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Effect of seed treatment on germination and growth of bullock's heart (*Annona reticulata* L.) seedling

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Abstract

Annona reticulata L. of the family Annonaceae (commonly known as Bullock's heart or Ramphal) is one of the world's most exquisite, but less studied fruit species in Maharashtra (India). Despite the importance of *A. reticulata*, the germination of its is poor, uneven and irregular and also seeds loose viability quickly because of this, it is necessary to improve the seed germination as well as seedling growth. Keeping this view the proposed experiment entitled, "Effect of seed treatment on germination and growth of bullock's heart (*Annona reticulata* L.) seedling" was carried at College of Horticulture, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli (Maharashtra) during the year 2022-23. The experiment was laid out in Randomized Block Design with fourteen treatments which were replicated two times. The experimental findings revealed that seeds treated with Cow dung slurry 50% for 24 hours (T₅) showed best performance for germination percentage (60.5%) and survival percentage (99.23%). Similar trend of findings was noted in case of, growth parameters viz., seedling height (48.68 cm), number of leaves (22.0) and leaf area (71.75 cm²) were recorded superior results in Cow dung slurry 50% for 24 hours (T₅).

Keywords: Bullock's heart, seed treatment, germination and growth parameters

Introduction

Bullock's heart (*Annona reticulata* L.) is one of the most important dryland crops which comes under the Annonaceae family. This group contains the largest primitive family of flowering plants (Kral, 1960) [9]. The family Annonaceae has 119 species and 40–50 genera, of which six are significant commercially. (Popenoe, 1974 and Geurts, 1981) [12, 5]. According to Darlington and Wylie (1956) [3], *Annona reticulata* is a diploid species of custard apple with chromosome number n=7, while 2n=14 has also been observed. It is seen growing gregariously and widely in hilly tracts, waste areas, and has entirely naturalized in several districts of Andhra Pradesh, Punjab, Rajasthan, Uttar Pradesh, Madhya Pradesh, Bihar, West Bengal, Assam, Gujarat, Maharashtra, Karnataka, Kerala, and Tamil Nadu.

The 100 g of bullock's heart fruit contains the following values such as total calories: 101 kcal, carbohydrates 25.2 g, fibre 2.4 g, fat 0.6 g, saturated fat 0.2 g, protein 1.7 g, vitamin A 33 IU, vitamin C 19.2 mg, thiamine 0.1 mg, riboflavin 0.1 mg, niacin 0.5 mg, vitamin B6 0.2 mg, pantothenic acid 0.1 mg, calcium 30 mg, iron 0.7 mg, magnesium 18 mg, phosphorous 21 mg, potassium 382 mg.

Seed germination is a complex physiological process which is largely influenced by the environmental factors such as water potential, temperature, humidity, light, nitrate, and other elements. In order to grow a plant from seed, it is crucial to have a complete understanding of seed viability, storage, sowing timing, germination parameters, and seedling care. The germination of bullock's heart is poor, uneven and irregular and also seeds loose viability quickly because of this, it is necessary to improve the seed germination as well as seedling growth. Therefore, to overcome this problem seed treatment is most important. Seed propagation is important specially in hybridization as well as for raising of rootstocks. Hence the study is necessary to increase germination percentage, uniformity and to reduce the germination period.

With reference to above context, the present investigation is carried out to see the effect of seed treatment on germination and growth of bullock's heart (*Annona reticulata* L.) seedling.

Materials and Methods

The experiment was performed at Nursery no. 10, College of Horticulture, Dapoli, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli-415 712, Dist. Ratnagiri, (M. S.).

The experiment was laid out in Randomized Block Design with fourteen treatments namely, T₁ (GA₃ 200 ppm for 12 hours), T₂ (GA₃ 200 ppm for 24 hours), T₃ (GA₃ 200 ppm for 36 hours), T₄ (Cow dung slurry 50% for 12 hours), T₅ (Cow dung slurry 50% for 24 hours), T₆ (Cow dung slurry 50% for 36 hours), T₇ (Cattle urine 5% for 12 hours), T₈ (Cattle urine 5% for 24 hours), T₉ (Cattle urine 5% for 36 hours), T₁₀ (Salt solution 5% for 12 hours), T₁₁ (Salt solution 5% for 24 hours), T₁₂ (Salt solution 5% for 36 hours), T₁₃ (water for 24 hours), T₁₄ (Control) which were replicated two times.

The seedlings were transplanted in polybags which were filled with potting mixture of Soil and FYM in 3:1 proportion. Total 10 seedlings from each treatment (5 seedlings per replication) were selected for the observation of morphological characters. The count of number of germinated seeds were taken daily upto 90 days and germination percentage was recorded. On the other hand, growth parameters *viz.*, seedling height and number of leaves were recorded at 60, 90, 120, 150 and 180 days after germination whereas, survival percentage and leaf area were recorded at 180 DAG.

