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Effect of pre-sowing seed treatments on germination and seedling growth in different jamun varieties (*Syzygium cuminii* Skeels)

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Abstract

Jamun seeds are recalcitrant in nature and available during a particular season. To make use of available seeds for propagation purpose, there is need to increase the germination percent. In this regard, the research was conducted at Kittur Rani Channamma College of Horticulture, Arabhavi during 2018-19 to examine the effect of different seed treatments in different varieties of jamun for germination and seedling growth. Among the different seed treatments 24 hours AJG-85 seeds soaked in normal water recorded the maximum germination percent (95.14%) and Untreated Local selection seeds recorded the minimum percent of germination (54.40%). Konkan Bahadoli seeds soaked in normal water for 24 hours recorded the maximum seedling height (35.56 cm) and seedling vigor index (3109.80). The highest seedling diameter (5.75 mm) was noticed in AJG-85 seeds that were treated with 200 ppm GA₃ solution for 10 minutes. In untreated Local Selection seeds, the minimum growth was observed.

Keywords: Jamun, varieties, treatments, germination, growth

Introduction

Jamun (*Syzygium cuminii* Skeels.) is an important underutilized, indigenous tropical fruit crop of India, belongs to the family Myrtaceae. Jambul, Jambolanplum, Duhat plum, Damson plum, Portuguese plum, Indian blackberry, and Malabar plum are some other names used for it. Because of its hardness and great yield potential, it has recently gained popularity as a dry zone horticultural crop. It consists of over 75 species and found growing wild throughout the country for its edible fruits. It is commonly grown in India, Malaysia, Afghanistan, Pakistan, Myanmar and Bangladesh (Chaudhary and Mukhopadhyay, 2012) [3].

Jamun has gained tremendous importance because of its incomparable medicinal and nutritional properties. Apart from the usual content like minerals, proteins, sugar, colors and it is a good source of iron. (Singh and Srivastava, 2000) [10]. Almost all parts of the tree are used for various purposes. The ripen fruits are tasty and pleasant flavoured used in the preparation of delicious beverages, jam, jellies, wine, squash, vinegar and pickles. (Swami *et al.*, 2012) [11]. The plant is rich in anthocyanins, glucosides, isoquercetin, ellagic acid, kaemferol, and myrecetin. Seeds contain alkaloid such as jambosine and glycoside such as jambolin or antimellin, which blocks the diastatic conversion of starch into sugar. (Ramteke *et al.*, 2015) [9]. Presently, plants are being propagated asexually through grafting and budding for commercial scale production. Raising of vigorous and healthy rootstock/ seedling is crucial for carrying out vegetative techniques of propagation. Jamun seeds loses viability very quickly and are available during particular season. Hence, some important techniques and varieties were put forth for enhancing germination by using different seed treatment to meet the requirement of nurserymen.

Materials and Methods

The experiment was conducted on seed germination in different varieties of jamun in the Fruit Science department, Kittur Rani Channamma. College of Horticulture, Arabhavi, during 2018-19. The experiment was laid out in Factorial completely randomized design using two factors. Factor I considered as three varieties *viz.*, Konkan Bahadoli-M₁, AJG-85-M₂ and Local selection-M₃ and Factor II as seed treatments Control-T₁, Soaking of seeds in normal water for 24 hrs-T₂, Dipping of seeds in boiling water for 5 second- T₃, Soaking of seeds in cow urine for 12 hrs-T₄, Soaking of seeds in growth regulator (GA₃) at 200 ppm for 10 min-T₅ with 5 replications.

Each replication has 15 seeds (Number of seeds per treatment- 75) Observation recorded on initiation of germination, 50 percent germination and maximum germination was recorded daily upto 90 days. Germination percent and growth parameters like seedling height, seedling

diameter and seedling vigour index was recorded 90 days after sowing.

$$\text{Seed germination (percent) } = \frac{\text{Number of seeds germinated}}{\text{Number of seeds sown}} \times 100$$

Table 1: Effect of seed treatments on seed germination in different varieties of jamun

