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Short communication

Dormancy and seed germination in *Solanum nigrum* Linn: A wild medicinal plant

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Solanum nigrum L. commonly known as black nightshade is a wild medicinal plant. In general, wild species are sources of desirable genes in any crop improvement programme. However, the precise use of such species in future breeding cannot be determined until they are collected, grown and their compatibility with cultivated strains assessed. The demand for this leafy vegetable was increased from 2077.9 (2001-02) to 2192.2 tonnes (2004-05), indicating the commercial value and the farmers are moving into its production. Recognizing the importance as a leafy vegetable plant in urban and rural areas in addition to ethnic and medicinal value, conservation of the species needs attention. Most of the relevant germplasm is undoubtedly being conserved by the users in *in-situ*, especially where the plants are used for culinary purpose. However, there is a need to conserve the seeds of this species in Seed Gene Bank (SGB). Under National Agricultural Technology Project (NATP-PB), *Solanum nigrum* genotypes were collected from different geographical regions for conservation in National Genebank, NBPGR, New Delhi. While testing the viability of seeds for long term conservation it was observed that seeds of some species exhibited dormancy/ hardiness ranging from 92-98%. The variation in hardiness of seed is possibly due to different environmental conditions of their place of origin, degree of maturation, time of collection and length of storage period. Induction of germination after breaking long term dormancy is required for rapid multiplication of this hardy vegetable crop. Therefore, an experiment was carried out to standardize the best treatment to overcome the dormancy and to attain high germination. The overall results of various treatments on the seeds collected from different sources are presented in this paper.

Seeds of various genotypes of the tested crop were collected from seven different locations viz., Rajasthan, Andhra Pradesh, Andaman & Nicobar Island, Punjab, Tamil Nadu, Kerala, and Orissa in India under National Agricultural Technology Project. A total of five physico-chemical treatments were imposed to break the dormancy/ hardseededness. The treatments viz., i) Pre-Chilling at 10°C for 7 days, ii) Pre-Chilling at 10°C for 7 days followed by soaking in 0.2% KNO_3 for 48h, iii) Pre-Chilling at 10°C for 7 days followed by soaking in GA_3 500 ppm for 48h, iv) treatment with GA_3 500 ppm, and v) treatment with 0.2% KNO_3 at the time of planting were given. Before subjecting to various treatments seeds were surface sterilized using 2.5% sodium hypochlorite with several rinses of distilled water. The germination test was conducted in 9 cm Petri dishes containing two layer of Whatman No 1 filter paper. The Plates were maintained at temperature of 30 ± 1°C in a seed germinator along with the untreated seed used as control. The seeds were observed regularly after seven days for germination and continued till the seedling developed all essential structures such as shoot and root. Final observation carried out on 28th day to record normal, abnormal, hard and dead seeds as per the International Rules for Seed Testing (ISTA 1999).

The data generated from the laboratory experiments were analyzed statistically by adopting CRD as described by Panse and Sukhatme (1985). The data on germination percentage were transformed to the respective angular (arc sine) values before subjecting them to statistical analysis using MSTAT software.

Solanum nigrum genotypes tested for seed viability under ambient conditions showed very low germination ranging from 2-6% and rest of the seeds remained fresh hard or dormant even after 30 days of planting. It is clear that there is dormancy in the tested genotypes. Salisbury *et al.* (1961) reported that the buried seeds of *Solanum nigrum* remained dormant for at least 39 years in Britain and resulting in 83% germination when moved into a suitable environment. Dormancy is a condition where seeds will not germinate even when the optimum/congenial environmental conditions including water, temperature and aeration are provided for germination (Hartmann *et al.*, 2002). It not only prevents immediate germination but also regulates the time, conditions and place that germination will occur.

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Table 1. Effect of Seed dormancy breaking treatments on germination percentage in different genotypes of *Solanum nigrum*.

