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RESEARCH PAPER

Influence of floatation technique on seed and seedling characters in davana (*Artemisia pallens*)

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Abstract : Davana (*Artemisia pallens*) is an important high valued annual medicinal and aromatic herb of India belonging to the family Asteraceae. India has a monopoly in production and export trade of davana oil and India stands 3rd in essential oil production in the world. This study was conducted at the Department of Seed Science and Technology, Tamil Nadu Agricultural University, Coimbatore to upgrade the seed quality of davana seeds. The seeds were subjected to the following seed quality assessment. The observation made on seed recovery (%), 1000 seed weight (mg), germination per cent, seedling length (cm), dry matter production and vigour index. The results revealed that davana seeds upgraded with petroleum ether was found to improve the seed quality parameters *viz.*, 1000 seed weight (120 mg), germination (71 %) and vigour index (170.0).

Key Words : Davana, Seed quality, Upgrading, Seed recovery per cent, Germination per cent, Seedling length, Drymatter production, Vigour index

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INTRODUCTION

Aromatic plants are the natural source of perfumes and fragrance widely exploited by essential oil industries across the world. India stands 3rd in essential oil production in the world, the first being France while Britain takes the 2nd place. Davana (*Artemisia pallens*) is an important high valued annual aromatic herb of India belonging to the family Asteraceae and commercially cultivated in south India as a short duration crop from November to March. India has a monopoly in production and export trade of davana oil and India stands 3rd in essential oil production in the world. Davana is traditionally used in religious ceremonies and in making garlands, bouquets, floral decorations and floral chaplets, lends an element of freshness and a rich sumptuousness of fragrance to religious occasions (Narayana *et al*., 1998). The essential oil of davana extracted from air dried flowering herb, is a brown viscous liquid with deep mellow, persistent, rich fruity odour and it is recognized as one of the most useful essential oils for formulating natural flavours that are used in cakes, pastrics, beverages in United States of America, Europe and Japan (Pisana, 1989). *Artemesia pallens* possesses anti-inflammatory, antipyretic and analgesic propertiesit is used in Indian folk medicine for the treatment of diabetes mellitus. (Al-Harbi *et al*., 1994).

Seed production under variable environmental

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conditions may result in differences in seed size, weight and density, which ultimately affect the germination as well as subsequent plant vigour and production. Hence, the importance of seed processing has been identified as an integral part of post harvest management by many researchers (Pandita and Randhawa, 1995 and Ramesh, 1996), and hence, determination of processing technique is important for obtaining better quality seeds.

MATERIAL AND METHODS

The study was conducted with davana seeds obtained from Horticultural college and Research Institute, Periyakulam formed the base material for this study. The experiment was conducted at Department of Seed Science and Technology, Tamil Nadu Agricultural University, Coimbatore to upgrade the seed quality of davana seeds. Bulk seeds were subjected to floatation technique by placing them in a column of organic solvents and water and stirred well. After two minutes, the sinkers and floaters were collected separately and washed with water to make them free of solvents. Then, they were dried to original moisture content, and each fraction was weighed. The chemicals used for floatation technique were acetone, petroleum ether, ethanol and water. The dried seed fractions in each treatment were evaluated for the following seed quality parameters. Seed recovery per cent, 1000 seed weight, germination percentage, seedling length, drymatter production and vigour index were the observations, recorded. Seed recovery per cent estimated by the following method. Seeds retained on each sieve (BSS 30 × 30 and BSS 36 × 36) and that passed through BSS 36 × 36 were weighed individually and seed recovery percentage was calculated using the following formula and mean expressed as seed recovery in percentage :

$$\text{Seed recovery (\%)} = \frac{\text{Weight of the seed retained on sieve}}{\text{Total weight of the seed}} \times 100$$

For 1000 seed weight, the freshly harvested seed were counted in eight replications of 1000 seeds each, weighed in precision balance and mean weight was recorded in mg. Germination percentage (ISTA, 1999). The germination test was carried out as per the procedure prescribed by ISTA with four replicates of 100 seeds each in roll towel medium. The test conditions of 25 ± 2ºC and 95 ± 3 per cent RH were maintained in a germination room illuminated with fluorescent light. After eight days, the normal seedlings produced were counted and expressed as percentage. Seedling length (cm), ten normal seedlings were selected at random from each replication and the seedling length was measured from the tip of primary root to the tip of the primary leaf and expressed in cm. Drymatter production (mg seedlings^{-10}), randomly selected ten normal seedlings used for seedling measurements were dried under shade for 24h and then dried in hot air oven maintained at 85 ± 1˚C for 48h. It was cooled in a desiccator for 30 min. and weighed. The values were expressed as mg seedlings^{-10}. Vigour index (Abdul-Baki and Anderson, 1973), vigour index (VI) was computed using the following formula and expressed as whole number.VI = Germination percentage × seedling length (cm). The data obtained from experiments were analyzed by the 'F' test for significance following the method Factorial Completely Randomized Design as described by Panse and Sukhatme (1985). Wherever necessary, the per cent values were transformed to angular (Arc-sine) values before analysis. The critical differences (CD) were calculated at 5 per cent probability level. The data were tested for statistical significance.

