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Influence of Date of Transplanting on Growth and Yield Attributes and Resultant Seed Quality of Davana

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ABSTRACT

A field experiment was conducted at TamilNadu agricultural university, Coimbatore during rabi 2011 to study the effect of time transplanting on growth, yield attributes and resultant seed quality of davana. The experiment was laid out with five different dates of transplanting viz., October 15th, November 1st, November 15th, December 1st and December 15th with the spacing of 15 × 7.5 cm and 125:125:75 NPK kg/ha were adopted in a randomized block design with four replications. The results revealed that the seedlings transplanted at 15th November recorded the maximum number of branches/plant, seed yield/plant, seed yield/plot, resultant seed germination and vigour index.

Keywords: Date of Transplanting; Davana; Seed Yield and Seed Quality

1. 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. Davana (Artemisia pallens wall. ex. D.C.) is an important highly 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. Davana is traditionally used in religious ceremonies and in making garlands, bouquets, floral decorations and floral chaplets, lending an element of freshness and a rich sumptuousness of fragrance to religious occasions [1] (Narayana *et al*., 1998). Davana is being propagated through seeds. The productivity of any crop is the ultimate results of its growth and development. Time of transplanting is one of the major factors for getting maximum seed yield and quality. *Artemesia pallens* possesses anti-inflammatory, antipyretic and analgesic properties. It is used in Indian folk medicine for the treatment of Diabetes mellitus [2] (Al-Harbi *et al*., 1994). Hence, an attempt was made to study the effect of date of transplanting on the growth and yield attributes and resultant seed quality.

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2. Materials and Methods

2.1. Experimental Conditions

Field experiments were conducted during rabi 2011 at TamilNadu Agricultural University Coimbatore to study the effect of different dates of transplanting on the growth and yield attributes and resultant seed quality of davana. The experiment was laid out in Randomized block design with four replications. Five different dates of transplanting viz., October 15th (DS1), November 1st (DS2), November 15th (DS3), December 1st (DS4) and December 15th (DS5) with the spacing of 15 × 7.5 cm and 125:125:75 NPK kg/ha accommodating 90 plants/plot. The seeds of davana (*Artemesia pallens*) obtained from Horticultural college and Research Institute, Periyakulam was chosen for the study. Growth attributes such as plant height (cm), fresh weight of the seedling (g/plant), dry matter production, chlorophyll content of the seedling—estimated through the chlorophyllmeter at vegetative, flowering and maturity stages using SPAD meter., days to first flower, days to 50% flowering, number of branches/plant. Yield attributes viz., number of flower heads/plant, seed yield/plant, seed yield/plot, 1000 seed weight, herbage yield/plot. Resultant seed quality such as germination (%) [3] (ISTA, 1999), seedling length (cm) the distance between the tip of the primary leaf to the tip of the primary root, vigour index [4] (Ab-

dul Baki and Anderson, 1873). Vigour index (VI) was computed using the following formula and expressed as whole number. VI = Germination percentage × Seedling length (cm) and Dry matter production ($g \cdot seedlings^{-10}$) dried in a hot air oven maintained at 85˚C for 48 h and cooled in a dessicator for 30 min and weighed in an electronic digital balance. Weather data given as **Annexure 1**.

2.2. Statistical Analysis

The data obtained from experiments were analyzed by the 'F' test for significance following the method Factorial Randomized Block Design as described by [5] Panse and Sukhatme. 1985. 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.

3. Results and Discussion

The results of **Table 1** were followed. The seedling transplanted on November 15th (DS 3) recorded significantly higher plant height, fresh weight of the seedling, dry matter production of the seedling and chlorophyll content. Days to first flowering, days to fifty percent flowering attained earlier in the seedlings transplanted by November 15th, number of branches/plant (26), number of flower heads/plant (110), seed yield/plant (9.01 g), seed yield/plot (112.6 g), 1000 seed weight (162.81 mg), herbage yield/plot (1268.11 g) was also observed higher with the seedlings transplanted during November 15th. Resultant seed quality such as germination%, seedling length, Dry matter production and vigour index was also higher in November 15th seedlings which was followed by the seedlings transplanted by December 1st.

