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Standardization of suitable invigouration treatment for seed quality enhancement in davana (*Artemisia pallens)*

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Abstract: *Davana (Artemisia pallens) ia an important high valued annual 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 Department of seed science and technology, TamilNadu Agricultural University, Coimbatore to standardization of suitable invigouration treatment for seed quality enhancement in davana under laboratory condition. The seeds of davana subjected to different seed invigouration treatments. The treatments are seed invigouration with GA_3 25 ppm, GA_3 50 ppm, GA_3 100 ppm, Thiourea 100 ppm, Thiourea 150 ppm, Thiourea 200 ppm, KNO_3 0.05%, KNO_3 0.1%, KNO_3 0.2% with three different soaking durations viz., 10, 20 and 30 mins. and dry seeds served as control. The observation made on germination %, seedling length (cm), dry matter production and vigour index. The results revealed that seed invigouration with $GA_3$50 ppm for 20 min. improved the germination (62%), seedling length (2.4cm) and vigour index (147.6)*
Keywords: *Davana, seed invigouration, germination %, seedling length, drymatter production, vigour index.*

I. 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*) ia 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) [1]. 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) [2]. *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) [3]. Pre-sowing seed treatments for rapid and uniform field emergence is the essential pre requisite for increased yield and profit of any crop (Vashistha *et al*., 2009) [4]. Uniformity in seedling emergence of direct seeded crops has major impact on final yield and quality, which could be achieved by presowing treatments. Since, Davana is being propagated through seeds, hence an attempt was made to standardize suitable seed invigouration treatments on seedling augumenting parameters.

II. Materials 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 experiments was conducted at Department of seed science and technology, TamilNadu Agricultural University, Coimbatore to study the effect of different seed invigouration treatments. The treatments are seed invigouration with GA_3 25 ppm, GA_3 50 ppm, GA_3 100 ppm, Thiourea 100 ppm, Thiourea 150 ppm, Thiourea 200 ppm, KNO_3 0.05%, KNO_3 0.1%, KNO_3 0.2% with three different soaking durations *viz*., 10, 20 and 30 mins. and dry seeds served as control. Germination percentage, seedling length, drymatter production and vigour index are the observations recorded. Germination Percentage (ISTA, 1999) [5],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 $\pm$ 2ºC and 95 $\pm$ 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) [6], Vigour index (VI) was computed using the following formula and expressed as whole number.VI = Germination percentage x 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.[7]. Wherever necessary, the percent 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.

III. Results

The results of table 1 were followed. Significant difference was noticed for germination % due to seed invigouration treatments. Among the treatments the seed invigouration with GA_3 with 50 ppm recorded the higher germination percentage (62%) which was on par with the seed invigouration with GA_3 with 25 ppm (61%) and the lower germination percentage recorded with the control (43%). Among the soaking duration 20 mins recorded the higher germination (58%) and the lower germination was recorded in 10 mins soaking (48%). In the interaction effect the seed invigouration with GA_3 at 50 ppm with 20 mins soaking recorded the higher germination (77%) and the lower germination recorded with control (48%).

For seedling length (cm) Significant difference was observed due to seed invigouration treatments. Among the treatments the maximum seedling length was observed with seed invigouration with GA_3 with 50 ppm (2.4cm) which was on par with the seed invigouration withThiourea with 100 ppm and thiourea 200 ppm (2.4cm) and the lower seedling length was recorded with the control (1.7cm). Among the duration 20 mins soaking recorded the higher value (2.2cm) which on par with 30 mins soaking (2.2cm) and the lower value recorded with 10 mins soaking (2.1cm). In the interaction effect the seeds invigouration with thiourea 100 ppm with 30 mins soaking recorded the higher value (2.5cm) and the lower value recorded with control (1.7cm).

The results of Table 2 were followed.The results revealed that there is a significant difference observed for the vigour index. Among the treatments the seed invigouration with GA_3 at 50 ppm recorded the maximum vigour index (148) followed by the seed invigouration with GA_3 at 25 ppm (131) and the lower germination percentage recorded with the control (72). Among the soaking duration, 20 mins soaking recorded the higher value (130) and the lower value recorded with 10 mins soaking (102). In the interaction effect the seed invigouration with GA_3 at 50 ppm with 20 mins soaking recorded the higher value (186) and the lower value recorded with control (72). There is no significant difference observed for dry matter production of the seedlings.

