www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.03
TPI 2021; 10(1): 705-708

www.thepharmajournal.com
Received: 07-11-2020
Accepted: 09-12-2020

Kharvendra Sharma
Mahatma Gandhi Chitrakoot Gramodaya Vishwa Vidyalaya, Madhya Pradesh, India

SK Singh
Mahatma Gandhi Chitrakoot Gramodaya Vishwa Vidyalaya, Madhya Pradesh, India

Shubham Mangal
Mahatma Gandhi Chitrakoot Gramodaya Vishwa Vidyalaya, Madhya Pradesh, India

Kumudani Sahu
Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Corresponding Author:
Kharvendra Sharma
Mahatma Gandhi Chitrakoot Gramodaya Vishwa Vidyalaya, Madhya Pradesh, India

Effect of different treatments on breaking seed dormancy in aonla (*Phyllanthus emblica* L.)

Kharvendra Sharma, SK Singh, Shubham Mangal and Kumudani Sahu

Abstract
An experiment was conducted during 2014 in the Orchard, KVK, Majhgawan, Satna, (MP) to assess the effect of different treatments on breaking seed dormancy in anola. The maximum (80.39%) germination recorded in acid scarification for 30 seconds was significantly superior to other treatments and the least was recorded in (32.33%) control. The seeds subjected to acid scarification for 30 seconds recorded minimum number of days (12.27) for 50 per cent germination but seedling length (15.23 cm) and root length (7.68 cm) was higher in seeds treated with GA3 500 ppm for 24 hours. The seedlings from the acid scarified seeds for 30 seconds registered maximum vigour index of 1223.

Keywords: seed, germination, scarification, vigour index

Introduction
Aonla (*Phyllanthus emblica* 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. In the recent past growing of superior varieties of aonla is highly remunerative. Itis indigenous to tropical South-east Asia, particularly central and southern India it is under cultivation since ancient times (Firminger, 1947) [8]. Under natural habitat, it is found in dry deciduous forests of India. In India, 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. The fruit is highly nutritious and is the richest source of vitamin C (400-1300 mg/100 g) 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. Medicinally, it acts as coolant, refrigerant, diuretic and laxative. It is the basic constituent of Chyavanaprash and Amrit Kalash, the Ayurvedic medicinal preparations. It is also used in tannin and dyeing industries. Aonla fruit has high traditional and medicinal values (Diwan *et al.*, 2018) [7]. According to Bajpai (1969) [3], 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) [20]. 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 etc. for overcoming dormancy. Soaking of litchi seed in water improves seed germination (Lal *et al*., 2020) [15]. Plant growth regulators not only break seed dormancy but also improve flowering, fruiting and quality (Lal *et al.*, 2013; Tameshwar *et al*., 2017; Lal and Das, 2017) [14, 21, 13]. Hence, the present investigation was undertaken to assess the effect of different treatments to break the seed dormancy.

Materials and Methods
An experiment was conducted during 2014 in the Orchard, KVK, Majhgawan, Satna, (MP) to assess the effect of different treatments on breaking seed dormancy in anola. Experiment was comprised with eight treatments and three replication designed in Completely Randomized Design.

Treatment details
a. Water soaking: The aonla seeds were soaked in tap water for 24 hours under ambient temperature.

b. Soaking seeds in cow urine: The fresh urine from cow was collected from the dairy and the seeds were soaked in it for 24 hours.

c. Soaking of seeds in thiourea (2%): Thiourea of 2 g was initially dissolved in a little quantity of distilled water and then the volume was made upto 100 ml. Seeds of aonla were then soaked in the 2 per cent thiourea solution for 24 hours.

d. Soaking seeds in GA3 solutions: 500 ppm of gibberellic acid was prepared by dissolving 50 mg of GA3 in little quantity of ethyl alcohol.
Then the volume was made upto 100 ml with distilled water to get 500 ppm solution. Seeds of aonla were soaked in such solution for 12 hours and 24 hours as per the treatments.

e. Stratification: Seeds of aonla were soaked in distilled water and the seeds that settled at the bottom were taken and others were discarded.
These seeds were kept in between two layers of germination paper and then it was rolled. These papers were kept on moist sand filled tray under refrigerated condition (5°C) for 10 days.

f. Acid scarification: The seeds were treated with concentrated sulphuric acid for 30 seconds. Then the seeds were taken out and thoroughly washed with running tap water followed by shade drying for two hours. Then they were used for germination.

g. Control: Seeds were sown without any pre-treatment.

Seed germination (%)
Germination test was conducted in three replications of 100 seeds each by adopting rolled towel method as described in ISTA Rules (Anon., 1999) [2]. The temperature of 25°C±1°C and relative humidity of 95 per cent was maintained during the germination test. The germination counts were made on the 20th days after sowing and germination was expressed in percentage.

Number of days taken for 50 per cent germination
The number of days taken from sowing to the time when 50 per cent of the seeds germinated was marked and noted.