Appropriate and proper time of sowing is one of the basic requirements for obtaining maximum yield and high return of any crop. As emphasized by [6] Snoek (1981), the total yield of the crop is markedly influenced by different sowing and transplanting times. In seed production, [7] Wood *et al.* (1980) opined that the environmental conditions particularly the light and temperature [8] (Crocker and Barton, 1955) interact with genetic system and elicit developmental changes during ripening, which exert influence on yield and seed quality. Highest seed yield obtained from a plant height of 58.46 cm. This was likely due to the plant height of the plots being optimum. From the observation in field plots, it could be noted that the plant could be grown in optimum condition. These contributed to more branching and flowering subsequent to seed setting and eventually resulted in high seed yield. The results of **Table 2** were followed. Seedlings planted on November 15th came to early first flowering and also 50% flowering, number of branches, number of flower heads/plant contributing towards increasing seed yield. Similarly, maximum 1000 seed weight (162.8 mg) was recorded from the plots planted on November 15th. The results of **Table 3** were followed. Highest seed yield per plant (9.01 g), seed yield/plot (112.66 g) and herbage yield per plot (1268.11 g) was obtained with the seedlings planted on November 15th and each successive delay in transplanting resulted into corresponding decrease in seed yield. Similar results were observed under different set of climatic conditions as influenced by time of planting in radish by [9] Gill and Gill (1995) and [10] Warde *et al*. (2004).

The seed quality characters were significantly influence by time of planting.

The physiological potential of the seed in terms of germination (64%), seedling length (2.62 cm) and vigour index (168) were higher with the seeds produced in 15th

Table 1. Influence of time of transplanting on growth attributes at different growth periods.

Treatments	Plant height (cm)at different growth periods				Fresh weight of the seedling ($g \cdot plant^{-1}$)at different growth periods				Dry matter production of the seedling ($g \cdot plant^{-1}$) at different growth periods			
	Vegetative	Flowering	Maturity	Mean	Vegetative	Flowering	Maturity	Mean	Vegetative	Flowering	Maturity	Mean
DS1	29.4	53.37	49.55	**44.10**	7.45	15.36	11.77	11.53	3.69	10.04	8.66	7.46
DS2	29.9	54.17	54.84	**46.31**	7.86	18.22	13.95	13.34	4.90	10.80	9.74	8.48
DS3	32.9	56.21	58.16	**49.09**	8.16	18.40	16.62	14.39	5.02	12.03	9.80	8.95
DS4	29.9	50.15	53.73	**44.59**	7.41	13.54	12.44	11.13	3.89	8.96	8.45	7.10
DS5	26.4	48.14	47.74	**40.77**	7.14	11.97	10.48	9.86	3.63	7.75	7.45	6.28
Mean	**29.70**	**52.41**	**52.80**		**7.60**	**15.49**	**13.05**		**4.23**	**9.92**	**8.82**	
SEd	0.35	0.96	0.51		0.06	0.84	0.29		0.10	0.49	0.12	
CD (P = 0.05)	0.78	2.10	1.12		0.13	1.84	0.63		0.22	1.07	0.26	

Table 2. Influence of time of transplanting on chlorophyll content and yield attributes.

Treatments	Chlorophyll content (SPAD value)				Days to first flowering	Days to 50% flowering	Number of branches	Number of flower heads plant^{-1}
	Vegetative stage	Flowering stage	Maturity stage	Mean				
DS1	10.6	13.2	10.8	**11.6**	48	55	21	103
DS2	12.6	13.2	12.7	**12.9**	45	52	22	108
DS3	14.5	14.1	13.7	**14.1**	44	52	26	110
DS4	11.6	12.4	12.7	**12.3**	47	54	22	105
DS5	10.6	11.2	11.7	**11.2**	49	57	20	90
Mean	**12.0**	**12.8**	**12.3**		**47**	**54**	22	**103**
SEd	0.260	0.324	0.138		0.2371	0.6671	0.3845	2.0387
CD (P=0.05)	0.567	0.707	0.302		0.5167	1.4535	0.8378	4.4421

Table 3. Influence of time of transplanting on seed yield and resultant seed quality characters.

Treatments	Seed Yield plant^{-1} (g)	Seed yield plot^{-1} (g)	1000 seed weight (mg)	Herbage yield plot^{-1} (g)	Germination (%)	Seedling length (cm)	Dry matter production (mg·seedlings^{-10})	Vigour index
DS1	5.57	69.54	151.76	898.05	58(49.60)	2.23	1.20	129
DS2	7.68	95.93	154.77	1064.39	60(50.76)	2.31	1.22	139
DS3	9.01	112.66	162.81	1268.11	64(53.13)	2.62	1.23	168
DS4	7.74	96.77	156.78	949.17	62(51.94)	2.45	1.21	152
DS5	6.33	79.08	158.79	799.62	61(51.35)	2.38	1.20	145
Mean	**7.266**	**90.796**	**156.982**	**995.8676**	**61(51.35)**	**2.40**	**1.21**	**146.54**
SEd	0.2093	5.0241	1.2476	53.7202	0.6687	0.0188	0.0047	2.2503
CD (P = 0.05)	0.4561	10.9467	2.7184	117.0474	1.4570	0.0410	0.0101	4.9031

Figures in parenthesis indicate arc sine values.

