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Effect of pre-germination treatments on germination of Aonla (*Emblica officinalis* Gaertn.) seeds

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ABSTRACT

The germination of aonla seeds is less and uneven owing to seed dormancy hence, an experiment on "Effect of pre-germination treatments on germination of aonla (*Emblica officinalis* Gaertn.)" seeds was carried out at Kittur Rani Channamma College of Horticulture, Arabhavi, Gokak, Karnataka during 2022. The study revealed significant influence of different pre-germination treatments on germination parameters. Seeds treated with GA_3 @ 500 ppm for 24 hours recorded minimum days taken for initiation of germination (8.07), days taken for 50 per cent germination (10.15), days taken for maximum germination (12.33) and highest germination percentage (80.73). Therefore use of pre-germination treatments was recommended as an approach to enhance the germination in aonla seeds.

Key words: *Aonla, Pre-germination treatments, GA_3 and germination.*

Introduction

Aonla or Indian gooseberry (*Emblica officinalis* Gaertn.) is one of the most important arid zone and wasteland fruit crop of commercial importance belonging to the family euphorbiaceae with chromosome number of 28. It is one of the most important minor fruit of Indian origin, which is predicted to be the 'Fruit of the 21stCentury' even though it is under cultivation since ancient times (Firminger, 1947). It is also called as 'Indian gooseberry', 'Amla', 'Nelli', 'Amlaki', 'Amali', 'Ambala' and 'Amalakamu' in different parts of India (Radha and Mathew, 2007). This species is indigenous to tropical South-Eastern Asia. In India, its cultivation is very common in states like Haryana, Himachal Pradesh, Maharashtra and some parts of Karnataka with an annual production of 1039 thousand tons spreaded over an area of 92 thousand hectares (Anon., 2018).

Medicinal value of aonla fruits is well established for its medicinal and therapeutic properties from the ancient time and considered as a wonder fruit for health conscious population in India. Fruits are highly nutritious and richest source of vitamin C (600mg/100g) among the fruits next to Barbados cherry, which helpful in curing vitamin C deficiency problems. It is one of the three ingredients of the famous ayurvedic preparation, Triphala, which is prescribed in many digestive disorders. A few ayurvedic preperations based on aonla are Chyavanaprasa and Amlaki Rasayam. Fruits have high antioxidant activity and have potential as natural antioxidant supplement in neutraceuticals and food processing industries (Radha and Mathew, 2007).

Aonla is a branched tree and ranges from 9-12 m in height. It is hardy tree, prolific bearer and highly remunerative even without much care. Fruits usually are with hard pulp and astringent and not fit for fresh consumption but extensively used for making

pickles and preserves. The astringency helps to preserve vitamin C in ripe fruit and dried aonla fruits retain ascorbic acid in a better way. Preserves (Murrabba), candy, herbal jam, toffee, jellies, aonla powder and dehydrated shreds, pickles, chutney and sauce are the value added products (Radha and Mathew, 2007).

Aonla can be successfully cultivated in marginal soil and various kinds of wasteland situations such as sodic and saline soil, ravines, dry and semi dry regions along with medicinal properties made this crop so valuable. We cannot reach out the demand for genuine planting material because freshly harvested seeds do not germinate even when exposed to favourable environmental conditions owing to seed dormancy such as hard and thick testa or due to incorrect storage or handling (Mousavi *et al*., 2011). Such seeds may require special treatments like stratification, scarification, soaking in water, growth regulators, chemicals *etc*. for overcoming dormancy. Hence, the investigation was carried out at Department of Fruit Science, Kittur Rani Channamma College of Horticulture, Arabhavi to study the effect of pre-germination treatments on germination of aonla (*Emblica officinalis* Gaertn.)" seeds.

Materials and Methods

Experimental details

The present investigation was carried out during the year 2022 at Kittur Rani Channamma College of Horticulture, Arabhavi in Belagavi district of Karnataka. Arabhavi is situated in northern dry tract of Karnataka state at 16º15´ North latitude and 94º45´ East longitude and at an altitude of 612.03 m above the mean sea level (MSL) which receives mean annual rainfall of 530 mm. The experiment was laid in completely randomized design with twelve treatments with three replications. Fully ripe and healthy aonla fruits were harvested from the orchard, then the fruits were sun dried for four weeks. After sun drying hard stones were cracked and split opened. From split opened fruits brown coloured small seeds were collected. Then collected seeds were immersed in beaker containing distilled water. The seeds which were settled at the bottom of the beaker were collected while the floating once were discarded. Required amount of seeds for experiment were subjected to different pre-germination treatments as showed in Fig. 1.

Treatment details

T_1: Control
T_2: Hot water treatment at 60°C for 30 seconds
T_3: GA_3 @ 250 ppm for 24 hours
T_4: GA_3 @ 500 ppm for 24 hours
T_5: Thiourea @ 1% for 24 hours
T_6: Thiourea @ 2% for 24 hours
T_7: KNO_3 @ 1% for 24 hours
T_8: KNO_3 @ 2% for 24 hours
T_9: Conc. H_2SO_4 (98%) for 30 seconds
T_{10}: Cowdung slurry for 24 hours
T_{11}: Cow urine @ 10% for 24 hours
T_{12}: Cow urine @ 20% for 24 hours

The germination parameters were worked out daily from date of sowing to till no further germination were recorded and then the days taken for initiation of germination, days taken for 50 per cent germination, days taken for maximum germination and germination percentage was worked out. Germination percentage was calculated based on the following formula.

$$\text{Germination percentage (\%)} = \frac{\text{Number of seeds germinated}}{\text{Number of seeds sown}} \times 100$$

