

Seed pretreatments enhance germination in *Occimum gratissimum* (lameaceae)

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Abstract: *Occimum gratissimum* (fever plant) is a crop with a wide range of use as a medicinal plant and as a spice. In spite of its huge economic importance, the plant is only grown in homestead. The study investigated the effects of light, temperature and water treatments on the germination of the seeds. The incubation of seeds at 25°C under light condition, coupled with leaching in running water for 12 hours was found to release the dormancy in the seeds of *Occimum gratissimum*. [The Journal of American Science. 2008;4(3):41-45]. (ISSN: 1545-1003).

Keyword: medicinal plants, endangered species, *occimum*, germination, dormancy,

Introduction

Occimum gratissimum (linn), the fever's plant belong to the group of labiates herbs with about 180 genera and 3500 species (Lancer and Gill, 1991; Masfield et al., 1973; Sofowora, 1982). The aromatic leaves add flavor to soups and sauces. *O. gratissimum* produces a volatile oil which has anti-microbial properties (Moundipa et al., 2005; Sofowora, 1982); as such it is being used as a vegetable spice for meat seasoning in Nigeria. Its efficacy in the control of food storage insects and as a fungicide has also been explored (Awuah, 1996; Eze et al., 2006). Its leaf extract is generally believed to cure respiratory infections (Agusiobo, 1984; Lasisi and Ajuwon, 2002). Additionally, it is also used in the treatment of epilepsy, high fever and mental illness (Abdulrahman, 1992; Oliver, 1980; Osifo, 1992). Furthermore, *O. gratissimum* is being used for the cure of diarrhoea, headache, ophthalmic (ocular) diseases, skin diseases, pneumonia, cough, fever, conjunctivitis, as well as digestive disorders (Obuekwe and Obuekwe, 2002; Onajobi, 1986; Sidhu et al., 2007; Sofowora, 1993). In India, it is believed to be used for aromatic baths of fumigations for the treatment of rheumatism and paralysis.

O. gratissimum is an erect perennial shrub, about 1.5m in height and propagates only by seeds. In spite of its enormous economic and industrial potentials, no deliberate attempt has been made to cultivate the crop as it is still grown as a garden plant. With development and its allied ecological problems such as bush burning moving to the rural areas, the compound farm concept is threatened, and as such under-utilized species like *O. gratissimum* are most endangered. Hence, there is need to engage in more research activities that would enhance its, conservation, improvement and processing. A preliminary report indicated frequent loss of viability in the seeds of *O. gratissimum* (Ojeifo and Denton, 1993). In this study, the effect of seed pretreatments on dormancy status of *O. gratissimum* was explored.

Materials and methods

The seeds of *O. gratissimum* were collected from the parent stands. A white table spread of 1m² was spread at the base of the stand. Various terminal racemes on many branches on the stand were gathered by hand and shaken at the direction of the white table spread. The small seeds were then collected from this spread and then were sun-dried, de-husked and stored in the refrigerator.

Seeds of *O. gratissimum* were subjected to germination tests. De-husked seeds were surface-sterilized in 10% w/v chlorox for 30 seconds and rinsed in several changes of distilled water. Fifty seeds were planted in each of the 9 cm diameter petri dishes lined with moist sterile filter. The experiment was carried out under light and dark at 29±1°C. Light was supplied by four 40 watt white fluorescent lamps at a distance of 1 m (1200 lux). The petri dishes for the dark condition were wrapped completely with aluminum foil and kept in a dark cupboard. Fifty seeds were also planted for germination. The set up was subjected to combinations of light/dark and temperature requirements of 10°C, 15°C, 25°C, 30°C, 35°C and 40°C. Observations were made for up to day 10 of incubation. Radicle emergence of up to 1.5 mm was taken as a visible sign of germination.

Dormancy breaking by leaching in water was investigated. Seed lots were wrapped in clean sieve-cloth, placed in a beaker and put under running tap water for 12, 24, 36 and 48 hours. Control seeds were not leached. The seeds were then tested for germination at 25°C under light condition.

Statistical analysis

All experiments were repeated 5 times. Data were statistically analyzed by the SAS software using a completely randomized design and means were compared at the $p = 0.05$ level of significance using Duncan's multiple range test (SAS GLM, $P < 0.05$; SAS Institute, 1989).

Results and Discussion

Germination test showed that the seeds of *O. gratissimum* were in a state of dormancy (Table 1). Seeds germinated poorly especially in the dark with a maximum of 40% after 10 days (Table 1). Germination of seeds of *O. gratissimum* was enhanced under light conditions. 70% seed germination was observed as from the 6th up to the 10th day after sowing. The optimum temperature for seeds subjected to combination of light and temperature treatments was 25°C (Table 2). Light-induced germination was also observed in *Ocimum basilicum* seeds (Dawoud et al., 2003). It has long been established that light sensitivity of seeds operates through the phytochrome pigment systems (Black, 1972; Donohue, 2007). The dormancy challenge on the germination of *O. gratissimum* appears to be a combination of hard seed coat, the presence of germination inhibitors and a light requirement. Hence the release of dormancy from these seeds can only be achieved when the restriction to the entry of water and oxygen is eliminated and that the inhibiting substances are prevented from affecting the biochemistry of germination in these seeds. This would consequently trigger other processes that lead to embryo germination.

The leaching of seeds in running water for 12 hours, coupled with sowing at the optimum temperature and light conditions gave 100% germination (Table 3). It is plausible that germination inhibitors in the seeds, which act by blocking the enzymes sites, have been leached out by the running water. Çırak et al. (2007) also reported the release of exogenous dormancy in the seeds of a *Hypericum* species by presoaking the seeds in water for 24 hours. It was, however, surprising to note that further treatment for longer period under running water for 24-48 hours had deleterious effects on the seeds (Table 3).