IV. Discussion:

In any production programme, rapid and uniform field emergence is the essential pre requisite to increase yield, quality and ultimately the profit. Pre-sowing invigouration is one such technological highlight for higher field emergence focused to the value addition of seed for betterment. Seed invigouration implies an improvement in seed performance by any post harvest treatment resulting in improving germinability, greater storability and better yield performance than the corresponding untreated seed. Pre-sowing seed invigouration treatments are numbered many (Sundaralingam *et al.,* 2001) [8] and are claimed to have invigourative effect for enhancing the yield to a tune of 10-15 per cent (Vijayakumar, 1996) [9]. An invigoruation treatment should bring about qualitative improvement in the seed, which should persist even after the treatment is removed, and the treatments are basically physiological in nature.

In the present study, the seed invigouration with GA_3 at 50 ppm with 20 min. soaking recorded the higher germination and vigour index which was 37.6 and 56.9 percentage increase over the control seeds (Fig.1). Rudre *et al.,* (1993) [10] observed that the lemon- scented gum seeds treated with gibberellic acid improved the germination percentage and vigour index of the seedlings. Gibberellic acid is known for breaking seed dormancy and promoting germination by increasing the embryo growth potential and/or by reducing the mechanical constraint. (Finch-savage and Leubner Metzger, 2006) [11]. Gibberellins are more directly implicated in the control and promotion of germination.

The primary effect of seed treatment is attributed to certain enzymatic activities taking place in seed, while it is being held in moist condition. The relatively higher seed quality parameters in seeds treated with GA_3 was attributed to enlarged embryos, higher rate of metabolic activity and respiration, better utilization and mobilization of metabolities to growing points and higher activity of embryos (Earlpuls and Lampeth 1974) [12]. Hydration with GA_3 treatment might have stimulated the hypocotyls growth as GA_3 includes cell elongation resulting in rapid emergence (Chandra kanthpawar, 2006) [13].

V. Conclusion:

The seeds of davana subjected to different seed invigouration treatments. The treatments are seed invigouration with GA_3 25 ppm, GA_3 50 ppm, GA_3 100 ppm, Thiourea 100 ppm, Thiourea 150 ppm, Thiourea 200 ppm, KNO_3 0.05%, KNO_3 0.1%, KNO_3 0.2% with three different soaking durations *viz.*, 10, 20 and 30 mins. and dry seeds served as control. The davana seeds invigourated with GA_3 at 50 ppm with 20 mins soaking duration recorded the higher germination percentage (62), seedling length 2.4 cm and vigour index 147.6. the control seed recorded the lower germination percentage (43), seedling length 1.7 cm and vigour index 71.7. From this study, it is concluded that davana seeds invigouration with GA_3 at 50 ppm with 20 mins soaking recommended for seed treatment.

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Table 1.Effect of seed invigouration treatments on germination (%) and seedling length (cm).

Treatments	Germination (%)				Seedling length (cm)			
	Duration				Duration			
	D1	D2	D3	Mean	D1	D2	D3	Mean
T1	43 (40.97)	43 (40.97)	43 (40.97)	**43 (40.97)**	1.7	1.7	1.7	**1.7**
T2	55 (47.87)	69 (56.16)	60 (50.76)	**61 (51.35)**	2.0	2.2	2.2	**2.2**
T3	52 (46.14)	77 (61.34)	57 (49.02)	**62 (51.94)**	2.3	2.4	2.4	**2.4**
T4	55 (47.87)	61 (51.35)	60 (50.76)	**59 (50.18)**	2.3	2.3	2.1	**2.2**
T5	47 (43.28)	63 (52.53)	49 (44.42)	**53 (46.72)**	2.4	2.4	2.3	**2.4**
T6	47 (43.28)	52 (46.14)	51 (45.57)	**50 (45.00)**	2.1	2.3	2.5	**2.3**
T7	40 (39.23)	53 (46.72)	44 (41.55)	**46 (42.70)**	2.4	2.4	2.3	**2.4**
T8	43 (40.97)	48 (43.85)	47 (43.28)	**46 (42.70)**	1.9	2.2	2.2	**2.1**
T9	48 (43.85)	51 (45.57)	53 (46.72)	**51 (45.57)**	2.0	2.4	2.3	**2.2**
T10	51 (45.57)	60 (50.76)	53 (46.72)	**55 (47.87)**	2.1	2.1	1.9	**2.0**
Mean	**48 (43.85)**	**58 (49.60)**	**52 (46.14)**		**2.1**	**2.2**	**2.2**	
	T	**D**	**TXD**		**T**	**D**	**TXD**	
SEd	1.00111	0.54833	1.73398		0.06215	0.03404	0.10764	
CD (P=0.05)	2.00253	1.09683	3.46848		0.12431	0.06809	0.21532	