Treatments	Number of days taken for germination			Germination (%)
	Initiation	50 percent	Maximum	
Factor I (Varieties)				
M ₁	13.28	15.29	21.18	83.16 (66.24)
M ₂	12.62	15.12	20.56	88.78 (71.01)
M ₃	18.29	19.61	26.78	66.00 (54.41)
SE m±	0.22	0.18	0.17	0.55 (0.43)
CD @ 5%	0.62	0.53	0.50	1.58 (1.22)
Factor II (Seed treatments)				
T ₁	18.56	20.64	26.95	68.22 (56.01)
T ₂	13.24	14.95	22.06	84.15 (67.75)
T ₃	14.43	16.60	23.80	77.46 (62.18)
T ₄	14.29	16.25	21.61	82.10 (65.64)
T ₅	13.13	14.95	19.77	84.63 (67.85)
SE m±	0.28	0.24	0.23	0.72 (0.56)
CD @ 5%	0.81	0.68	0.65	2.02 (1.58)
Interaction effect (Varieties × Seed treatments)				
M ₁ T ₁	17.49	20.08	26.33	69.33 (56.35)
M ₁ T ₂	12.50	13.63	19.81	87.36 (69.23)
M ₁ T ₃	13.30	15.52	21.31	82.83 (65.50)
M ₁ T ₄	11.57	14.09	20.29	88.97 (70.94)
M ₁ T ₅	11.54	13.13	18.15	87.33 (69.15)
M ₂ T ₁	16.67	18.82	24.40	80.94 (64.16)
M ₂ T ₂	10.93	13.22	19.07	95.14 (77.28)
M ₂ T ₃	12.81	15.12	22.06	86.23 (68.28)
M ₂ T ₄	11.58	14.53	19.54	87.33 (69.21)
M ₂ T ₅	11.15	13.94	17.72	94.22 (76.12)
M ₃ T ₁	21.49	23.02	30.13	54.40 (47.51)
M ₃ T ₂	16.31	17.94	27.29	69.96 (56.75)
M ₃ T ₃	17.20	16.60	28.03	63.33 (52.73)
M ₃ T ₄	19.74	16.25	25.01	69.70 (56.78)
M ₃ T ₅	16.73	14.95	23.43	72.34 (58.27)
SE m±	0.49	0.41	0.39	1.25 (0.96)
CD @ 5%	1.40	1.18	1.12	3.54 (2.73)

Treatment details	DAS: Days after sowing
M ₁ : Konkan Bahadoli	T ₁ : Control T ₂ : Soaking of seeds in normal water for 24 hrs
M ₂ : AJG-85	T ₃ : Dipping of seeds in boiling water for 5 second
M ₃ : Local selection	T ₄ : Soaking of seeds in cow urine for 12 hrs
	T ₅ : Soaking of seeds in GA ₃ solution at 200 ppm for 10 min

Table 2: Effect of seed treatments on growth parameters at 90 DAS in different varieties of jamun

Treatments	Seedling height (cm)	Seedling diameter (mm)	Seedling vigour index
Factor I (Varieties)			
M ₁	29.12	4.20	2441.68
M ₂	26.39	4.59	2389.20
M ₃	20.77	2.37	1376.61
SE m±	0.68	0.10	60.16
CD @ 5%	1.94	0.29	170.61
Factor II (Seed treatments)			
T ₁	20.25	2.79	1442.03
T ₂	28.56	4.10	2444.39
T ₃	23.54	3.31	1843.86
T ₄	28.87	3.98	2399.13
T ₅	25.91	4.42	2216.40
SE m±	0.88	0.13	77.67
CD @ 5%	2.50	0.38	220.26
Interaction effect (Varieties × Seed treatments)			
M ₁ T ₁	24.28	3.19	1682.40

M ₁ T ₂	35.56	4.60	3109.80
M ₁ T ₃	26.44	3.86	2190.20
M ₁ T ₄	29.82	4.73	2652.40
M ₁ T ₅	29.48	4.61	2573.60
M ₂ T ₁	18.40	3.36	1661.40
M ₂ T ₂	28.48	5.09	2709.40
M ₂ T ₃	24.22	3.89	2087.60
M ₂ T ₄	33.46	4.86	2917.20
M ₂ T ₅	27.39	5.75	2569.80
M ₃ T ₁	18.08	1.84	982.30
M ₃ T ₂	21.66	2.60	1513.97
M ₃ T ₃	19.95	2.19	1253.80
M ₃ T ₄	23.34	2.35	1627.20
M ₃ T ₅	20.86	2.88	1505.80
SE m±	1.53	0.23	134.52
CD @ 5%	4.34	0.65	381.50

