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STUDY ON INTERACTION EFFECT OF DIFFERENT GROWING MEDIA AND GIBBERELLIC ACID ON SEED GERMINATION AND SEEDLING GROWTH OF JAMUN (*SYZYGIUM CUMUNII* L. SKEELS)

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ABSTRACT

The study entitled "Study on interaction effect of different growing media and gibberellic acid on seed germination and seedling growth of Jamun (*Syzygium cumunii* L. Skeels)" was carried out at College of Horticulture, Dr. Y.S.R Horticultural University, Venkataramannagudem, West Godavari district, Andhra Pradesh, during the year 2019. Media was taken at four levels (Soil, Soil + cocopeat @ 1:1, Soil + vermicompost @ 1:1, Soil + cocopeat + vermicompost @ 1:1:1) and GA_3 at four levels (control (0 ppm), 100, 200 and 300 ppm) with 16 treatment combinations, which were replicated thrice. The seeds were presoaked for 24 hours in different concentrations of GA_3 and were sown into the different growing media. From the above conducted experiment, it is reported that the seeds treated with GA_3 @ 300 ppm and sown in media with soil, cocopeat and vermicompost have taken minimum number of days taken for germination (7.33 days), days taken to 50% germination (10.43 days), germination at 15 and 30 days after sowing (56.56 and 99.92%, respectively) and survivability percent (99.92%). At 150 DAS maximum height (116.66 cm), number of leaves (65), maximum girth (8.76 mm), longest root (31.53 cm), more number of secondary roots per seedling (43.83), maximum fresh and dry weight of the shoot (94 g and 23.60) were observed in seeds treated with GA_3 @ 300 ppm and sown in media with soil, cocopeat and vermicompost over control.

Key words : Jamun, Gibberellic acid, Vermicompost, Cocopeat.

Introduction

Jamun is an important indigenous underutilized fruit crop belongs to the family Myrtaceae consisting of over 75 species. It is also known as *Syzygium jambolanum* and *Eugenia cumini*. Other common names are Jambul, Black plum, Javaplum, Indian Black berry, Jamblang etc. Family myrtaceae includes other crops like guava, water apple, feijoa, eucalyptus, allspice etc., Jamun has gained tremendous importance and recognition in recent past not only because of its uncomparable medicial properties. It is effective in the treatment of diabetic mellitus, inflammation, ulcers and diarrhea. The plant is rich in compounds containing anthocyanins, glucoside, ellagic acid, isoquercetin, kaemferol and myrecetin. The seeds are claimed to contain alkaloid, jambosine and glycoside jambolin or antimellin, which halts the diastatic conversion of starch into sugar. Therefore, the powdered seeds are useful for diabetic patients (Swami *et al*., 2012).

Propagation of jamun is done by seeds as well as vegetatively but is usually multiplied by seeds. The seeds have no dormancy, hence fresh seeds are sown immediately after extracting from fruits. The time required to grow jamun seedlings to a suitable size for grafting may be as long as one year. Seedling plants bear fruits of variable size and quality. As this crop has gained importance, there is a demand for the plants of early bearing, dwarf statured with high yield potential. This is only possible with vegetative propagation. For vegetative propagation of jamun, there is need of healthy, quick growing and attaining graftable size of seedlings in short span of time from their sowing time. Therefore, shortening this time is considered very important and it

can be achieved by enhancing the seedling growth. Seed germination is the resumption of active growth of embryo that results in the emergence of the young plant. During germination, gibberillic acid induces the synthesis of hydrolytic enzymes, such as amylase and protease. Gibberellins (GA_3) activate the embryonic vegetative growth, weakens the endosperm layer that involves the germination (Taiz and Zeiger, 2006). Sometimes, germination percentage is good, but survivability of the seedlings cannot be assured due to lack of proper nutrition in the media. Growth media composition influences seed germination and quality of the seedlings. Growth medium directly affects seed germination, seedling growth, development and later maintenance of the extensively functional rooting system. A good growth medium 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.

