Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2019; SP2: 131-133

TR Barathkumar
Assistant Professor, Department of Horticulture, Faculty of Agriculture, Annamalai University, Annamalai Nagar, Tamil Nadu, India

Correspondence
TR Barathkumar
Assistant Professor, Department of Horticulture, Faculty of Agriculture, Annamalai University, Annamalai Nagar, Tamil Nadu, India

Studies on influence of different seed treatments on dormancy breaking in aonla (*Phyllanthus embolic* L)

TR Barathkumar

Abstract
Investigations were undertaken in the Department of Horticulture, Faculty of Agriculture, Annamalai University, Annamalainagar, Tamil Nadu, India during 2015- 2017 to "Studies on effect of different seed treatments on dormancy breaking in Aonla (*Phyllanthus embolic* L)". The seeds were treated with T_1 - Tap water for 24 hrs, T_2 - Hot water 25^0C for 10 seconds, T_3 -Hot water 50^0C for 10 seconds, T_4 - GA_3 250 ppm for 24 hrs, T_5 – GA_3 500 ppm for 24 hrs, T_6 - KNO_3 1 per cent for 24 hrs, T_7 - KNO_3 2 per cent for 24 hrs, T_8 - H_2SO_4 0.25 per cent for 3 minutes, T_9 - H_2SO_4 0.50 per cent for 3 minutes, T_{10} - Stratification at 5^0C for 10 days, T_{11} - Stratification at 10^0C for 10 days and T_{12} -Control (untreated). There were twelve treatments replicated thrice in completely randomized block design. Among the different treatments, 2 per cent KNO_3 for 24 hours significantly increased the seed germination percentage, highest root length and highest dry matter content followed by GA_3 500 ppm for 24 hours as compare to other treatments. Shoot length, days taken for 50 per cent germination, days taken for graf table thickness and Vigor Index was highest in seed treatment with GA_3 500 ppm for 24 hours.

Keywords: Seed treatments, dormancy breaking, aonla

Introduction
Aonla (*Phyllanthus embolic* L.) belongs to the family Euphorbiceae is one of the important minor fruit crops of our country. In India, it is called by various names such as Aonla, Nelli, Amla, Amlika, Dhotri, Emblica and Usuri. Aonla is indigenous to tropical South-east Asia, particularly central and southern India it is under cultivation since ancient times (Firminger, 1947).

The fruit is highly nutritious and is the richest source of vitamin C (400-1300 mg/100g) among the fruits next only to Barbados cherry. It is also the richest source of pectin which is mostly useful in making jam and jellies. Aonla is known for its medicinal and therapeutic properties from the ancient time in India and considered as a wonder fruit for health conscious population (Chopra *et al*, 1958; Khanna and Bansal, 1974). It is one of the three ingredients of the famous Ayurvedic preparation, Triphala, which is prescribed in many digestive disorders (Chopra *et al.* 1958). Aonla fruits are astringent, cooling anodine, carminative, digestive, stomechic, laxatic, altrant, aphordisac, diuretic antipyretic, and trichogenous (Nadkarni and Nadkarni, 1999; Treadway, 1994). Aonla fruit is acidic, acrid, cooling, diuretic and laxative (Gopalan and Mohanram, 1996). Aonla is a rare example of an edible material, which is rich in tannins as well as ascorbic acid (Kalra, 1988). It is also used in making pickles, candy, jelly, jam and preserves (Karla, 1988) shampoo, oil and dye (Singh *et al.*, 1993). Beside fruits, leaves, bark and even seeds are being used for various purposes.

Under natural habitat, it is found in dry deciduous forests of India. In India, Aonla is cultivated with an Area of 88000 Ha and Production of 972000 MT during the year 2015 – 2016. Its cultivation is very common in the eastern districts of Uttar Pradesh particularly Pratapgarh and Varanasi. It is also grown in states like Haryana, Himachal Pradesh, Maharashtra and some parts of Karnataka.

