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Effect of light and temperature on germination behaviour of *Aconitum deinorrhizum* Stapf

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ABSTRACT

The present investigations were undertaken in the Department of Forest Products, College of Forestry, Dr YS Parmar University of Horticulture and Forestry, Nauni, Solan, HP to study the effect of light and temperature on germination behaviour of *Aconitum deinorrhizum*, an endangered medicinal plant of the Western Himalaya. The study revealed that the seeds of *A deinorrhizum* exposed to continuous light conditions gave better responses in terms of initiation of germination, days taken for completion of germination and seed germination percentage as compared to continuous dark condition irrespective of the temperatures. Maximum germination percentage of 76.67 was observed in seeds maintained at 20^0C under continuous light conditions. Under continuous dark conditions seed maintained at 20^0C also gave maximum germination (63.60%). Exposure to 20^0C temperature at continuous light also gave peak value (2.17), germination value (4.58) and germination energy (30.14%) indicating, thereby, that 20^0C temperature is the most optimal for getting higher seed germination in this species.

Keywords: *Aconitum deinorrhizum,* Indian aconite, germination, light, temperature

INTRODUCTION

Aconitum deinorrhizum Stapf, commonly known as mohra and Indian aconite, is one of the important *Aconitum* species in Western Himalayas. Plants of this species are common in the sub-alpine and alpine zone of the Himalaya from Indus to Kumaon occurring at altitudes between 2400-4500 m (Chopra et al 1956, Kirtikar and Basu 1975, Chowdhery and Wadhwa 1984). It is one of the endangered medicinal plants of Western Himalayas and its population reduction rate is 50-80 per cent. It is in the negative list of export (Anon 2003).

A deinorrhizum roots contain alkaloids, which are responsible for its poisonous properties. Air-dried roots contain up to 1.2 per cent of alkaloids chiefly aconitine and pseudo-aconitine. Pseudo-aconitine is highly toxic and biologically 1.5 times as active as aconitine. A sample of roots from Bushahar was reported to contain 0.9 per cent alkaloid of which pseudo-aconitine was 0.4 per cent (Chopra et al 1956, Chopra et al 1965).

The herb is also valued as an anodyne, diuretic and diaphoretic. Externally, it is used with mustard oil as a massage in neuralgia, paralysis and muscular rheumatism (Kirtikar and Basu 1975, Chauhan 1984). Root is smoked in toothache and body pain. Leaves are employed to improve the flavour of country liquor. It is also used in leprosy, cholera and in diarrhoea (Manandhar 1980). The main preparations from the roots of this plant are agnitundivati, laghuvishgarbhataila, swalpkasturi-bhairovrasa, sanjivanivati, mrityunjayarsa, kaphketu-rasa etc. (Chauhan 1999).

A deinorrhizum reproduces through vegetative means and also by seeds. Germination is good in this species but being slow growing and sensitive to climatic conditions, takes more time to come to blooming stage and its later survival is very short due to its sensitivity to the weather and climatic changes. Therefore, slow growth, difficulty in vegetative propagation and continued exploitation without replenishment has depleted its wild resources to an alarmingly low level. This is one of the major reasons that inspite of its immense therapeutic values, this species could not be taken up for commercial cultivation and according to Red Data Book of Indian Medicinal Plants this species has been placed in the category of vulnerable species (Anon 1987).

There is no standard method of propagation of this valuable drug plant, hence requiring immediate attention for its conservation and systematic exploitation from existing resources. Keeping this in view, the present study was contemplated to study the effect of light and temperature on germination behaviour of *A deinorrhizum.*

MATERIAL AND METHODS

The present investigations were conducted in the Department of Forest Products, Dr YS Parmar University of Horticulture and Forestry, Nauni, Solan, HP. Healthy and uniform sized seeds were used for germination studies. The experiment was conducted in seed germinator in the month of March under Completely Randomized Design with nine treatments and three replications. The seeds were soaked in water for 24 hours and separate batches kept under continuous light and dark conditions at 10°C, 15°C, 20°C and 25°C. The control batch was maintained at room temperature.

RESULTS AND DISCUSSION

The results obtained in the present studies are summarized as under :

Days taken for initiation of germination

A perusal of data presented in Table 1 reveal that the earliest germination (13.38 and 14.72 days) was observed at 20°C under both light and dark conditions (T_4 and T_8), respectively, which was significantly lower than control, T_1 (22.18).

Days taken for completion of germination

Exposure of seeds at 20°C to both light and dark conditions resulted in earliest completion of germination (33.62 days in T_4 and 34.33 days in T_8) as against the maximum of 41.12 days taken under control (T_1) condition (Table 1).

Germination

Seeds maintained under control (T_1) condition gave the minimum germination percentage (30.69%) as against the maximum of 76.67 per cent recorded under continuous light at 20°C (T_4). This maximum germination percentage of 76.67 per cent was also statistically higher than all other treatments observed under both light and dark conditions (Table 1).

Peak value (PV)

The maximum peak value of 2.17 observed at 20°C under continuous light (T_4) was significantly higher than all other treatments including control (T_1). The minimum peak value of 0.91 was observed under control condition (T_1) (Table 1).

Germination value (GV)

The maximum germination value (4.58) was observed in T_4, which was significantly higher from all other treatments including control which gave the minimum germination value of 0.87 (Table 1).