Keeping in view the above points, the present investigation was carried out to study the interaction effect of different media and GA_3 on seed germination and growth of jamun seedlings in order to obtain maximum graftable size of root stock in short duration.

Materials and Methods

The present experiment was carried out during the period of 2019 at College Farm, Dr. Y. S. R. Horticultural University in factorial randomized block design with three replications. GA_3 @ 100 mg, 200 mg and 300 mg was weighed in an electrical weighing balance and each was dissolved in 10 ml. of 99 percent absolute ethyl alcohol and make up to 1000 ml by adding distilled water and one treatment is taken as control where 1000ml distilled water is used. Seeds were soaken for 24 hours and then sown into different media. Media is composed of different proportions of soil, cocopeat and vermicompost. Cocopeat is soaken in water and washed thoroughly to reduce the EC (electrical conductivity) and sun dried. A total of 120 polythene bags were filled with soil, 120 bags were filled with the media comprising of soil and cocopeat in the ratio of 1:1, 120 bags were filled with the media comprising of soil and vermicompost in the ratio of 1:1 and 120 bags were filled with the media comprising of soil, cocopeat, vermicompost in the ratio of 1:1:1. Germination and growth parameters were taken in accordingly by selecting five different plants in each replication. Statistical analysis was done as per procedure given by Panse and Sukhatme (1978).

The following treatment combinations were replicated thrice and analysed statistically by subjecting to Factorial Randomized Block Design (F.R.B.D).

S. no.	Treatment combinations
1.	T_1: Soil + Control
2.	T_2: Soil + GA_3 100 ppm
3.	T_3: Soil + GA_3 200 ppm
4.	T_4: Soil + GA_3 300 ppm
5.	T_5: Soil + coco peat + control
6.	T_6: Soil + coco peat + GA_3 100 ppm
7.	T_7: Soil + coco peat + GA_3 200 ppm
8.	T_8: Soil + coco peat + GA_3 300 ppm
9.	T_9: Soil + vermicompost + control
10.	T_{10}: Soil + vermicompost + GA_3 100 ppm
11.	T_{11}: Soil + vermicompost + GA_3 200 ppm
12.	T_{12}: Soil + vermicompost + GA_3 300 ppm
13.	T_{13}: Soil + coco peat + vermicompost + control
14.	T_{14}: Soil + coco peat + vermicompost + GA_3 100 ppm
15.	T_{15}: Soil + coco peat + vermicompost + GA_3 200 ppm
16.	T_{16}: Soil + coco peat + vermicompost + GA_3 300 ppm

Results and Discussion

The present experiment was carried out under shade net at DR.Y.S.R. Horticultural Universiy, tadepalligudem, Andhra Pradesh in the year 2019. The following results regarding germination and growth have been collected by analysing five random plants in each treatment and their average has been presented below.

Germination parameters

The data in Table 1 and Fig. 1 have shown that the seeds treated with GA_3 @ 300 ppm and sown in media with soil, cocopeat and vermicompost have taken minimum number of days taken for germination (7.33 days), days taken to 50% germination (10.43 days), germination at 15 and 30 days after sowing (56.56 and 99.92%, respectively).

This might be due to rapid increase in hydrolysis of reserve food material like starch stored in the seeds by the action of hydrolytic enzymes activated by externally applied GA_3 hormone leads to cell wall plasticity and better water absorption (Patel *et al*., 2016). The present results are in accordance with the findings of Ratan and Reddy (2004) in mango, Parmar *et al*. (2016) and Palepad *et al*. (2016) in custard apple, Padma *et al*. (2015) in papaya and Gurung *et al*. (2014) in passion fruit.