Aonla is propagated by both sexual (seed) and asexual (vegetative) methods. But the aonla plants raised through seed do not come true-to-type and there is a high variability. According to Bajpai (1969), aonla is presently grown in forests from self-sown seeds or by sowing seeds of unknown parentage. Hence, they exhibit wide range of heterozygosity with respect to growth, yielding capacity, quantity, quality, size and shape of fruits etc. Freshly harvested seeds of aonla do not germinate even if exposed to favourable conditions of germination owing to seed dormancy (Srimathi *et al*., 2000) [15]. Dormancy may be because of internal (physiological) factors affecting embryo or morphological factor such as hard, thick testa, or due to incorrect storage or handling (secondary dormancy). Such seeds may require special treatments like stratification, scarification, soaking in water, growth regulators etc.

for overcoming dormancy. Hence, the present investigation was undertaken to find out the suitable seed treatment for dormancy breaking in Aonla (*Phyllanthus embolic* L).

Materials and methods

The experiment was carried out in the Department of Horticulture, Faculty of Agriculture, Annamalai University, Annamalainagar, Tamil Nadu, India during 2015- 2017.To carry out the study, required seed material was collected from the Forest Department, Government of Tamil Nadu, Bannari, Sathyamangalam Taluk, Erode District. The seeds were treated with T_1 - Tap water for 24 hrs, T_2 - Hot water 25^0C for 10 seconds, T_3 -Hot water 50^0C for 10 seconds, T_4 - GA_3 250 ppm for 24 hrs, T_5 – GA $_3$ 500 ppm for 24 hrs, T_6 - KNO_3 1 per cent for 24 hrs, T_7 - KNO_3 2 per cent for 24 hrs, T_8 - H_2SO_4 0.25 per cent for 3 minutes, T_9 - H_2SO_4 0.50 per cent for 3 minutes, T_{10} - Stratification at 5^0C for 10 days, T_{11} - Stratification at 10^0C for 10 days and T_{12} -Control (untreated). There were twelve treatments replicated thrice in completely randomized block design. The observations *viz.,* Germination percentage(%), Days taken for 50 percent germination (Days), Shoot length (cm), Root length (cm), Dry matter production (g), Vigour index were recorded and subjected for statistical analysis (Panse and Sukhatme, 1967) [10].

Results and discussion

The data recorded on different seed characters showed significant difference among the different treatments (Table.1) Freshly harvested seeds of aonla do not germinate even if exposed to favourable conditions of germination owing to seed dormancy (Srimathi *et al.,* 2000) [15]. Dormancy may be because of internal (physiological) factors affecting embryo or morphological factor such as hard, thick testa, or due to incorrect storage or handling (secondary dormancy). Such seeds may require special treatments like stratification, scarification, soaking in water, growth regulators etc. for overcoming dormancy.

Among the various seed treatments elucidated in the present study the seed highest germination was reported with KNO_3 (2 per cent). The increase in germination percentage of seeds was also emphasized by the evidence quoted by Srimathi (2000) [15] in aonla, jamun and ber. Similarly potassium nitrate soaked seeds enhanced the germination percentage of various trees species such as *Peltophorum ferrugenium* (Mukhopadhyay *et al*., 1990) [8], *Albizia lebbeck* (Roy, 1992) [13] and *Acacia nilotica* (Palani *et al*., 1995) [9]. The possible reason for this phenomenon might be due to an increased activity of nicotiamide adenine dinucleotide phosphate reduced ($NADPH_2$) by K^+ ion (Srimathi, 2000 and Rajamanickam *et al.,* 2002) [15, 11].

The root length has to be considered as one of the important criteria for assessing the suitability of the seedlings to be used as root stocks. It was evident from the present investigation potassium nitrate treated seeds recorded the highest root length. This may be due to an increase in oxidation of nicotiamide adenine dinucleotide phosphate (Hendricks and Taylorson, 1975) and an increase in oxidation of NADPH (Rajamanickam *et al.,* 2002) [11].

The KNO_3 exhibited significantly increased in dry matter production. The increase in root length, shoot length and number of leaves have lead to the overall assimilation and redistribution of photosynthates within the plant and resulted in higher fresh and dry weight of seedling and increased dry matter accumulation (Choudhary and Chakrawar, 1982) [2]. In similar way, Gholap *et al.* (2000) [3] observed better seedling growth with GA3 200 ppm in aonla.