Treatment details	T ₁ : Control T ₂ : Soaking of seeds in normal water for 24 hrs
M ₁ : Konkani Bahadoli	T ₃ : Dipping of seeds in boiling water for 5 second
M ₂ : AJG-85	T ₄ : Soaking of seeds in cow urine for 12 hrs
M ₃ : Local selection	T ₅ : Soaking of seeds in GA ₃ solution at 200 ppm for 10 min

Results

Germination parameters

Data presented in Table 1 revealed that, the AJG-85 variety showed the minimum number of days required for initiation of germination (12.62) among the three varieties. whereas, Local selection seeds took maximum number of days (18.29) for initiation of germination. Among different seed treatments, seeds treated with 200 ppm GA₃ solution for 10 minutes recorded the minimum number of days taken for initiation of germination (13.13). which was on par with seeds soaked in normal water for 24 hrs (13.24). The maximum number of days was reported in control (18.56). Among the interaction effects, minimum number of days taken for initiation of germination was observed in AJG-85 seeds treated with normal water for 24 hrs M₂T₂ (10.93) which was on par with AJG-85 seeds treated with GA₃ solution at 200 ppm for 10 minutes M₂T₅ (11.15), Konkani Bahadoli seeds were treated with a 200 ppm GA₃ solution for 10 minutes M₁T₅ (11.54), Konkani Bahadoli seeds were treated with cow urine for 12 hours M₁T₄ (11.57) and in normal water for 24 hours M₁T₂ (12.50). Untreated seeds (control) of Local selection genotype M₃T₁ were observed for maximum number of days (21.49).

Among three varieties, the minimum number of days taken for fifty percent germination was recorded in AJG-85 (15.12) which was on par with Konkani Bahadoli (15.29) whereas, the maximum number of days was found in Local selection (19.61). Among the different seed treatments, the minimum number of days required for fifty percent germination was obtained in seeds treated with GA₃ at 200 ppm for 10 minutes and normal water soaked seeds for 24 hours (14.95) days each whereas, control recorded the maximum number of days (20.64). Among the interaction effects, Konkani Bahadoli seeds treated with 200 ppm GA₃ for 10 min taken the minimum number of days for fifty percent germination M₁T₅ (13.13) which was on par with AJG-85 seeds soaked in normal water for 24 hrs M₂T₂ (13.22), Konkani Bahadoli seeds in same treatment M₁T₂ (13.63), AJG-85 seeds treated with GA₃ at 200 ppm for 10 min M₂T₅ (13.94) and Konkani Bahadoli seeds treated with cow urine for 12 hrs M₁T₄ (14.09) whereas, the maximum number of days were recorded in untreated seeds (control) of Local selection M₃T₁ (23.02). AJG-85 seeds recorded minimum number of days for

maximum germination (20.56) and Local selection seeds were recorded the maximum number of days (26.78) for germination among three varieties. Significantly minimum number of days taken for maximum germination was recorded in seeds treated with GA₃ solution at 200 ppm for 10 min (19.77) whereas, the maximum number of days was observed in untreated seeds (26.95). Among the interaction effects, minimum number of days taken for maximum germination was noticed in AJG-85 seeds treated with GA₃ solution at 200 ppm for 10 min M₂T₅ (17.72) which was on par with Konkani Bahadoli seeds in the same treatment M₁T₅ (18.15). Whereas, the maximum number of days were observed in untreated Local selection M₃T₁ (30.13) among the treatments.

Among three varieties, highest germination percentage was recorded in AJG-85 (88.78%) and minimum was recorded in Local selection (66.00%). Seed treatment with GA₃ at 200 ppm resulted the highest germination percentage (84.63%) which was on par with seeds soaked in normal water for 24 hrs (84.15%). Whereas, the least germination percentage was noticed in control (68.22%). Among the interaction effects, highest germination percentage was recorded in AJG-85 seeds soaked in normal water for 24 hrs M₂T₂ (95.14%) which was on par with same variety seeds treated with 200 ppm GA₃ solution for 10 min M₂T₅ (94.22%). The least germination was recorded in Local selection seeds under control M₃T₁ (54.40%).