Growth media has appropriate cation exchange capacity for retention of nutrients and have properties like good water holding capacity as well as sufficient porosity, thus permitting adequate moisture and exchange of gasses between the growth media and the embryo. It

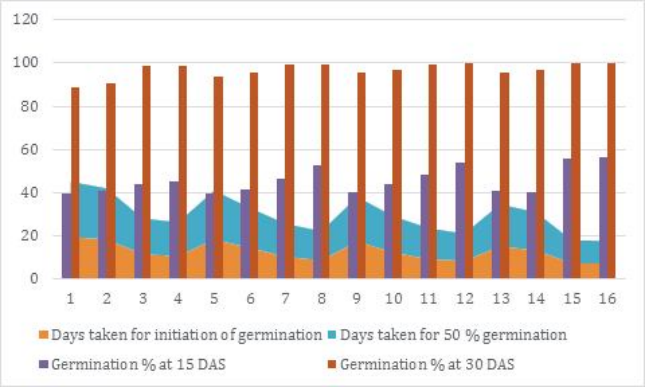

Fig. 1 : Interaction effect of GA_3 and media on germination parameters of Jamun.

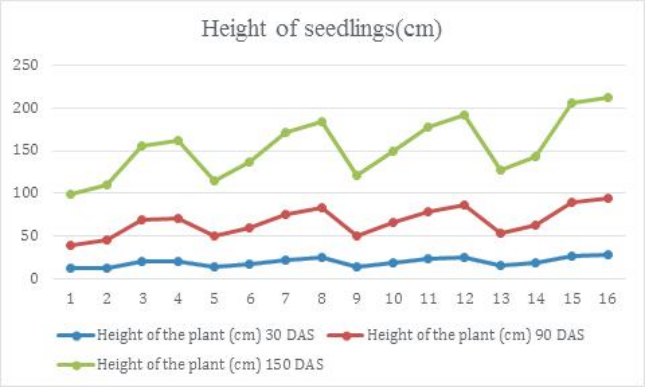

Fig. 2 : Interaction effect of GA_3 and media on height of Jamun seedlings.

Table 1 : Interaction effect of GA_3 and growing media on germination parameters of Jamun.

Treatment combinations	Days taken for initiation of germination	Days taken for 50% germination	Germination % at 15 DAS	Germination % at 30 DAS
T_1	19.60	25.53	39.54	88.73
T_2	18.53	23.53	40.86	90.60
T_3	11.63	16.57	44.12	98.43
T_4	10.77	15.60	45.21	98.48
T_5	18.53	22.50	39.64	93.63
T_6	14.53	18.53	41.28	95.56
T_7	10.53	15.20	46.45	99.00
T_8	8.77	13.50	52.89	99.33
T_9	17.57	20.60	39.99	95.56
T_{10}	12.47	16.83	44.18	96.56
T_{11}	9.37	14.27	48.23	99.33
T_{12}	8.63	12.50	54.04	99.83
T_{13}	15.33	19.40	41.13	95.56
T_{14}	13.43	17.56	39.99	97.00
T_{15}	7.53	10.60	55.81	99.89
T_{16}	7.33	10.43	56.56	99.92
SE(m) ±	0.045	0.18	0.30	0.68
CD at 5%	0.131	0.52	0.89	1.99

is essential for rapid and uniform germination of seeds (Anjanawe *et al*., 2013, Vikas *et al*., 2015). These results are in conformity with the findings of Ravimycin *et al*. (2016) in Coriander and Barman *et al*. (2016) in jamun.

Vermicompost, which simultaneously provide sufficient levels of oxygen and water to the roots, adequate storage of water and nutrients for the plant, balancing of physical, chemical and biological requirements for good plant growth, light weight and to produce uniform plant growth (Rakesh *et al*., 2012). The present results are in accordance with the findings of Bhardwaj (2013) in papaya and Singh *et al*. (2015) in custard apple.

Growth parameters

The growth parameters have shown significant differences as shown in Tables 2, 3 and Figs. 2, 3, 4; the parameters like plant height, number of leaves and girth were taken from 30 to 150 DAS at 60 days interval. At 150 DAS maximum height (116.66 cm), maximum girth (8.76 mm), longest root (31.53 cm), more number of secondary roots per seedling (43.83), maximum fresh and dry weight of the shoot (94 g and 23.60 g, respectively), fresh and dry weight of the root (29.43 g and 7.35 g, respectively) were observed in seeds treated with GA_3 @ 300 ppm and sown in media with soil, cocopeat and vermicompost over control. This might be due to the fact that GA_3 induces early seed germination by breaking the

Table 2 : Interaction effect of GA_3 and growing media on height and girth of Jamun seedlings.