Treatments	IC 370439 (Rajasthan)	IC 382115 (A.P)	IC 539854 (A&N Isls)	IC 258522 (Punjab)	IC 260041 (T.N)	IC 333525 (Kerala)	IC259895 (Orissa)	Mean
Pre-chilling at 10°C for 7 days	48.0 (44.1)	52.0 (46.4)	54.0 (47.5)	33.0 (35.4)	46.0 (42.9)	50.0 (45.3)	13.0 (21.4)	42.2 (40.4)
Pre-chilling at 10°C for 7 days followed by soaking of seeds in 0.2% KNO_3 for 48 h	79.0 (63.1)	84.0 (66.9)	89.0 (71.1)	74.0 (59.7)	87.0 (69.3)	89.0 (71.1)	43.0 (41.3)	77.8 (63.2)
Pre-chilling at 10°C for 7 days followed by soaking of seeds in GA_3 500 ppm for 48 h	74.0 (59.7)	80.0 (63.8)	71.0 (57.7)	68.0 (55.9)	82.3 (65.30)	83.0 (66.0)	49.0 (44.7)	72.4 (59.1)
Treatment with 0.2% KNO_3 at the time of plating	69.0 (56.4)	66.5 (54.9)	70.0 (57.1)	56.0 (48.7)	68.0 (55.8)	70.0 (57.1)	21.0 (27.6)	60.0 (51.1)
Treatment with GA_3 500 ppm at the time of plating	61.0 (51.6)	49.0 (44.7)	61.0 (51.6)	44.0 (41.8)	67.0 (55.2)	66.0 (54.6)	27.0 (31.6)	53.5 (47.3)
Control	5.0 (13.5)	3.0 (10.6)	6.0 (14.6)	2.0 (9.1)	5.0 (13.5)	5.0 (13.5)	2.0 (9.1)	4.0 (12.0)
Mean	56.00	55.75	58.50	46.17	59.12	60.50	25.83	

C D at 5% Treatments (A): 1.90 (1.33), Genotypes (B): 2.05 (1.45), (AXB): 5.02 (3.54)

Figures in parenthesis are transformed arc sin values

Among the various physico-chemical treatments tested to break dormancy, pre-chilling at 10°C for 7 days followed by soaking of seeds in 0.2% KNO_3 for 48 h was effective in improving germination percentage of all genotypes and reduced the hard seed per cent (Table 1). Pre-chilling and soaking in GA_3 500 ppm also showed significant effect in all genotypes, except seeds collected from Orissa where only 49 per cent germination was obtained as compared to rest of the genotypes. Gao and Yamata (1991) observed the persistence of seed dormancy in eggplant for more than 2 months and reported that GA_3 100 ppm was the most effective treatment in breaking seed dormancy. Similarly, Krishnasamy and Palaniappan (1990) reported high degree of seed dormancy in eggplant that persisted up to 5 months and was overcome by GA_3 200 ppm.

In general, stratification treatments have been reported to break dormancy of viable seeds and enhance germination in many species (Baskin *et al.*, 2001). In the present study pre-chilling at 10°C for 7 days could also improve germination from 3 to 54 per cent in three genotypes viz., 52, 54 and 50 collected from Kerala, Andhra Pradesh and Andaman & Nicobar Island, respectively over untreated control (Table1). Similarly, Bond and Turner (2002) reported that *S. nigrum* seeds stored for more than 7 months exhibited seed dormancy and was overcome by subjecting the seeds to stratification for 2 days at 5°C, whereas, at very low temperatures seeds showed low viability. However, exposure of seeds to different duration of stratification has also been used by various workers to improve seed germination and seedling vigour. The physiological role behind these phenomena is usually associated with the breakdown of germination inhibitors (Tucker and Gray, 1986). Treatment with 0.2% KNO_3 showed significant increase in seed germination up to 70% and GA_3 500 ppm up to 67%, it also showed comparable performances in breaking seed dormancy irrespective of the genotypes collected from different places. These results were supported by Gupta and Singh (1996) who observed that application with GA_3 and KNO_3 improved germination in *Solanum viarum* seeds. In the present study significant difference were observed between the genotypes, treatments and genotypes over treatments as per the statistical analysis. However, it can be concluded that for the purpose of commercial cultivation, development of seedlings through seeds is the best and cheaper method and the results of our study indicated that pre-chilling at 10°C for 7 days followed by soaking for 48 h in 0.2% KNO_3 is a suitable dormancy breaking treatments for obtaining maximum germination of *Solanum nigrum*.

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