On the whole, this study has indicated that *O. gratissimum* germination test should be conducted at 25°C preferably in light. Dormancy in this species can be released by 12 hour washing of the seeds under running tap water.

Table 1. Percentage germination of *O. gratissimum* seeds after 10 days incubation under light and dark at 29±1°C. Data are means of 5 replicates.

Period(days)	Percentage germination	
	Light	Dark
2	0.0±0.0 ^d	0.0±0.0 ^c
4	20±4.5 ^c	0.0±0.0 ^c
5	40±3.7 ^b	0.0±0.0 ^c
6	70±2.4 ^a	30±5.6 ^b
8	70±2.4 ^a	40±2.8 ^a
10	70±2.4 ^a	40±2.8 ^a

*Mean ± SE. Means having the same letter are not significantly different (p=0.05) according to Duncan's multiple range test.

Table 2. Percentage germination of *O. gratissimum* seeds incubated under varying temperatures for 10 days. Data are means of 5 replicates.

Temperature (°C)	Percentage germination	
	Light*	Dark*
10	50±4.6 ^d	25±5.6 ^b
15	65±3.4 ^{bc}	20±2.6 ^b
25	80±4.6 ^a	45±4.8 ^a
30	70±4.7 ^b	50±3.6 ^a
35	60±4.2 ^{cd}	20±3.4 ^{bc}
40	35±4.6 ^e	15±2.1 ^c

*Mean ± SE. Means having the same letter are not significantly different (p=0.05) according to Duncan's multiple range test.

Table 3. Effect of leaching on seed germination in *O. gratissimum*. Data are means of 5 replicates.

Treatment	Duration (hour)*	Percentage germination (10 th day)*
Leaching	12	100±0.0 ^a
	24	50±5.6 ^c
	36	30±3.4 ^d
	48	25±2.7 ^d
Control	-	77±6.5 ^b

*Mean ± SE. Means having the same letter are not significantly different (p=0.05) according to Duncan's multiple range test.

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References

1. Abdulrahman, F. (1992): Studies in Natural Products. The Moraceae in African traditional medicine and management of psychiatry in Borno State. M.Sc. Thesis. Department of Chemistry, University of Maiduguri. Pp. 89-94.
2. Agusiobo ON (1984). Vegetative Gardening. Macmillan Press London pp. 344-345.
3. Awuah RT (1996). Possible utilization of plant products in grain storage. In: Cardwell KF. (ed) Proceedings of the workshop on mycotoxins in food in Africa. November 6–10, 1995 at cotonou, Benin. International Institute of Tropical Agriculture, Benin, p 32.

4. C. Çırak, K. Kevseroğlu and A.K. Ayan (2007). Breaking of seed dormancy in a Turkish endemic *Hypericum* species: *Hypericum aviculariifolium* subsp. *depilatum* var. *depilatum* by light and some pre-soaking treatments. *Journal of Arid Environments* 68 (1): 159-164.
5. Donohue K, Heschel MS, Chiang GCK, Butler CM, Barua D (2007). Phytochrome mediates germination responses to multiple seasonal cues. *Plant, Cell & Environment* 30 (2): 202–212.
6. Eze SC, Asiegbu JE, Mbah BN, Orkwor GC, Asiedu R (2006). Biocontrol of storage insect and use as fungicide were explored *Agro-Science* 5 (1) : 8-12 .
7. Kiranjot Sidhu, Jasjeet Kaur, Gurvinder Kaur and Kunwarjeet Pannu (2007). Prevention and Cure of Digestive Disorders Through the Use of Medicinal Plants. *J. Hum. Ecol.*, 21(2): 113-116.
8. Lancer RHM, Hill GD (1991). *Agricultural Plants*, 2nd edition. Cambridge University Press, pp. 287.
9. Lasisi AO, Ajuwon AJ (2002). Beliefs and perceptions of ear, nose and throat-related conditions among residents of a traditional community in Ibadan, Nigeria. *Afr J Med Med Sci*. 31(1):45-48.
10. Macefield GB, Wallis M, Harrison SG, Nicholson (1973). Labiate Herbs. In: the Oxford Book of Food Plants. Oxford University Press, pp. 142.
11. Moundipa PF, Flore KGM, Bilong CFB, Bruchhaus I (2005). *In vitro* amoebicidal activity of some medicinal plants of the bamun region (cameroon). *Afr. J. Traditional, Complementary and Alternative Medicines* 2 (2): 113 – 121.
12. Obuekwe IF and Obuekwe IC (2002). Indigenous methods used for the management of diarrhoea in an urban community in Edo State, Nigeria. *Journal of Medicine and Biomedical Research* 1 (1) 2002.
13. Ojeifo IM, Denton L (1993). Growing *Occimum gratissimum* in Nigeria: Outlook on the botany, economic importance, cultivation and research strategies. In JA Okojie, Okali DUU (eds) *Lost crop of Nigeria: implications for Food security*. University of Abeokuta Conference proceeding Series (3) pp. 216-230.
14. Oliver, B. (1980): *Medicinal Plants in Nigeria*. Published by Nigerian College of Arts, Science and Technology. Ibadan, Pp. 90-94.
15. Onajobi, FD (1986). Smooth muscle contraction lipidic-soluble principles in chromatography fractions of *Ocimum gratissimum*. *J. Ethnopharmacol.* 18, 3-11.
16. Osifo, N.G. (1992): *A System of Traditional Health Care*. VoL2. Pp. 56.
17. Sofowora (1982). *Medicinal plants and traditional medicine in Africa*. Macmillan London pp. 68-72.
18. Sofowora, L.A. (1993). *Medicinal plants and traditional medicine in Africa*, Spectrum books Ltd, Ibadan. Pp. 55-71.