



ISSN: 2230-9926

Available online at <http://www.journalijdr.com>

IJDR

**International Journal of
DEVELOPMENT RESEARCH**

International Journal of Development Research
Vol. 3, Issue, 10, pp.111-113, October, 2013

Full Length Research Article

STANDARDIZATION OF GERMINATION MEDIA FOR SEEDLING EVALUATION OF DAVANA (*Artemisia pallens*)

*¹Jayanthi, M., ²Vijayakumar, A., ³Vanangamudi, K. and ⁴Rajamani, K.

¹Department of Seed Science and Technology, Adhiparasakthi Agricultural, Horticultural College and Research Institute, G.B. Nagar, Kalavai, Vellore

^{2,3}Department of Seed Science and Technology and Tamil Nadu Agricultural University, Coimbatore

⁴Department of Medicinal and Aromatic crops, Tamil Nadu Agricultural University, Coimbatore

ARTICLE INFO

Article History:

Received 09th July, 2013

Received in revised form

26th August, 2013

Accepted 08th September, 2013

Published online 04th October, 2013

Key words:

Davana seed,
Germination media,
Seedling evaluation,
Germination percentage.

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. Davana is propagated highly through seeds. Either on trade or before sowing evaluation of seed germination is essential. International rules for seed testing recommended different methodological requirements for seed quality evaluation. One such requirement is the selection of media for germination to assure actual germination as media provide proper platform for full expression of seedling emergence and growth. Hence, the studies were conducted at the Department of Seed Science and Technology, Tamil Nadu Agricultural University, Coimbatore, on standardization of media and methodologies for germination test under germination room conditions in line with ISTA for seedling evaluation of davana seeds. On evaluation of seed germination, paper medium adopting roll towel methodology was highly recommended as the best media for evaluation of germination percentage of davana seeds in seed testing.

Copyright © 2013 Jayanthi, et al., This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

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, pastries, beverages in United States of America, Europe and Japan (Pisana 1989). *Artemisia pallens* possesses anti-inflammatory, antipyretic and analgesic properties, it is used in Indian folk medicine for the treatment of Diabetes mellitus. (Al-Harbi *et al.*, 1994). ISTA (1993) formulate, procedures for testing the physical, physiological and health status of seed, which differ from seed to seed and newer crops are added based on necessity. Among the seed quality characters, evaluation of germination is the prime and most important reliable character that explores the relative planting value of the seed lot. It should be evaluated in a correct media, to give accurate and reproducible results. The objective of the germination test is to express the maximum germination potential of seed which is the most important than all other quality parameters. The use of standardized ideal techniques in the laboratory such as those prescribed by ISTA is warranted as it ensures that results obtained for a given seed lot in one laboratory would be identical with those obtained from any other laboratory in the same or other countries (Willan, 1985). In the laboratory, the environmental conditions, including moisture, temperature, aeration and light,

*Corresponding author: Jayanthi, M.

Department of Seed Science and Technology, Adhiparasakthi Agricultural, Horticultural College and Research Institute, G.B. Nagar, Kalavai, Vellore

Table 1. Influence of germination media on seedling characters

Media	Normal seedlings (%)	Abnormal seedlings (%)	Dead seed (%)	Seedling length (cm)	Dry matter production (mg seedlings ⁻¹⁰)	Vigour index
Petriplate	77 (61.34)	8 (14.17)	15 (22.78)	2.4	1.21	185
Roll towel	82 (64.89)	4 (17.45)	14 (21.78)	2.6	1.23	213
Inclined plate	80 (63.43)	4 (17.45)	16 (23.57)	2.5	1.22	200
On-sand	74 (59.34)	6 (14.41)	20 (26.56)	2.3	1.21	170
In-sand	71 (61.34)	9 (22.78)	20 (26.56)	2.3	1.21	163
Mean	77 (61.34)	6.2 (14.21)	17 (24.35)	2.4	1.22	186
SEd	2.1921	0.1643	0.2625	0.0698	0.0186	5.7194
CD (P=0.05)	4.6723	0.3501	0.5596	0.1488	NS	12.1907

(Figures in parentheses indicate arc sine transformed values)

must not only be specific enough to indicate germination but also favorable for the development of the seedlings to a stage where interpretation as normal and abnormal types were possible. Medium plays an important role in germination testing, because seeds have characteristic requirements of moisture and oxygen for germination. Thus minute seeds germinate on Top of Paper (TP) rather than sand. Seeds, which require light for germination also, need TP as germination medium. Best suited medium depends upon the physical condition of the seeds. Generally, sand as medium is best suited for large sized seeds and paper for small sized seeds (Nawabhar, 2008). Hence studies were initiated to standardize suitable media and methodology for evaluation of seed germination of davana seeds at the Department of Seed Science and Technology, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu during 2012.