November month. [11] Castillo *et al*. (1994) and [12] Greven *et al*. (1997) stated that the environment during seed development is the major determinant of seed quality, particularly seed vigour. It is concluded that 15th November planting recorded the maximum seed yield and quality characters. Hence for seed production 15th November could be recommended for davana.

4. Conclusion

From the present investigation, it could be concluded that the seedlings planted on 15th November recorded the maximum seed yield and quality characters such as higher germination percentage, seedling length, drymatter production and vigour index. Hence for seed production 15th November could be recommended for davana.

REFERENCES

[1] M. R. Narayana, M. N. A. Khan and B. P. Dimri, "Davana and Its Cultivation in India," Farm Bulletin, No. 12, CIMAP, Lucknow, 1998, pp. 1-10.

[2] M. M. Al-Harbi, S. Qureshi, M. M. Ahmed, G. A. Riza and A. H. Shah, "Studies on the Anti-Inflammatory Antipyretic and Analgestic Activities of Santanonin," *The Japanese Journal of Pharmcology*, Vol. 64, No. 3, 1994, pp. 135-139. doi:10.1254/jjp.64.135

[3] ISTA, "International Rules of Seed. Testing (Supplement rules)," *Seed Science and Technology*, Vol. 27, 1999, pp. 25-30.

[4] A. A. Abdul-Baki and J. D. Anderson, "Vigor Determination in Soybean Seed by Multiple Criteria," *Crop Science*, Vol. 13, No. 6, 1973, pp. 630-633. doi:10.2135/cropsci1973.0011183X001300060013x

[5] V. G. Panse and P. V. Sukhatme, "Statistical Methods for Agricultural Workers," ICAR Publication, New Delhi, 1985, pp. 327-340.

[6] N. Snoek, "How Close Should Broccoli Be Planted," *Greontenen Fruit*, Vol. 36, 1981, pp. 50-51.

[7] D. W. Wood, R. K. Scott and P. C. Longdon, "The Effect of Mother Plant Temperature on Seed Quality in *Beta vulgaris* L.," In: P. D. Hebblethwaite, Ed., *Seed Production*, Off. Seed Anal., Vol. 54, 1980, pp. 50-60.

[8] W. Crocker and L. V. Barton, "Effect of the Conditions of

Seed Formation and Storage on Germination, Physiological Basis of Seed Germination," American Publishing Co., Pvt., New Delhi, 1995.

[9] S. S. Gill and B. S. Gill, "Influence of Time of Transplanting in Radish," *Seed Research*, Vol. 23, 1955, pp. 28-30.

[10] A. D. Warde, V. S. Gonge, L. V. Kulwal and J. Giri, "Effect of Time of Planting and Spacing on Seed Yield and Quality of Radish Var. Pusa Chetki," *Agricultural Science Digest*, Vol. 24, No. 1, 2004, pp. 21-23.

[11] A. G. Castillo, J. G. Hampton and P. Coolbear, "Effect of Sowing Date and Harvest Timing on Seed Vigour in Garden Pea (*Pisum sativum* L.)," *New Zealand Journal of Crop and Horticultural Science*, Vol. 22, No. 1, 1994, pp. 91-95. doi:10.1080/01140671.1994.9513810

[12] M. M. Greven, B. A. McKenzie and G. D. Hill, "The Influence of Stress on Yield, Abortion and Seed Size of French Dwarf Beans (*Phaseolus vulgaris* L.)," *Proceedings of Agronomy Society New Zealand*, Vol. 27, 1997, pp. 101-108.

Annexure

Annexure 1. Weather data from Aug 2011-Mar 2012.

Month	Maximum temperature ˚C	Minimum temperature ˚C	Relative humidity 1	Relative humidity 2	Rainfall (mm)	Sun shine (hours)	Rainy days	Evaporation (mm)
AUG-11	31.3	22.8	87.2	56.4	0.2	4.6	1	4.9
SEP	31.2	23.0	90.9	60.4	1.6	7.4	4	5.6
OCT	22.6	20.1	90.6	59.3	7.4	6.5	14	4.3
NOV	28.7	20.8	89.7	61.0	8.1	5.4	11	3.2
DEC	29.3	19.1	89.2	52.0	0.4	6.4	1	3.3
TOTAL	143.1	105.8	447.6	289.1	17.7	30.3	31.0	21.3
AVERAGE	28.6	21.2	89.5	57.8	3.5	6.1	6.2	4.3
JAN-12	29.6	19.1	88.9	48.1	68.9	8.1	0	3.4
FEB	30.9	20.9	85	36	0	8.8	0	5.1
MAR	35.6	20.9	80	30	0	9.3	0	6.5

