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Seed scarification studies in certain medicinal plants inhibiting the grasslands of Nilgiri Biosphere Reserve, Western Ghats

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Abstract

Seed scarification studies in six medicinal plants namely, *Anaphalis elliptica* DC., *Ceropegia pusilla* W.&A., *Hedyotis articularis* Br., *Heracleum rigens* Wall., *Leucas vestita* Benth. and *Luzula campestris* DC. inhabiting the Nilgiri Biosphere Reserve, Western Ghats were carried out to know their germinability. The results showed that the seed germination rate increased in all the six species by seed treatment with the growth promoter, Indole Acetic Acid (IAA) at 100-150ppm. The growth promoter, Napthalene Acetic Acid (NAA) at 100-150ppm also influenced seed germination percentage of the four species *viz*., *Ceropegia pusilla*, *Heracleum rigens*, *Leucas vestita* and *Luzula campestris*. The growth hormone, Gibberellic Acid (GA_3) at 100-150ppm was found to be effective for seed germination in three species *viz*., *Hedyotis articularis*, *Heracleum rigens* and *Leucas vestita*. It is concluded that the treatment of seeds with the growth promoters IAA, NAA and GA_3 at the concentration between 100-150ppm are more effective for the germination of seeds of all the six species studied. It is suggested that the sowing of seeds in suitable micro-sites of grasslands of Nilgiri Biosphere Reserve after this standardized treatment can be practised to enhance the populations of these plants considerably.

Keywords: grass lands, medicinal plants, Nilgiri Biosphere Reserve, seed scarification, Western ghats

INTRODUCTION

One of the most important survival mechanisms for plants growing in unpredictable conditions is their ability to produce a population of seeds with considerable variation in their germinability i.e., heteroblasty (Gutterman, 1985). Many environmental factors including some intrinsic factors like embryo development, longevity of storage tissues, activity of enzymes etc. influence germination process in seeds. Some economically important plants *viz*., *Anaphalis elliptica*, *Ceropegia pusilla*, *Hedyotis articularis*, *Heracleum rigens*, *Leucas vestita* and *Luzula campestris* inhabiting the high altitude grasslands (>1600 above msl.) of Nilgiri Biosphere Reserve, Western Ghats are determined to have less perpetuation in their communities mainly due to the lower rates of seed germination and seedling survival (Suresh, 2008). In view of this, the present study was conducted to determine the response of the seeds of these species to scarification and treatment with some growth promoters, so as to increase the population in their habitats.

MATERIALS AND METHODS

Plant description

The six plant species selected for the present study, *viz*., *Anaphalis elliptica* of Asteraceae, *Ceropegia pusilla* of Asclepiadaceae, *Hedyotis articularis* of Rubiaceae, *Heracleum rigens* of Apiaceae, *Leucas vestita* of Lamiaceae and *Luzula campestris* of Juncaceae are distributed in the four grasslands of Nilgiri Biosphere Reserve, Western Ghats, namely, Thiashola, Korakundah, Ebbenadu and Wenlocdown between altitudes 1650 and 2200m above msl. All these species are reported to have medicinal values also (Anonymous, 1940-1976; Jain, 1996). The powder form of whole plant of *Anaphalis elliptica* is used for treatment of fever. The powder form of tubers of *Ceropegia pusilla* is used in the treatment of dysentery, diarrhoea and indigestion. The paste of whole plant of *Hedyotis articularis* is used to cure cholera, diarrhoea, dysentery and fever. The fruits of *Heracleum rigens* is reported to cure fever. The leaves of *Leucas vestita* in the form of paste is used in the treatment of rheumatism. Rhizome in the form of paste of the species, *Luzula campestris* is used as diuretic.

Methods

The healthy seeds of all the six study species were collected from the grasslands of Nilgiri Biosphere Reserve, Western Ghats, during the seed maturation period and brought to the laboratory. The seeds were air-dried for a fortnight at room temperature, after which they were stored in polyethylene bottles for the study.