Shoot length
From the germination test, 10 normal seedlings in each replication were sampled at random on the 20th day for measuring shoot length. The shoot length was measured from the collar region to tip of the shoot and mean shoot length was expressed in centimeter.

Root length (cm)
Ten normal seedlings that were adopted for recording shoot length were also used to measure root length. Root length was measured from the collar region to the tip of the longest root in centimeter.

Vigour index
The vigour index was calculated by adopting the method suggested by ISTA (Anon., 1985) [1] as detailed below.

Vigour index = Germination percentage x Mean length of seedlings (cm)

Results and Discussion

Days taken for 50 per cent germination
The number of days taken for 50 per cent germination as influenced by different seed treatments varied significantly among the treatments (Table 1). The seeds subjected to acid scarification for 30 seconds recorded minimum number of days (12.27) for 50 per cent germination followed by seeds treated with 500 ppm of GA3 for 24 hours recording 12.69 days and GA3 500 ppm for 12 hours recording 13.36 days. The seeds with stratification treatment at 5 °C for 10 days were the last to attain 50 per cent germination.

Seed germination
There was significant difference in per cent germination due to different treatments used to break dormancy (Table 1). The maximum (80.39%) germination recorded in acid scarification for 30 seconds was significantly superior to other treatments and the least was recorded in (32.33%) control.

Seedling length
The seedling length differed significantly due to different dormancy breaking treatments (Table 2). The seedling length was higher in seeds treated with GA3 500 ppm for 24 hours (15.23 cm) followed by acid scarification for 30 seconds (15.22 cm). However, these were statistically at par. The lower seedling length was observed in seeds treated with stratification at 5 °C for 10 days (9.60 cm).

Root length
The data on root length as influenced by different dormancy breaking seed treatments are presented in Table 2. The highest root length (7.68 cm) was recorded in GA3 500 ppm for 24 hours followed by GA3 500 ppm for 12 hours (7.13 cm). However, they were at par with each other. The least (5.23 cm) root length was observed in both untreated and stratified seeds of aonla.

Vigour index
The data presented on vigour index in Table 2, revealed a similar pattern as that of per cent germination. The seedlings from the acid scarified seeds for 30 seconds registered maximum vigour index of 1223. This was followed by seeds treated with GA3 500 ppm for 24 hours (1035). The lowest seedling vigour (326) was observed in seeds stratified at 5°C for 10 days.
Acid scarification brings about the softening of hard seed coat by dissolution of deposited lipids, pectic substances and high density waxes, which are responsible for hard seededness (Denny, 1917) [5] and make it permeable to water. These observations are in line with the findings of Singhrot and Makhija (1979) [19] in ber, Todaria and Negi (1992) [22] in *Cassia javanica*. Similar results of increased germination per cent (72%) of *Cassia fistula* seeds soaked in concentrated sulphuric acid for 9 minutes as compared to control (4.00%) was observed by Randhawa *et al.*, (1986) [17]. Stratification and priming of seed have been reported to be beneficial for germination and seedling growth in *Diospyros lotus* which is used as rootstock for most of the *Diospyros* species worldwide. Soaking seeds for about 12 hours in cold water improves germination (Kumar *et al.*, 2016) [12].
The treatment with gibberellic acid at 500 ppm for 24 hours of soaking proved to be the second best alternative to acid scarification treatment. The exogenous application of GA antagonizes the ill effect of inhibitors (Brain and Homming,

1955) [4] and increases endogenous gibberellin like substances (Mathur *et al*., 1971) [16]. GA helps in the synthesis of enzymes and one of them is α-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) [10]. In similar way, Gholap *et al*. (2000) [9] observed better germination and seedling growth with GA3 200 ppm in aonla and in custard apple (Jain *et al.*, 2017) [11]. Similar results were also obtained by Dhankhar and Singh (1996) [6] in aonla and Shanmugavelu (1970) [18] in some of leguminous plant species.

It can be concluded that acid scarification for 30 second significantly improved seed germination and broken seed dormancy in aonla.

Table 1: Effect of different seed treatments on days taken for 50 per cent germination and per cent germination in aonla

Tr. No.	Treatments	Per cent Germination	Days taken for 50 % germination
T_1	Water soaking for 24 hours	55.20 (48.01)	15.22
T_2	Soaking seeds in cow urine for 24 Hours	60.34 (50.99)	14.76
T_3	Soaking seeds in thiourea (2%) for 24 Hours	67.47 (55.26)	14.35
T_4	Gibberellic acid 500 ppm for 12 hours	68.00 (55.58)	13.36
T_5	Gibberellic acid 500 ppm for 24 hours	72.46 (58.38)	12.69
T_6	Stratification at 5°C for 10 days	34.01 (35.69)	16.70
T_7	Acid scarification for 30 seconds	80.39 (63.75)	12.27
T_8	Control	32.33 (34.67)	16.68
	S.Em±	0.19	0.37
	CD at 1%	1.54	0.78

Values in the parenthesis indicate arcsine transformed value

Table 2: Effect of different seed treatments on root length, seedling length and vigour index in aonla