The treatment with gibberellic acid 500 ppm for 24 hours of soaking proved to be the best alternative to Potassium nitrate treatment for germination percentages, root length and dry matter production. The exogenous application of GA antagonizes the ill effect of inhibitors (Brain and Hemming, 1955) [1] and increases endogenous gibberellins like substances (Mathur *et al*., 1971) [7]. GA helps in the synthesis of enzymes and one of them is a-amylase which converts the starch into simple sugars during the process of germination. These sugars provide energy that is required for various metabolic and physiological processes associated with germination. Other enzymes activated by GA include those which weaken the seed coat and allow the axis to burst through. GA also enhances cell elongation, so the radicle can push through the endosperm and seed coat that restrict its growth (Hartman and Kester, 1979) [4].

The maximum shoot length in GA_3 treated seeds may be attributed to the cell multiplication and elongation in the cambium tissue of the internodal region, because GA3 apparently activates the metabolic processes or nullifies the effect of growth inhibitors (Singh *et al*. 1989) [14].

The highest seedling vigour index shown by GA_3 treatment might be due to increase in germination percentage and seedling height which have contributed to higher Vigour index. Similar reports of maximum seedling Vigour index by GA3 treatment were also reported by Biradar *et al.* (2005) in guava.

Application of GA_3 produced highest thickness of grafts among the different treatments. The possible reason for this phenomenon may be due to the fact that the exogenous application of GA antagonizes the ill effect of inhibitors (Brain and Hemming, 1955) [1] and increases endogenous gibberellin like substances (Mathur *et al*., 1971) [7] and also It might be due to the secretion of growth promoters (Srinivas, 1987) [16] which might have enhanced uptake of nitrogen (Manjunath *et al*., 1984) and stimulated the growth and biomass (Huang *et al.,* 1985; Swaminath and Vadiraj, 1988) [6, 17] there by increased the survival rate of planted grafts.

Summary

Seed treatment with 2 per cent KNO_3 for 24 hours significantly increased the seed germination percentage, highest root length and highest dry matter content as compare to the treatments. The possible reason for this phenomenon might be due to an increased activity of nicotiamide adenine dinucleotide phosphate – reduced ($NADPH_2$) by K^+ ion. The treatment with Gibberellic acid 500 ppm for 24 hours of soaking proved to be the best alternative to Potassium nitrate treatment for germination percentages, root length and dry matter production and also had registered highest values for shoot length, days taken for 50 per cent germination, days taken for graftable thickness and Vigor Index. The reason might be that the exogenous application of GA antagonizes the ill effect of inhibitors and increases endogenous gibberellins like substances. GA helps in the synthesis of enzymes and one of them is a-amylase which converts the starch into simple sugars during the process of germination. These sugars provide energy that is required for various metabolic and physiological processes associated with germination. Other enzymes activated by GA include those which weaken the seed coat and allow the axis to burst through. GA also enhances cell elongation, so the radicle can

push through the endosperm and seed coat that restrict its growth.

Thus it is evident that seeds treated with GA_3 500 ppm for 24 hours are suitable for the breaking of seed dormancy and maximizing the growth and development of seedlings in aonla.

Table 1: Influence of Different Seed Treatments on Dormancy Breaking In Aonla (*Phyllanthus Emblica* L)