Uniform seeds were surface sterilized with 0.1% aqueous solution of mercuric chloride for about 5 minutes. Then they were washed thoroughly with distilled water and soaked in 50, 100, 150 and 200ppm of Indole Acetic Acid (IAA), Naphthalene Acetic Acid

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(NAA) and Gibberellic Acid (GA_3) for 24 hours at room temperature. Acid treatment with conc. H_2SO_4 for 30 seconds and hot water treatment for 5 minutes were also given for all the six species separately.

The seeds soaked in distilled water served as control. After 24 hours they were again washed with distilled water and sown in Petri plates lined with filter paper placing 25 seeds/plate. The filter papers were regularly watered with equal quantity of distilled water. Observations were made on the 30th day after sowing for seed germination count. The criterion for germination was the visual detection of protrusion of radicle. Triplicates were maintained for all the six species.

RESULTS AND DISCUSSION

The results of seed scarification and treatment of seeds with growth promoters *viz*., IAA, NAA and GA_3 at different concentrations, conc. H_2SO_4 and hot water for the six studied species showed varied response (Table 1). Generally, the IAA treatment of seeds at 100-150ppm for all the six species enhanced the germination percentage from 5 - fold (*Ceropegia pusilla*) to 9 - fold (*Anaphalis elliptica*, *Leucas vestita* and *Luzula campestris*) greater than that of the control. However, for the four species *viz*., *Ceropegia pusilla*, *Heracleum rigens*, *Leucas vestita* and *Luzula campestris*, the growth promoter, NAA at 100-150ppm enhanced the germination percentage at maximum level. For three species, *Hedyotis articularis*, *Heracleum rigens* and *Leucas vestita* the treatment of seeds with GA_3 and IAA at 100-150ppm separately increased the germination percentage at the highest level than any other treatment. This indicates that the nature of treatment and types of seeds subjected under treatment are the most important factors influencing the germination behaviour despite many other environmental factors (Mayer and Mayber, 1966; Egharevba *et al*., 2005; Hossain *et al*., 2005). Early studies also confirmed that the treatment of seeds with the growth promoters like IAA, NAA and GA_3 at different concentrations and other chemicals to be very effective in many plants (Gutterman, 1985; HuanZhang *et al*., 2003; Butola and Badola, 2004; Sharma *et al*., 2006; Shivanna *et al*., 2007).

It has been observed that further increase in concentration of all the growth promoters above 150ppm decreased the germination percentage significantly in all six species studied. Singh and Murty (1987) explained that the concentration of growth substances beyond the optimum level influences negatively in seed germination process. The acid and hot water treatments in the present study exhibit no response with respect to germination percentage in comparison to control. This fact may be explained that these treatments are effective only for the species of hard seed coat, but in the presently studied species, the seeds are soft with thin seed coat and hence acid and hot water treatments are unwarranted as they activate the tissues and might kill

Table 1. Percent germination of seeds of *Anaphalis elliptica*, *Ceropegia pusilla*, *Hedyotis articularis*, *Heracleum rigens*, *Leucas vestita* and *Luzula campestris* as influenced by growth hormones in different concentrations and conc. H_2SO_4 and hot water 30 days after sowing.