Results and Discussion

The data relating to germination percentage in bullock's heart as influenced by the different seed treatments are given in Table 1. The data reported that there was significant variation in seed germination among all the treatments.

At 90 days after sowing, the highest germination percentage was recorded in treatment T₅ (60.50%) which was at par with T₄ (56.50%) and T₃ (55.00%) and significantly superior over the rest of the treatments whereas, treatment T₂ (27.00%) exhibited minimum germination percentage. The presence of a component (auxin) that promotes growth may be the cause for greater germination percentage in cow dung slurry treatment (Shinde and Malshe, 2015). These results were conformity with the results obtained by Mistry and Sitapara (2020) [10] in karonda, Prajapati *et al.* (2014) [13] in khirni, Jangala (2013) [7] in cashew nut, Fandohan *et al.* (2010) [4] in tamarind and Khandekar *et al.* (2006) in nutmeg.

The data on the effect of seed treatment on survival percentage in bullock's heart are given in Table 1. The results demonstrated that seedling survival percentage at 180 DAG was significantly impacted by the organic sources.

The highest survival percentage was noted in treatment T₅ (99.23%) which was at par with treatments T₄ (99.04%), T₃ (98.23%), T₁₁ (97.98%), T₁₃ (97.92%), T₁ (94.63%), T₁₄ (94.29%), T₈ (94.07%) and T₁₂ (93.48%) and significantly superior over the remaining treatments. However, the lowest survival percentage was observed in T₂ (86.09%). Thus, Treatment T₅ (cow dung slurry 50% for 24 hours) showed superior results over other treatments. Cow dung is known for better germination, seedling growth, vigour and suitable for

commercial use for seed soaking before sowing to improve germination and seedling health (Ambika and Balakrishnan, 2015) [1] and (Parmar *et al.*, 2016) [11]. These results are identical with findings obtained by Rajput and Sharma (2020) [14] in custard apple and Prajapati *et al.* (2014) [13] in khirni.

The data on effect of seed treatment on seedling height, number of leaves and leaf area in bullock's heart was recorded at 180 days after germination are given in Table 2.

At 180 days after germination, the highest seedling height was noted in T₅ (48.68 cm) which was at par with treatments T₄ (46.87 cm), T₁₃ (46.53 cm), T₃ (44.16 cm), T₁₁ (43.68 cm) and T₁₄ (42.33 cm) and significantly superior over the remaining treatments. However, the lowest seedling height was observed in T₂ (31.82 cm). The plant height might be affected by cow dung which induced the cell elongation process and quicker multiplication of cell after germination, ultimately increased the height of the plant (Rajput and Sharma, 2020) [14]. Presence of growth promoting substance (auxin) and nutrients in cow dung slurry may be responsible for rapid growth of seedling (Shinde and Malshe, 2015) [15]. Present findings are in accordance with the results obtained by Athani *et al.* (2010) [2] in guava, Prajapati *et al.* (2014) [13] in khirni and Thanuja *et al.* (2019) [16] in rakta chandan.

At 180 days after germination, different treatments significantly influenced the production of leaves. The maximum number of leaves were exhibited in treatment T₅ (22.0) which was at par with treatments T₄ (21.0), T₁₃ (20.5), T₃ (20.4) and T₁₁ (19.6) and significantly superior over the remaining treatments. The minimum number of leaves were recorded in T₂ (16.0). From the above context, results indicated that maximum number of leaves per seedling were observed in T₅ *i.e.*, cow dung slurry (50%) for 24 hours. The plant height might be affected by cow dung which induced the cell elongation process and quicker multiplication of cell after germination which increased the height of the plant ultimately it increased number of leaves (Rajput and Sharma, 2020) [14]. The results are in accordance with Athani *et al.* (2010) [2] in guava, Prajapati *et al.* (2014) [13] in Khirni, Shinde and Malshe (2015) [15] in Khirni and Thanuja *et al.* (2019) [16] in Rakta Chandan.

At 180 days after germination, the highest leaf area was recorded in treatment T₅ (71.75 cm²) which was significantly superior over the remaining treatments. However, the lowest leaf area was recorded in T₂ (37.35 cm²) which was significantly inferior over the remaining treatments. Thus, treatment T₅ (Cow dung slurry 50% for 24 hours) recorded superior results over the remaining treatments. The progressive effect of cow dung on leaf area observed because of early germination and faster growth of seedling (Hartmann and Kester, 1997) [6]. Similar results were also obtained by Khandekar *et al.* (2006) [8] in nutmeg.