Treatment combinations	Height of the plant (cm)			Girth of the plant (mm)		
	30 DAS	90 DAS	150 DAS	30 DAS	90 DAS	150 DAS
T_1	12.26	28.13	58.33	0.40	2.50	5.73
T_2	13.20	32.83	64.33	0.53	2.83	5.86
T_3	21.53	48.13	86.33	0.76	3.83	7.46
T_4	21.26	50.00	90.66	0.86	3.70	7.30
T_5	14.70	36.10	64.66	0.60	2.86	6.43
T_6	18.36	41.13	76.66	0.70	2.96	6.83
T_7	22.33	53.20	95.06	0.86	3.96	7.46
T_8	25.63	58.20	100.33	0.96	4.46	7.83
T_9	14.43	35.43	70.66	0.63	2.93	6.46
T_{10}	19.46	46.03	83.06	0.76	3.26	7.13
T_{11}	23.43	56.10	97.33	0.93	4.13	7.63
T_{12}	26.06	61.06	104.66	1.06	4.53	7.93
T_{13}	16.40	37.63	73.66	0.66	2.96	6.66
T_{14}	19.53	43.13	80.00	0.73	3.23	6.93
T_{15}	27.60	62.33	115.00	1.13	4.93	7.96
T_{16}	28.40	66.10	116.66	1.23	5.40	8.76
SE (m) ±	0.18	1.27	2.91	0.03	0.10	0.21
CD at 5%	0.54	3.68	8.41	0.09	0.31	0.63

Table 3 : Interaction effect of GA_3 and growing media on growth parameters of Jamun seedlings.

Treatment combinations	Root length (cm)	Number of secondary roots	Fresh weight of shoot (gms)	Dry weight of the shoot (gms)	Fresh weight of root (gms)	Dry weight of root (gms)
T_1	12.40	12.93	47.53	10.96	11.33	2.79
T_2	14.60	14.70	48.73	13.53	13.93	3.63
T_3	19.60	18.73	56.06	15.50	16.43	4.10
T_4	21.70	22.00	61.03	16.50	16.63	4.15
T_5	18.60	27.60	55.56	14.63	15.60	3.90
T_6	20.56	32.96	66.43	17.60	17.50	4.37
T_7	23.70	31.06	77.46	19.50	20.53	5.13
T_8	25.60	35.00	81.50	20.26	22.40	5.60
T_9	19.63	36.06	75.50	18.56	17.60	4.40
T_{10}	22.76	41.10	68.43	17.56	18.5	4.62
T_{11}	23.60	39.10	81.63	20.60	23.5	5.87
T_{12}	27.60	40.06	85.60	21.46	25.5	6.37
T_{13}	20.73	38.93	66.53	17.76	19.46	4.86
T_{14}	22.56	40.66	71.63	19.43	20.53	5.13
T_{15}	28.46	42.63	88.80	22.43	26.46	6.61
T_{16}	31.53	43.83	94.00	23.06	29.43	7.35
SE (m) ±	0.65	0.77	2.20	0.57	0.60	0.16
CD at 5%	1.89	2.23	6.37	1.65	1.74	0.48

seed dormancy and sprouting of seeds by activation of hydrolytic enzymes. GA_3 might also involve in elongation of cells in germinated seedlings, which reflected in maximum seedling length with GA_3 seed treatment at higher concentrations (Sable and Waskar, 2009). Results are in accordance with Meena and Jain in papaya (2005) and Kumar *et al*. (2008) in mango, Meena *et al*. (2017) in papaya.