(Figures in parentheses indicate arc sine transformed values)

T1 - Control ; T2 - Seed invigouration with GA_3 25 ppm ; T3 - Seed invigouration with GA_3 50 ppm; T4 - Seed invigouration with GA_3 100 ppm ; T5 - Seed invigouration with Thiourea 100 ppm ; T6 - Seed invigouration with Thiourea 150 ppm; T7- Seed invigouration with Thiourea 200 ppm ; T8 - Seed invigouration with KNO_3 0.05% ; T9 - Seed invigouration with KNO_3 0.1% ; T10 - Seed invigouration with KNO_3 0.2%
D1-10 mins ; D2 – 20 mins ; D3 – 30 mins.

Table 2. Effect of seed invigouration treatments on dry matter production (mg seedling^{-10})and vigour index

Treatments	Dry matter production (mg seedling^{-10})				Vigour index			
	Duration				Duration			
	D1	D2	D3	Mean	D1	D2	D3	Mean
T1	1.10	1.10	1.10	**1.10**	71.7	71.7	71.7	**71.7**
T2	1.20	1.23	1.23	**1.22**	109.3	152.5	132.0	**131.3**
T3	1.23	1.24	1.22	**1.23**	119.6	185.6	137.6	**147.6**
T4	1.24	1.21	1.22	**1.22**	127.1	139.8	126.8	**131.0**
T5	1.22	1.23	1.22	**1.22**	112.0	150.4	113.5	**125.3**
T6	1.21	1.22	1.23	**1.22**	98.0	119.6	124.6	**114.0**
T7	1.23	1.23	1.23	**1.23**	96.6	129.6	102.3	**109.5**
T8	1.21	1.21	1.21	**1.21**	82.7	105.6	101.0	**96.4**
T9	1.22	1.23	1.23	**1.23**	94.9	121.6	122.5	**113.0**
T10	1.21	1.21	1.20	**1.21**	106.9	124.2	102.3	**111.1**
Mean	**1.21**	**1.21**	**1.21**		**101.9**	**130.1**	**113.5**	
	T	**D**	**TXD**		**T**	**D**	**TXD**	
SEd	0.03759	0.02059	0.06512		2.22397	1.21812	3.85204	
CD (P=0.05)	NS	NS	NS		4.44863	2.43661	7.70525	

T1 - Control ; T2 - Seed invigouration with GA_3 25 ppm ; T3 - Seed invigouration with GA_3 50 ppm; T4 - Seed invigouration with GA_3 100 ppm ; T5 - Seed invigouration with Thiourea 100 ppm ; T6 - Seed invigouration with Thiourea 150 ppm; T7- Seed invigouration with Thiourea 200 ppm ; T8 - Seed invigouration with KNO_3 0.05% ; T9 - Seed invigouration with KNO_3 0.1% ; T10 - Seed invigouration with KNO_3 0.2%
D1-10 mins ; D2 – 20 mins ; D3 – 30 mins.

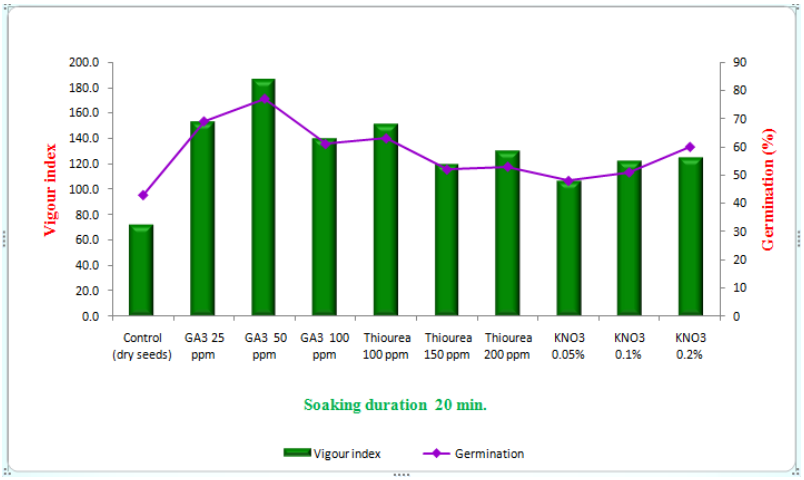

Fig.3. Effect of seed invigouration treatments on germination (%) and vigour index