M_3 and found significantly superior over rest of growing media and minimum fresh weight of roots (3.66 g) was noted under M_0. Significantly, maximum dry weight of roots (1.06 g) recorded under treatment M_3 which found significantly superior over rest of growing media while minimum (0.89 g) in M_0. Probable reasons may be that the media M_3 contains rich source of nutrient. The excellent plant growth in vermicompost and FYM mixture was possibly due to some plant growth promoters in worm casts which increase physiological activities, essential for cell division, cell enlargement or both. The findings are supported by Roy and Shrivastava [5].

Data indicates that maximum survival percentage (82.72) was recorded under M_3 comprising soil + vermicompost + FYM and minimum (77.31) under M_0 at 150 days after seed sowing. In the present study, maximum seedling vigour index-I (4031.40 cm) and seedling vigour index-II (256.85 g) recorded in M_3. While, the soil (M_0) recorded lowest seedling vigour index-I (3188.01 cm) and seedling vigour index II (200.97 g). The probable reason of highest seedling vigour in vermicompost and FYM mixture can be that it has relatively high content of humus-like compounds, active micro organisms, enzymes as well as physical and nutritional condition which increased the physiological activities of plant.

Table 1: Effect of growing media on days to start germination, days taken to 50 % germination and percentage of germination at 30 days after sowing

Treatment	Days taken to start germination	Days taken to 50 percent germination	Percentage of germination at 30 days after sowing
Soil (M_0)	18.42	21.67	68.33
Soil + FYM (M_1)	16.17	19.75	75.83
Soil + Vermicompost (M_2)	17.08	20.75	71.67
Soil + FYM + Vermicompost (M_3)	15.33	18.83	79.17
Sem. (±)	0.345	0.296	1.945
C.D (0.05)	1.002	0.856	5.646

Table 2: Effect of growing media on vegetative character, survival percentage and seedling vigour index of jamun seedling

Treatment	Height of shoot (cm)	No. of leaves/ seedling	Girth of stem (mm)	Height of seedlings (cm)	Survival percentage (%)	Seedling vigour index-I (cm)	Seedling vigour index-II (gm)
M_0	9.14	5.08	4.08	49.29	77.31	3188.01	200.97
M_1	10.62	5.83	4.37	52.78	80.64	3764.70	235.04
M_2	9.80	5.42	4.23	51.03	79.28	3429.52	216.76
M_3	11.50	6.58	4.67	54.98	82.72	4031.40	256.85
S.Em.±	0.098	0.254	0.036	0.235	0.446	23.87	2.45
C.D. (0.05)	0.284	0.738	0.105	0.681	1.296	69.28	7.13

Table 3: Effect of growing media on root length, no. of roots, fresh and dry weight of shoot and root at 150 days after sowing

Treatment	Root length (cm)	No. of roots	Weight of Shoot (gm)		Weight of Root (gm)	
			Fresh	Dry	Fresh	Dry
M_0	23.70	76.83	8.31	2.00	3.66	0.89
M_1	25.59	83.67	9.31	2.22	4.13	1.00
M_2	24.41	79.83	8.87	2.09	3.89	0.95
M_3	26.73	88.17	9.73	2.34	4.39	1.06
S.Em.±	0.158	0.844	0.078	0.021	0.042	0.01
C.D (0.05)	0.459	2.448	0.227	0.062	0.121	0.03

The data regarding different physiological parameter was recorded in Table-3. The media significantly influenced the Leaf Area Index and Leaf Area Duration. The maximum Leaf Area Index (1.85) and Leaf Area Duration (10511.25 cm^2.days) was observed under treatment M_3 at 150 days after sowing whereas the treatment M_0 (only soil) was recorded minimum LAI and LAD at 150 days after sowing. This also suggest the role of nitrogen enhancing persistence and longevity of LA, which is a key factor in terms of photosynthesis productivity of the plants, that assimilates higher amount of photosynthates production and if the mobilization is proper to the sink, it will enhance the economic productivity. The data revealed that growing media significantly reduced the Light Transmission Ratio (LTR) and minimum Light Transmission Ratio (55.21) was recorded under M_3 and maximum Light Transmission Ratio (62.99) was recorded under M_0. The finding was supported by that of Munde and Gajbhiye [3]. The data revealed that growing media significantly increased the Energy Interception (Ei). Maximum Energy Interception (0.61) was recorded under M_3 soil + vermicompost + FYM and minimum Energy Interception (0.53) was recorded under M_0. The maximum Chlorophyll Content Index (62.27 g/m^2) noted under M_3 (soil + vermicompost + FYM) at 150 DAS, respectively and it was significantly superior over rest of the media. The minimum Chlorophyll Content Index of (58.54 g/m^2) was recorded under M_0 (only soil) at 150 days after seed sowing, respectively. This could be due to FYM, which has high organic carbon content and other macro nutrient like N and micro nutrients such as Ca, Mg and Fe which are essential for chlorophyll development.

Table 4: Effect of growing media on physiological parameter of jamun seedling

Treatment	Leaf area index	Leaf area duration (cm^2×day)	Light transmission rate	Energy intensity	Chlorophyll content (g/m^2)
M_0	1.59	9810.45	62.99	0.53	58.54
M_1	1.77	10252.27	58.23	0.58	60.80
M_2	1.68	9982.56	60.75	0.55	59.26
M_3	1.85	10511.25	55.21	0.61	62.27
S.Em.±	0.008	10.34	0.301	0.003	0.10
C.D. (0.05)	0.002	30.008	0.873	0.009	0.29

CONCLUSION

In the light of the results obtained from the present investigation it is concluded that that better performance in majority of parameter like germination, vegetative growth and physiological parameter were obtained in growing media M_3 (Soil + FYM + Vermicompost) over other growing media.

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CITATION OF THIS ARTICLE

Satya Narayan Hota, Ajay Kumar Karna, Bharat Kumar Dakhad and P. K. Jain. Influence of Growing media on Germination, growth and survival of jamun (*Syzygium cumini* L. Skeels) Bull. Env. Pharmacol. Life Sci., Vol 7 [11] October 2018: 130-133