Table 1: Effect of seed treatment on germination percentage and survival percentage in bullock's heart

Treatment No.	Treatment details	Germination percentage (%)	Survival percentage (%)
T ₁	Soaking of seeds in GA ₃ (200 ppm) for 12 hours	39.50 (38.93)	94.63 (76.59)
T ₂	Soaking of seeds in GA ₃ (200 ppm) for 24 hours	27.00 (31.30)	86.09 (68.10)
T ₃	Soaking of seeds in GA ₃ (200 ppm) for 36 hours	55.00 (47.86)	98.23 (82.35)
T ₄	Soaking of seeds in Cow dung slurry (50%) for 12 hours	56.50 (48.73)	99.04 (84.37)
T ₅	Soaking of seeds in Cow dung slurry (50%) for 24 hours	60.50 (51.06)	99.23 (84.96)
T ₆	Soaking of seeds in Cow dung slurry (50%) for 36 hours	37.50 (37.76)	90.93 (72.47)
T ₇	Soaking of seeds in Cattle urine (5%) for 12 hours	29.50 (32.89)	91.24 (72.78)
T ₈	Soaking of seeds in Cattle urine (5%) for 24 hours	34.00 (35.66)	94.07 (75.90)
T ₉	Soaking of seeds in Cattle urine (5%) for 36 hours	27.50 (31.62)	90.00 (71.56)
T ₁₀	Soaking of seeds in Salt solution (5%) for 12 hours	28.00 (31.94)	89.27 (70.88)
T ₁₁	Soaking of seeds in Salt solution (5%) for 24 hours	49.50 (44.71)	97.98 (81.82)
T ₁₂	Soaking of seeds in Salt solution (5%) for 36 hours	31.50 (34.14)	93.48 (75.21)
T ₁₃	Soaking of seeds in water for 24 hours	48.50 (44.14)	97.92 (81.70)
T ₁₄	Control (without treatment)	43.50 (41.26)	94.29 (76.16)
	Mean	40.57	94.03
	S.E m±	3.41	2.11
	CD at 5%	10.41	6.46
	Result	SIG	SIG

(Figures in the parentheses are arcsine transformed values)

Table 2: Effect of seed treatment on growth of Bullock's heart seedlings

Tr. No.	Treatment details	Seedling height (cm)	Number of leaves	Leaf area (cm ²)
		180 Days After Germination		
T ₁	Soaking of seeds in GA ₃ (200 ppm) for 12 hours	40.23	19.0	51.45
T ₂	Soaking of seeds in GA ₃ (200 ppm) for 24 hours	31.82	16.0	37.35
T ₃	Soaking of seeds in GA ₃ (200 ppm) for 36 hours	44.16	20.4	58.25
T ₄	Soaking of seeds in Cow dung slurry (50%) for 12 hours	46.87	21.0	63.30
T ₅	Soaking of seeds in Cow dung slurry (50%) for 24 hours	48.68	22.0	71.75
T ₆	Soaking of seeds in Cow dung slurry (50%) for 36 hours	40.20	18.7	50.30
T ₇	Soaking of seeds in Cattle urine (5%) for 12 hours	36.80	17.9	48.35
T ₈	Soaking of seeds in Cattle urine (5%) for 24 hours	37.82	18.5	49.90
T ₉	Soaking of seeds in Cattle urine (5%) for 36 hours	34.89	17.3	43.40
T ₁₀	Soaking of seeds in Salt solution (5%) for 12 hours	35.18	17.5	47.60
T ₁₁	Soaking of seeds in Salt solution (5%) for 24 hours	43.68	19.6	53.95
T ₁₂	Soaking of seeds in Salt solution (5%) for 36 hours	37.14	18.0	48.40
T ₁₃	Soaking of seeds in water for 24 hours	46.53	20.5	63.20
T ₁₄	Control (without treatment)	42.33	19.3	52.30
	Mean	40.45	18.97	52.82
	S.E m±	2.61	0.85	1.57
	CD at 5%	7.98	2.59	4.81
	Result	SIG	SIG	SIG

Conclusion

The overall study indicated superiority of treatments T₅, T₄, T₁₃, T₃ and T₁₁ over control (T₁₄) whereas treatments T₂, T₉, T₁₂ and T₇ were inferior to that of control. The overall results of experiment indicated that soaking of bullock's heart seeds in salt solution was not beneficial. Similarly, soaking of seeds in cattle urine 5% was also not beneficial. Soaking of bullock's heart seeds in cow dung slurry 50% for 24 hours and 12 hours and soaking of bullock's heart seeds in water for 24 hours was highly beneficial. The results obtained for GA₃ 200 ppm level were erratic. Considering the merit of cow dung slurry and water soaking these treatments need to be further investigated for longer extent, so as to confirm their merit.

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