RESULTS AND DISCUSSION

The results of Table 1 were followed. Among the solvents the maximum seed recovery percentage was recorded by the seeds upgraded with petroleum ether (98% and 2%) both in sinkers and floaters. The maximum 1000 seed weight was recorded in sinkers by the seeds upgraded with petroleum ether (120 mg) and the minimum 1000 seed weight was recorded with water (111 mg). In floaters, the maximum 1000 seed weight was recorded with petroleum ether (100 mg) and the minimum 1000 seed weight was recorded with water (94 mg). The higher germination percentage was recorded with petroleum ether (71% and 10%) both in sinkers and floaters, respectively and the lower percentage was recorded with acetone (61% and 5%) both in sinkers and floaters, respectively. The maximum seedling length was recorded with petroleum ether (2.4 cm) in sinkers and the minimum seedling length recorded with water (2.0 cm). No significant differences were observed for seedling length in floaters. No significant difference was observed for dry matter production. The maximum seed vigour was recorded with petroleum ether (170 and 20) sinkers and floaters, respectively and the lower vigour index was recorded with water (140 and 10) sinkers and floaters, respectively.

Floatation on liquid media is a widely used technique

Table 1 : Influence of floatation technique on seed recovery (%), 1000 seed weight (mg), germination (%), seedling length (cm), dry matter production (mg seedlings^{-10}) and vigour index

Treatments	Seed recovery (%)		1000 seed weight (mg)		Germination (%)		Seedling length (cm)		Dry matter production (mg seedlings^{-10})		Vigour index	
	Sinkers	Floaters	Sinkers	Floaters	Sinkers	Floaters	Sinkers	Floaters	Sinkers	Floaters	Sinkers	Floaters
Acetone	95(77.08)	5(12.92)	116	96	61(51.35)	5(12.92)	2.3	2.0	1.2	1.0	141	12
Petroleum ether	98 81.87)	2(8.13)	120	100	71(57.41)	10(18.43)	2.4	2.0	1.2	1.0	170	20
Ethanol	96(78.46)	4(11.53)	119	98	66(54.03)	8(16.43)	2.3	2.0	1.2	1.0	152	16
Water	89(70.63)	11(19.37)	111	94	64(53.13)	6(14.17)	2.2	2.0	1.1	1.0.	140	10
Mean	94.5(76.43)	5.5(16.43)	116.5	97	65.5(54.03)	7.3(15.62)	2.3	2	1.2	1.0	151	15
S.E. ±	2.3797	0.1836	1.7804	1.4821	1.8699	0.1887	0.0575	0.3515	0.1633	0.1528	3.8077	0.3775
C.D. (P=0.05)	5.1850	0.4001	3.8791	3.2292	4.0742	0.4112	0.1253	NS	NS	NS	8.2963	0.8225

NS=Non-significant

to separate filled, viable seeds from empty, dead filled, mechanically and insect damaged seeds. The method works on the principle that viable and dead filled or empty seeds are sorted in liquid media based on differences in specific density. The floatation method is one of the methods that can be used for the separation of filled and empty seeds. In this respect, through a simple method, the proportion of filled seeds or in other words. Seed quality in a seed lot could be improved at considerable amounts by using the floatation method. Thus, more uniform seedling emergence and higher germination percentage could be achieved in seedling production activities.

Botanically, davana seed is an achene being belonging to the family Asteraceae. There is a differential seed filling due to the nature of floral structure. Considering the above grading/upgrading davana seeds based on seed density will be highly useful. Hence, an attempt was made with floatation technique with different media.

Various liquid media such as water, ethanol, acetone and petroleum could be used in separating filled and empty seeds by floatation method. It is quite important not to damage the seed embryo and consequently seed germination ability during or after floatation treatment by these liquids that have different densities.

In the present study, the superiority of sinkers over floaters has been well established, moreover sinkers recovered by petroleum ether and ethanol consistently scored more over those obtained by acetone and water. The reason may be the density of liquids is usually below the density of water because the seed of most species is higher than water. In water the empty and filled seeds are in the beginning buoyant on the surface, but after sometimes the filled seeds sink to the bottom, adsorption principle seems to be specially suitable for the species in which the difference between the density co-efficients of the empty and filled seeds is too small (Selvakumari, 2005).

Germination is reported to be a function of both seed density and which seed density exercised a profound influence on the ultimate seed quality (Ferguson and Turner, 1971; Krieg and Bartee, 1975). Similar results were reported by Natarajan (2000) in marigold, Vijayan (2002) in zinnia and gaillardia. Germination in high density seeds is due to increased activity of redox enzyme in larger seeds helping in breaking down the complex food reserve materials into simple soluble sugar (Gurbanov and Berth, 1970). Thus, the floatation technique using petroleum ether or ethanol is recommended for upgrading davana seed for quality seedling production.

Conclusion :

Studies on upgrading the seed quality through floatation technique, revealed that seeds upgraded with petroleum ether improved the seed quality parameters *viz.*, germination percentage (71%), and vigour index (170.0) compared with the seeds upgraded with acetone and water.

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