Tr. No.	Treatments	Root length (cm)	Seedling length (cm)	Vigour index
T_1	Water soaking for 24 hours	6.89	13.77	760
T_2	Soaking seeds in cow urine for 24 Hours	6.83	11.27	679
T_3	Soaking seeds in thiourea (2%) for24 hours	6.77	11.01	743
T_4	Gibberellic acid 500 ppm for 12 Hours	7.13	13.56	982
T_5	Gibberellic acid 500 ppm for 24 Hours	7.68	15.23	1035
T_6	Stratification at 5°C for 10 days	5.23	9.60	326
T_7	Acid scarification for 30 seconds	7.07	15.22	1223
T_8	Control	5.23	12.94	418
	S. Em±	0.20	0.32	19.11
	CD at 1%	0.81	1.33	78.95

References

1. Anonymous. International Rules for Seed Testing, Seed Science and Technology 1985;13(2):299-355.
2. Anonymous. Summary of Research Report – Biennial Workshop. All India Co-ordinated Cashew Improvement Project held at Tamil Nadu Agricultural University, Coimbatore, 4-6th October 1999, 1-157.
3. Bajpai PN. Studies on flowering and fruit development in aonla (*Emblica officinalis* Gaertn). Horticulture Advances 1969;**7**(2):38-67.
4. Brain PW, Homming HG. The effect of GA on shoot growth of pea seedling. Physiol 1955;8:669- 681.
5. Denny EE. Permetability of membranes as related to their composition. Botanical Gazettee 1917;63:468-485.
6. Dhankhar GS, Singh M. Seed germination and seedling growth in aonla (*Phyllanthus emblica* L.) as influenced by GA3 and Thiourea. Crop Research 1996;12(3):363-366.
7. Diwan G, Sinha K, Lal N, Rangare NR. Tradition and medicinal value of Indian gooseberry: A review. Journal of Pharmacognosy and Phytochemistry 2018;7(1):2326-2333.
8. Firminger TA. Firminger's manual of gardening for India, Thacker Spink Co. Ltd., Calcutta 1947.
9. Gholap SV, Dod VN, Bhuyar SA, Bharad SG. Effect of plant growth regulators on seed germination and seedling growth in aonla (*Phyllanthus emblica* L.) under climatic condition of Akola. Crop Research 2000;20(3):546-548.
10. Hartmann HT, Kester DE. Plant Propagation Principles and Practices. Fourth Edition, Prentice Hall of India, Ltd. 1979, 407.
11. Jain S, Sharma TR, Lal N, Rangare NR, Kumar B. Effect of GA_3 and growing media on seed germination and growth of custard apple (*Annonas quamosa* L.). International Journal of Chemical Studies 2017;5(4):699-707.
12. Kumar S, Lal N, Nath V. Tendu (*Diospyros melanoxylon* (roxb)) in Underutilized Fruit Crops: Importance and Cultivation. Edited by Dr SN Ghosh et al**.** 2016, 1327-1338.
13. Lal N**,** Das RP. Effect of plant growth regulators on yield and quality of guava (*Psidium guajava* L.) cv. Allahabad Safeda. International Journal of Current Microbiology & Applied Science 2017;6(5):857-863.
14. Lal N, Das, RP, Verma, LR. Effect of plant growth regulators on flowering and fruit growth of guava (*Psidium guajava* L) cv. Allahabad Safeda. Asian Journal of Horticulture 2013;8(1):54-56.
15. Lal N, Marboh ES, Gupta AK, Kumar A, Nath V. Effect of soaking and placement of seed on germination and seedling emergence in litchi. Journal of Plant Development Sciences 2020;12(5):317-320.
16. Mathur DD, Couvillon GA, Vines HM, Hendershott CH. Stratification effects of endogenous gibberellic acid

(GA3) in peach seeds. Hort Science 1971;6:538-539.
17. Randhawa HS, Sharma LK, Jagmeet, Rathan GS. The acceleration of germination of cassia fistula fungi associated with rotting seeds and abnormal seedlings. Indian Journal of Forestry 1986;112(6):524-527.
18. Shanmugavelu KG. Effect of GA3 on seed germination and development of seedlings of some plant species. Madras Agriculture Journal 1970;57: 311-314.
19. Singhrot RS, Makhija M. Vegetative propagation of ber (*Z. mauritiana* Lam.) III. Effect of time of sowing and acid treatment on ber seed germination and seedling performance. Haryana Journal of Horticultural Sciences 1979;8(3-4):164-172.
20. Srimathi P. Research focus on seed collection, processing and storage of aonla, jamun and ber. Ph.D. thesis, TNAU, Coimbatore, TN 2000.
21. Tameshwar, Prasad VM, Lal N. Effect of plant growth regulators on gladiolus cv. Jester. Trends in Biosciences 2017;10(20):3982-3985.
22. Todaria NP, Negi AK. Pre-treatment of some Indian cassia seeds to improve their germination. Seed Science and Technology 1992;20:538-588.