Results and Discussion

Days taken for germination

Number of days taken for germination was significantly differed by different pre-germination treatments as depicted in Table 1. The minimum number of days taken for initiation of germination (8.07), 50 per cent germination (10.15) and maximum germination (12.33) were recorded in seeds treated with GA_3 @ 500 ppm for 24 hours (T_4) whereas, maximum number of days taken for initiation of germination (13.67), 50 per cent germination (17.33) and maximum germination (21.67) was recorded in control (T_1). The possible reason might be due to GA_3 acts directly on embryo relieving them from dormancy through promoting protein synthesis, elongation of coleoptiles and also helps in the production of ethylene (Stewart and Freebairn, 1969). This ethylene invokes the synthesis of hydrolases especially amylase which favours the hydrolysis of starch into soluble sugars and their translocation facilitates the early initiation of radical growth by removing some metabolic blocks as suggested by Gillard and Walton (1973). Therefore, the seeds treated with GA_3 @ 500

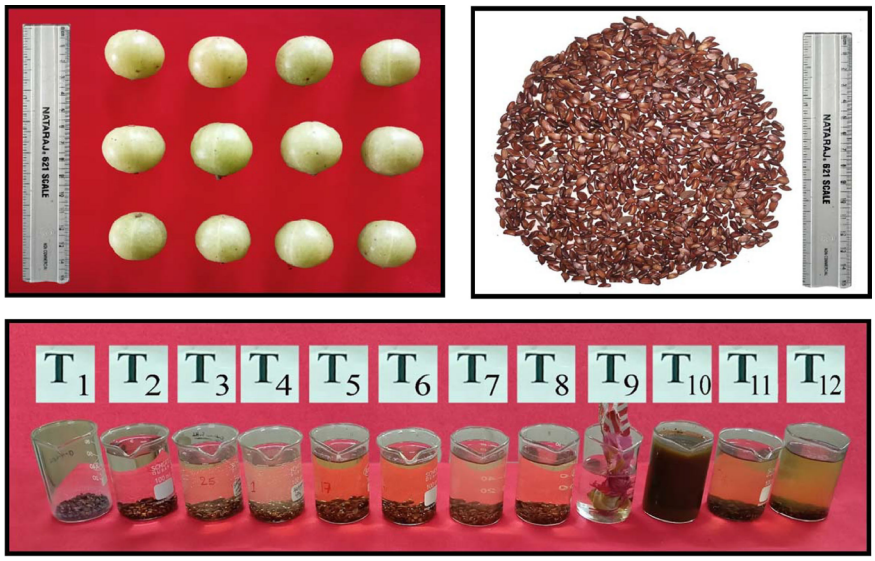

Fig. 1. Seeds collection and imposition of different pre-germination treatments

ppm for 24 hours completed germination within a shorter period as compared to control. The results obtained from this study was supported by Hota *et al*. (2018) in jamun, Barathkumar (2019) and Lalitha *et al*. (2020) in aonla and Yadav *et al*. (2022) in Jatti Khatti.

Germination percentage

The data related to germination percentage showed significant difference among the different pre-germination treatments as showed in Table 1. Significantly maximum germination percentage (80.73%) was recorded in seeds treated with GA_3 @ 500 ppm for 24 hours (T_4) followed by T_3, *i.e*. GA_3 @ 250 ppm for 24 hours (75.20%) and T_9, *i.e*. Conc. sulphuric acid for 30 seconds (71.83%) whereas, minimum germination percentage (39.83%) was recorded in control (T_1). Enhanced germination percentage by growth regulators like GA_3 is probably due to its effect to bring about a favourable internal condition by removing metabolic blocks in seeds leads to increase the imbibition of water. With the imbibed water, the embryo got activated and the process of germination is initiated. GA_3 triggers hydrolytic enzyme activities during germination (Dhankhar and Singh, 1996). This synthesized GA_3 helps in synthesis of

Table 1. Effect of different pre-germination treatments on germination parameters of aonla seeds

Treatments	Number of days taken for			Germination (%)
	Initiation of germination	50 % germination	Maximum germination	
T_1	13.67	17.33	21.67	39.83
T_2	12.33	15.33	18.67	48.77
T_3	9.33	11.67	14.00	75.20
T_4	8.07	10.15	12.33	80.73
T_5	10.33	12.67	15.33	66.03
T_6	9.67	12.33	14.33	70.10
T_7	10.67	13.33	15.67	65.10
T_8	10.00	12.67	15.00	67.47
T_9	9.67	12.00	14.33	71.83
T_{10}	11.00	14.00	16.33	55.40
T_{11}	11.67	14.67	16.67	50.43
T_{12}	10.67	14.33	16.00	52.83
S. Em±	0.40	0.47	0.50	1.10
CD @ 5 %	1.19	1.37	1.45	3.23

hydrolyzing enzymes particularly amylase and protease leads to hydrolysing of food materials which was utilized for the growth of embryo (Paleg, 1960). Also GA_3 enhanced seed germination by antagonizing the effect of inhibitors present in aonla seeds (Kumari *et al*., 2007). These findings were in agreement with Dilip *et al*. (2017) in Rangpur lime, Morestega *et al*. (2017) in passion fruit, Lalitha *et al*. (2020) in aonla and Yadav *et al*. (2022) in Jatti Khatti.

Conclusion

Germination of aonla seeds can be enhanced when seeds were treated with GA_3 @ 500 ppm for 24 hours and also recorded minimum days taken for initiation of germination, 50 per cent germination and maximum germination. The next best result was obtained when seeds were soaked in GA_3 @ 250 ppm for 24 hours.

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