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 experiment were conducted at Department of seed science and technology, Tamil Nadu Agricultural University, Coimbatore to standardize suitable germination media for seedling evaluation. Sixteen replicates of 25 seeds were sown in two different media *viz.*, paper and sand and adopting different methodologies. Treatments such as Top of paper (Petri plate), Roll towel, Inclined plate, On sand (sowing on top of sand) and In sand (sowing at 2 cm depth). Seeds were sown in the respective media and kept in germination room with the temperature of $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$ and 95 ± 2 per cent relative humidity. Seedlings were evaluated till the initiation of true primary leaf or mortality of seedlings. *i.e.*, up to 8 days the germination period. Then the germination test was terminated and the resultant seed and seedlings were categorized into normal, abnormal, dead seeds and hard seeds based on growth of seedlings. Normal seedlings - Seedlings which show the capacity for continued development into normal plant were counted and the mean expressed as percentage germination.

Abnormal seedlings - Seedlings that showed uneven growth of root and shoot, deformed, decayed and diseased symptoms were counted and the mean expressed as abnormal seedlings in percentage. Dead seeds - At the end of the germination test period, the seeds that oozed out the decayed material on pressing were considered as dead seeds and were counted replication/ treatment wise and the mean expressed as dead seed in percentage. Hard seeds - Number of seeds remained hard without moisture absorption at the end of germination test was counted and the mean expressed as percentage. Seedling length, dry matter production and vigour index are recorded.

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. Dry matter 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 $85 \pm 1^{\circ}\text{C}$ 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. $VI = \text{Germination percentage} \times \text{Seedling length (cm)}$. The data obtained from experiments were analyzed by the 'F' test for significance following the method Completely Randomized Design as described by 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.

RESULTS

Highly significant variations were observed for the evaluated seed quality parameters obtained from different growing media and methodologies. (Table 1) The results revealed that seed germination recorded based on normal seedlings was the highest germination (82%) in roll towel method, followed by between the incline plate method (80%) while the minimum of 71 per cent was observed with in-sand method sowing at the depth of 2 cm. The percentage of minimum abnormal seedling in roll towel media and inclined plate method (4%) where as the maximum abnormal seedlings absorbed in in-sand media. The lowest dead seed percentage recorded in roll towel (14%), the highest dead seed percentage observed in on-sand media and in-sand media. The seedling length ((2.6 cm), dry matter production (1.23 mg seedlings⁻¹⁰) and vigour index(213) was also recorded highest in roll towel media, and the minimum seedling length (2.3 cm), dry matter production (1.21 mg seedlings⁻¹⁰) and vigour index(163).The statistical analysis revealed that no significant differences were found in dry matter production.

DISCUSSION

In evaluation of seed germination, media is the basic requirement. The media serves as a moisture reservoir and provide a surface or medium in which the seeds can germinate and the seedlings can grow. The main aim of a laboratory germination test is to estimate the maximum number of seeds which can germinate under optimum conditions. The use of standardized ideal conditions (25°C and 95% RH) in the laboratory prescribed by ISTA ensures that results obtained from

a given seed lot in one laboratory should be identical with those obtained from any other laboratory in the same or in other countries. In seed testing, the commonly recommended media (ISTA, 1999) are paper, river /quartz sand, vermiculite and soil. Most widely used paper media are filter paper or germination paper which is easy to handle, versatile and comparatively cheap. The standard seed testing procedure for conducting the germination tests of medicinal plants are not available either in seed testing manual (Chalam *et al.*, 1967) or in the International Rules for Seed Testing (ISTA, 1999). Hence, this situation warrants standardization of media for germination and for getting reproducible results in any species. Not only the media, the method of germination for its fullest expression varied with crop. Hence standardization of methodology in addition to media is also warranted for optioning reproducible results. In the present study, germination media and methodologies were standardized with seeds collected from periyakulam. A maximum of 82 per cent germination was recorded in paper media adopting roll towel method and was followed by inclined plate method (80%), while on sand method recorded least 71 per cent germination.