Increase in plant height might be due to the release of beneficial chemicals derived from the bodies of the

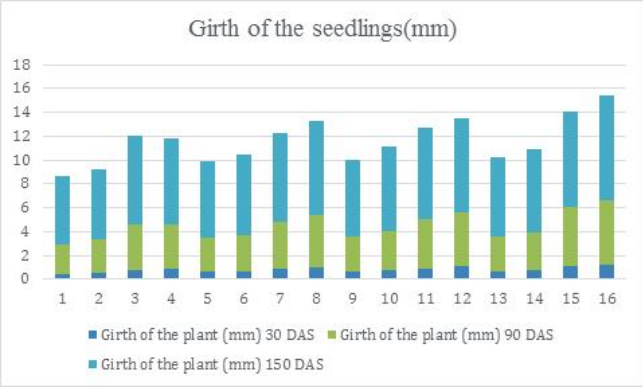

Fig. 3 : Interaction effect of GA_3 and media on girth of Jamun seedlings.

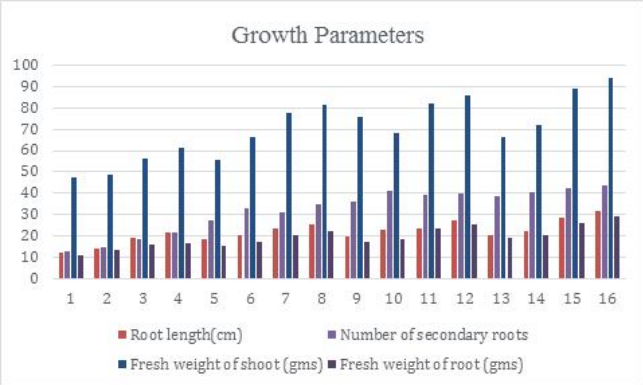

Fig. 4 : Interaction effect of GA_3 and media on growth parameters of Jamun seedlings.

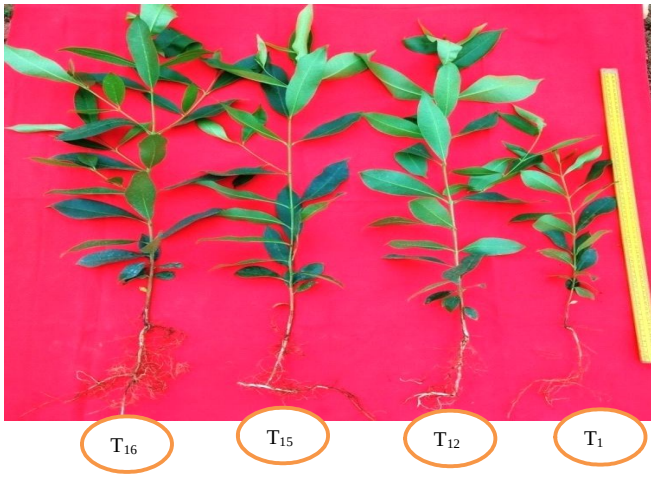

Fig. 5 : Shoot and root growth of seedlings raised in different treatment combinations at 120 DAS T_1- control, T_{12} - Soil + vermicompost + GA_3 300 ppm, T_{15}- Soil + coco peat + vermicompost + GA_3 200 ppm, T_{16} - Soil+coco peat + vermicompost+GA_3 300 ppm.

earthworms (Surakshitha and Sharath, 2015) and also due to the general improvement in the physical and chemical properties of the media due to the presence of vermicompost. It also might be due to good physical and biological conditions in cocopeat and vermicompost which had a positive effect on root development (Bhardwaj, 2013). Results obtained on this aspect are in line with the findings of Vikas *et al.* (2015) in papaya and Prajapati *et al*. (2017) in acid lime, Singh *et al.* (2002) in jackfruit and Kalyani *et al*. (2014) in guava.

Conclusion

From the present investigation it could be concluded that seeds that were treated with GA_3 @ 300 ppm and sown in media containing soil, cocopeat and vermicompost in the ratio of 1:1:1 shown earlier germination, maximum percentage of germination, survivability percentage. Seedlings also obtained maximum height and girth with more number of leaves during all the intervals (30, 90 and 150 DAS) as well as more number of roots with maximum length, fresh and dry weight of seedlings at 150 DAS.

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