Germination energy (%)

The maximum germination energy (30.14%) was observed in T_4 followed by T_5 (26.33%), T_8 (23.67%) and T_2 (22.20%) which was at par with one another. The minimum germination energy of 16.24 per cent was observed in control (T_1) which was significantly lower than T_4 (Table 1).

Seed exposed to continuous light conditions in the present study gave better responses in terms of initiation of germination, days taken for completion of germination and seed germination percentage as compared to continuous dark condition irrespective of the temperatures. Maximum germination percentage of 76.67 was observed in seeds maintained at 20°C under continuous light conditions (T_4). Under continuous dark conditions seed maintained at 20°C also gave maximum germination percentage of 63.50 per cent (T_8), which, however, was statistically significant over T_4. Exposure to 20°C temperature at continuous light also gave maximum peak value of 2.17, germination value 4.58 and germination energy 30.14 per cent. However, it is interesting to note that control set of seeds performed poorly in all parameters studied as compared to both light and dark conditions at different temperature levels. It appears that 20°C temperature under continuous light condition is most optimal for getting higher seed

Table 1. Effect of light and temperature on germination behaviour of seeds

Treatment (s)	Days taken for initiation of germination	Days taken for completion of germination	Germination (%)	Peak value (PV)	Germination value (GV)	Germination energy (%)
T_1 (Control)	22.18	41.12	30.69 (37.39)	0.91	0.87	16.24 (24.19)
Temperature (s)			**Light conditions**			
T_2 (10°C)	18.67	39.33	44.00 (39.98)	0.99	1.03	22.20 (27.57)
T_5 (25°C)	14.22	38.56	68.33 (56.80)	1.77	2.97	26.33 (31.02)
T_3 (15°C)	16.12	37.37	59.00 (53.12)	1.13	2.13	21.69 (26.92)
T_4 (20°C)	13.38	33.62	76.67 (61.15)	2.17	4.58	30.14 (33.04)
T_5 (25°C)	14.22	38.56	68.33 (56.80)	1.77	2.97	26.33 (31.02)
			Dark conditions			
T_6 (10°C)	19.78	39.48	46.64 (43.62)	1.06	1.70	18.16 (26.92)
T_7 (15°C)	17.67	35.14	51.41 (49.72)	1.18	1.98	18.28 (25.08)
T_8 (20°C)	14.72	34.33	63.56 (54.74)	1.70	2.27	23.67 (29.07)
T_9 (25°C)	15.69	38.69	55.00 (47.87)	1.27	2.01	20.90 (25.04)
$CD_{0.05}$	1.44	2.51	(6.62)	0.39	0.96	(5.96)

Figures in parentheses are arc sine transformed values

germination in this species. Semwal et al (1983) in *Picrorrhiza kurrooa* has found that germination initiation in light conditions took 3 days after sowing, whereas, germination started 9.2 days after sowing in complete darkness. Similarly, Nautiyal (1986) reported that *A heterophyllum* and *N jatamansi* showed 92.00 per cent germination in light conditions as compared to dark, highest germination occurred at 30°C in *M polyandra* and *R emodi* seeds while only few seeds germinated at 20°C and none at 10°C. Similar results have also been observed in *Fragaria daltoniana* and *Polygonum emodi* seeds when placed at 25°C under light condition (Nautiyal et al 1987, Nautiyal et al 2005).

REFERENCES

Anonymous 1987. Red data book of Indian plants. Botanical Survey of India, Dehradun, pp 311-313.

Anonymous 2003. *Aconitum deinorrhizum* Stapf: In Conservation assessment and management prioritisation for the medicinal plants of Jammu and Kashmir, Himachal Pradesh and Uttaranchal. Eds Ved DK, Kinhal GA, Ravi Kumar V, Prabhakaran V Ghate V, FRLTH, Bangalore, pp 95-96.

Chauhan NS 1984. Medicinal wealth of Pabbar valley in Himachal Pradesh. MSc thesis. HPKV, Palampur, HP, India.

Chauhan NS 1999. Medicinal and aromatic plants of Himachal Pradesh. Indus Publishing Company, Tagore Garden, New Delhi, pp 66-69.

Chopra RN, Badhwar RL and Gosh S 1965. Poisonous plants of India. ICAR, New Delhi, pp 110-113.

Chopra RN, Nayer SL and Chopra IC 1956. Glossary of Indian medicinal plants. CSIR, New Delhi, 4p.

Chowdhery HS and Wadhwa BM 1984. Flora of Himachal Pradesh–analysis botanical survey of India. New Delhi, 65p.

Kirtikar KR and Basu BD 1975. Indian medicinal plants. 2nd edition, Bishan Singh Mahendra Pal Singh, Dehradun, pp 38-40.

Manandhar NP 1980. Medicinal plants of Nepal Himalaya. Patna Pustak Bhandar, Kathmandu, Nepal, 7p.

Nautiyal MC 1986. Germination studies on some high altitude medicinal plants species. Indigenous Medicinal Plants Symposium, pp 107-112.

Nautiyal BP, Prakash V, Chauhan RS, Purohit H, Vashistha R and Nautiyal MC 2005. Cultivation of *Aconitum* species. Journal of Tropical Medicinal Plants **6(2)**: 193-200.

Nautiyal MC, Rawat AS, Bhadula SK and Purohit AN 1987. Seed germination in *Podophyllum hexandrum*. Seed Research **15(2)**: 206-209.

Semwal JK, Purohit AN and Gaur RD 1983. Seed germination in some Himalayan alpine plants. Seed Research **11(1)**: 42-46.

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