Tr.no	Treatment	Germination percentage (%)	Days taken for 50 percent germination (Days)	Shoot length (cm)	Root length (cm)	Dry matter production (g)	Vigour index
T_1	Tap water for 24 hrs	54.64 (47.66)	13.96	27.82	6.39	0.101	1520
T_2	Hot water 25^0C for 10 seconds	57.41 (49.26)	12.95	29.04	7.12	0.119	1667
T_3	Hot water 50^0C for 10 seconds	67.87 (55.47)	11.94	30.27	7.86	0.147	2054
T_4	GA_3 250 ppm for 24 hrs	72.35 (58.28)	9.49	33.07	9.01	0.192	2441
T_5	GA_3 500 ppm for 24 hrs	85.74 (67.81)	7.51	35.62	10.18	0.219	3116
T_6	KNO_3 1 per cent for 24 hrs	73.80 (59.21)	10.21	32.12	9.45	0.201	2324
T_7	KNO_3 2 per cent for 24 hrs	87.49 (69.29)	8.50	34.30	11.00	0.235	2941
T_8	H_2SO_4 0.25 per cent for 3 minutes	69.32 (56.31)	11.68	30.61	7.99	0.159	2122
T_9	H_2SO_4 0.50 per cent for 3 minutes	70.93 (57.37)	10.69	31.83	8.72	0.180	2258
T_{10}	Stratification at 5^0C for 10 days	53.19 (46.83)	14.06	27.37	6.25	0.091	1456
T_{11}	Stratification at 10^0C for 10 days	46.28 (42.87)	15.09	26.14	5.51	0.072	1210
T_{12}	Control (untreated)	38.69 (38.46)	16.10	24.91	4.78	0.056	964
	S. Ed.	0.74	0.48	0.59	0.36	0.007	59.74
	CD(P= 0.05)	1.46	0.98	1.21	0.72	0.015	120.32

References

1. Brain PW, Homming HG. The effect of GA on shoot growth of pea seedling. Physiol. 1955; 8:669- 681.
2. Choudhary BK, Chakrawar VR. Note on the effect of some chemicals on the germination of Renapur lime seeds. Indian J Agric. Sci. 1982; 51(3):201-203.
3. Gholap SV, Dod VN, Bhuyar SA, Bharad SG. Effect of plant growth regulators on seed germination and seedling growth in aonla (*Phyllanthus embolic* L.) under climatic condition of Akola. Crop Research. 2000; 20(3):546-548.
4. Hartmann HT, Kester DE. Plant Propagation Principles and Practices. Fourth Edition, Prentice Hall of India, Ltd., 1979, 407.
5. Hendricks SB, Kester DE. Plant propagation: principle and practices inhibition. Proceedings of the national academy of science (USA). 1989; 72:306-309.
6. Huang RS, Smith WK, Yost RS. Influence of VAM on growth, water relations and leaf orientation in subabul. New phytol. 1985; 97:209-213.
7. Mathur DD, Couvillon GA, Vines HM, Hendershott CH. Stratification effects of endogenous Gibberellic acid (GA_3) in peach seeds. Hort Science. 1971; 6:538-539.
8. Mukhopadhyay TP, Bhattacharjee SK, Biswas B. Effect of GA_3 and other chemicals on germination and viability of *Peltophorum ferrugenium* seeds. My Forest. 1990; 26(2):148-153.
9. Palani M, Dasthagir MG, Kumaran K. Effect of pre-soaking chemical treatment on germination and seedling growth in *Acacia nilotica*. I. Crop. J. 1995; 8:189- 192.
10. Panse VG, Sukhatme PV. Statistical Methods for Agricultural Workers, ICAR, New Delhi, 1967, 381.
11. Rajamanickam C, Anbu S, Balakrishna K. Effect of chemicals and growth regulators on seed germination in Aonla (*Emblica officinalis* G.). South Indian Hort. 2002; 50(1-3):211-14.
12. Roberts FH. Predicting the storage life of seeds. Seed Sci. & Technol. 1973; 1:499-554.
13. Roy MM. Effect of seed pretreatment with potassium nitrate on germination of *Albizia lebbek* (L) Benth. Indian J For. 1992; 15(40):356-357.
14. Sing M, Singh GN, Singh LN, Singh BN. Effect of Gibberellic acid on seed germination in Mosambi (*Citrus sinensis*). Haryana J Hort. Sci. 1989; 18:29-33.
15. Srimathi P. Research focus on seed collection, processing and storage of aonla, jamun and ber. Ph.D. thesis, TNAU, Coimbatore, 2000.
16. Srinivas K. Studies on the occurrence of VAM fungi and their interaction with some forest tree species. M.Sc. (Ag), thesis, TNAU, Coimbatore, 1987.
17. Swaminath MK, Vadiraj BA. Nursery studies on the influence of Azospirillum bio fertilizer on the growth and dry matter of forestry species. My Forest. 1988; 24(4):289-294.