Growth parameters

Data present in Table 2 revealed that, significantly highest seedling height was observed in Konkani Bahadoli (29.12 cm) whereas, the minimum seedling height was noticed in Local selection (20.77 cm). Among the different seed treatments, the maximum seedling height was noticed in cow urine treated seeds for 12 hrs (28.87 cm) which was on par with normal water soaked seeds for 24 hrs (28.56 cm) whereas, the control recorded minimum seedling height (20.25 cm). The interaction effects resulted that, maximum seedling height was recorded in Konkani Bahadoli seeds soaked in normal water for 24 hrs M₁T₂ (35.56 cm) followed by AJG-85 seeds treated with cow urine for 12 hrs M₂T₄ (33.56 cm) whereas, the minimum seedling height was observed in untreated seeds (control) of Local selection M₃T₁ (18.08 cm).

Among three varieties, Significantly the maximum seedling

diameter was recorded in AJG-85 (4.59 mm) whereas, Local selection seeds recorded the minimum seedling diameter (2.37 mm). Among the different seed treatments, significantly the maximum seedling diameter was observed in GA₃ solution at 200 ppm for 10 min (4.42 mm) followed by seeds soaked in normal water for 24 hrs (4.10 mm). Whereas, the minimum seedling diameter was observed in untreated seeds (2.79 mm). Among the interaction effects significantly maximum seedling diameter was observed in AJG-85 seeds treated with GA₃ solution at 200 ppm for 10 min M₂T₅ (5.75 mm). Whereas, the minimum seedling diameter was observed in untreated seeds of Local selection M₃T₁ (1.84 mm).

Among three varieties, the highest seedling vigour index was recorded in Konkani Bahadoli (2441.68) which was on par with AJG-85 (2389.20) whereas, minimum was noticed in Local selection (1376.61). Among the different seed treatments, the maximum seedling vigour index was observed in seeds soaked in normal water for 12 hrs (2444.39) which was on par with cow urine soaked seed for 12 hrs (2399.13) whereas, the least seedling vigour index was recorded in control (982.30). Among the different seed treatments, the maximum seedling vigour index was observed in seeds soaked in normal water for 12 hrs (2444.39) which was on par with seeds soaked in cow urine seed for 12 hrs (2399.13) whereas, the minimum seedling vigour index was recorded in the control (982.30). The maximum seedling vigour index was observed in Konkani Bahadoli seeds soaked in normal water for 24 hrs M₁T₂ (3109.80) which was on par with AJG-85 seeds treated with cow urine for 12 hrs (2917.20). Whereas, the least seedling vigour index was recorded in untreated Local selection (982.30).

Discussion

The minimum number of days taken for initiation, fifty percent and maximum germination might be due to bold seed size and high moisture content helps in early germination Joligker *et al.* (2017) [7] in guava and highest germination percentage is due to presence of higher polyembryonic nature of varieties Minja *et al.* (2017) [6] in mango along with water soaking, which helps softening of seed coat and the GA₃ treatment aids in the synthesis of enzymes like alpha-amylase during germination, which converts starch into simple sugars. These sugars provide the energy needed for many metabolic processes involved in seed germination process. (Hartmann and Kester, 1979). The findings were in accordance with Hota *et al.* (2011) [4], Anjanawe *et al.* (2013) [1] in papaya and Patil *et al.* (2018) in jamun. The minimum germination percentage due to small seed size and low moisture content.

The maximum seedling height due to vigorous growth of seeds coupled with water treatment helps the plants to utilise available resources efficiently, leading to increase in plant height. Cell division activity of GA₃ along with large and bold size of seed contributed the maximum diameter Patil *et al.* (2018) [8] in jamun. Highest seedling vigour index due to vigorous growth habit of variety along with water treatment. The finding results are in conformity with the results of Bavya *et al.* (2017) [2] in karonda and the minimum plant height, plant diameter and seedling vigour index due to slow growth habit of genotype.

Conclusion

AJG-85 proved to be the best variety for achieving the highest seed germination percentage, particularly when the seeds

were soaked in normal water for 24 hours and treated with a 200 ppm GA₃ solution for 10 minutes. On the other hand, Konkani Bahadoli seeds exhibited best seedling growth when the seeds were soaked in normal water for 24 hours.

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