Seedling length, dry matter production and vigour index showed similar trend as that of germination. The vigour index value was also higher with roll towel medium and was followed by inclined plate method. The lower seedling growth at sand medium might be due to the habitual growth habit of seeds in restricted depth of germination tray while in roll towel medium the better results might be due to the availability of more space for growth and it recorded maximum seedling length and in turn the vigour index. In the present study, it was also observed that the minimum percentage of abnormal seedling was observed in roll towel medium and inclined plate method (4%), while the seeds sown in on sand medium struggled to grow and put forth more of abnormal seedling (9%). Researchers expressed between paper as the best method in many small seeded species namely Singh *et al.* (1990) in methi; Kalavathi (1996) in *Hibiscus*; Swapna (2003) in *Ocimum spp.*, Chauhan *et al.* (2009) in *Andrographis paniculata* and Sumathi (2010) in Karpokkarasi.

Conclusion

Thus the present study highlighted that seed germination could be tested in davana seeds using paper media between the paper (roll towel) method has to be adopted for obtaining reproducible results of germination percentage.

REFERENCES

- Abdul-Baki, A.A. and Anderson. J.D. 1973. Vigour determination in soybean seed by multiple criteria. *Crop Sci.*, 13: 630-633.
- Al-Harbi, M.M., Qureshi, S, Ahmed, M.M., Riza, G.A. and Shah, A.H. 1994. Studies on the Anti-inflammatory antipyretic and analgesic activities of santanonin. *The Jap J. Pharmacol.* 64(3): 135-139
- Chalam, G.V., Singh, A and Darglas, J.E. 1967. Seed testing manual. ICAR, New Delhi, pp. 192-200.
- Chauhan, J.S., Tomar, Y.K., Indrakumar Singh, N., Seema Ali, Anoop Badoni, Debarati and Rana. A. 2009. Assessment of compatible substratum for *Andrographis paniculata* standard seed germination testing. *J. American. Sci.*, 5(6): 70-75.
- ISTA (1993). International Rules for Seed Testing. *Seed Sci. and Technol.*, 21: 1-288 (suppl.).
- ISTA.1999. International Rules for Seed Testing. *Seed Sci. & Technol.*, Supplement Rules, 27: 25-30.
- Kalavathi, D. 1996. Seed production, processing, testing and storage studies in medicinal plants of senna (*Cassia angustifolia* Vahl), periwinkle (*Catharanthus roseus* G. Don cv. Roseus) and roselle (*Hibiscus sabdariffa* Linn.). Ph.D. Thesis, Tamil Nadu Agricultural University, Coimbatore.
- Narayana, M.R., Khan, M.N.A. and Dimri, B.P.1998. Davana and its cultivation in India, *Farm Bull.*, No.12, CIMAP, Lucknow, 11: 1-10.
- Nawabahr. 2008. Effect of media on seed germination of *Cupaniopsis anacardioides* (A. Rich.) Radlk. *Indian Journal of For.*, 31 (1): 137-139.
- Panse, V.G. and Sukhatme,P.V.1985. Statistical methods for Agricultural workers. ICAR, Publication, New Delhi: 327-340.
- Pisana, R.C. Flavour and extract manufactures association of the united states report.11th International congress of essential oils, fragrances and flavours. New Delhi, India. 1989, pp.157.
- Singh, T., Singh, P.V. and Singh, R.K. 1990. Evaluation of best temperature and medium for testing germination of fenugreek seeds in laboratory. *Seed Res.*, 18(1): 31-33.
- Sumathi, S. 2010. Studies on seed production, post harvest handling and seed testing in karpokkarasi (*Psoralea corylifolia* L.) Ph.D. Thesis, Tamil Nadu Agricultural University, Coimbatore.
- Swapna, M. 2003. Tracing seed maturation pattern and development of seed testing procedure for *Ocimum spp.*, M.Sc. (Ag.) Thesis, Tamil Nadu Agricultural University, Coimbatore.
- Willan, R.L. 1985. A guide to forest seed handling with special reference to the tropics. FAO Forestry Paper, 20/2. FAO, Rome.