Treatment		Species					
		Anaphalis elliptica	*Ceropegia pusilla*	*Hedyotis articularis*	*Heracleum rigens*	*Leucas vestita*	*Luzula campestris*
Control		2±0^a	2±0^a	2±0^a	2±0^a	2±0^a	1±0^a
IAA (ppm)	50	9±1^b	0±0^b	1±0^b	1±0^b	1±0^b	1±0^b
	100	13±2^c	4±1^c	9±2^c	15±3^c	18±3^c	5±1^c
	150	18±3^d	10±2^d	15±3^d	4±0^d	13±2^d	9±2^d
	200	0±0^e	2±0^a	0±0^e	3±0^d	3±0^e	0±0^e
NAA (ppm)	50	1±0^a	0±0^a	1±0^a	1±0^a	1±0^a	1±0^a
	100	5±1^b	7±0^b	5±1^b	17±1^b	17±1^b	5±1^b
	150	2±0^c	5±1^c	8±2^c	14±1^c	11±1^c	8±1^c
	200	0±0^d	2±0^d	0±0^d	2±0^d	4±1^d	0±0^d
GA_3 (ppm)	50	0±0^a	0±0^a	1±0^a	2±0^a	1±0^a	1±0^a
	100	3±1^b	5±1^b	11±2^b	13±2^b	16±2^b	5±2^b
	150	2±0^b	3±0^c	14±3^c	7±0^c	14±1^c	3±1^c
	200	0±0^c	3±1^c	1±0^a	3±0^d	2±0^d	1±0^a
Conc. H_2SO_4		0±0	0±0	0±0	0±0	0±0	0±0
Hot water		0±0	0±0	0±0	0±0	0±0	0±0

In columns in each treatment the values followed by different letter are significantly varied at 5% level according to DMRT.

the embryonic tissues, arresting the enzymatic activity too (Sadhu, 1999).

It is concluded that the treatment of seeds with the growth promoters like IAA, NAA and GA_3 at the concentration between 100 and 150ppm is more favourable for the enhancement of germination of seeds of all the six species studied. Hence, to improve the population status of these species in the grasslands of Nilgiri Biosphere Reserve, the seeds can be collected in bulk during appropriate seasons and sown randomly in their habitats after treating them with the growth promoters like IAA, NAA and GA_3 separately at 100-150ppm.

REFERENCES

Butola, J.S. and Badola, H.K. 2004. Effect of pre-sowing treatment on seed germination and seedling vigour in *Angelica glauca*, a threatened medicinal herb. *Curr. Sci.*, 87 : 796-799.

Egharevba, R.K., Ikhatua, M.I. and Kalu, C. 2005. The influence of seed treatments and growing media on seedling growth and development of African walnut, *Plukenetia conophorum*. *Afri. J. Biotechnol.*, 4: 808-811.

Gutterman, Y. 1985. Flowering, seed development, and the influences during seed maturation and seed germination of annual weeds. *In*: S.O. Duke (ed.). *Weed Physiol.*, 1: 1-25.

Hossain, M.A., Arefin, M.K., Khan, B.M. and Rahman, M.A. 2005. Effects of seed treatments on germination and seedling growth attributes of Horitoki (*Terminalia chebula* Retz.) in the nursery. *Res. J. Agric. Biol. Sci.*, 1: 135-141.

HuanZhang, G., XinMei, B. and XiaoXiang, H. 2003. Effect of plant growth regulators on seed germination and seedling growth of walnut. *J. Hubei Agric. Coll.*, 23: 161-163.

Mayer, A. M. and Mayber, A. P. 1966. The germination of seeds. *In International Series of Mmonographs on Pure and Applied Biology*. Vol. III. Pergamon Press, London.

Sadhu, M.K. 1999. *Plant propagation*. New Age International (P) Limited, Publishers, New Delhi, Chennai.

Saraswathamma, D.N. and Jayachandra, 1981. Effect of pre-sowing soaking with growth regulators on the seedling growth in fenugreek (*Trigonella foenum-gracecum* L.) var. Pusa Early Bunching. *Comp. Physiol. Ecol.*, 6: 108-110.

Sharma, R.K., Sharma, S. and Sharma, S.S. 2006. Seed germination behaviour of some medicinal plants of Lahaul and Spiti cold desert (Himachal Pradesh): implications for conservation and cultivation. *Curr. Sci.*, 90: 1113-1118.

Shivanna, H., Balachandra, H.C. and Suresha, N.L. 2007. Influence of growth regulators and pre-sowing chemicals on germination and growth parameters of *Prosopis cineraria* (L.) Druce. *Karnataka J. Agri. Sci.*, 20: 328-329.

Singh, C. 1989. Changes in seed germination and seedling growth processes induced by various growth regulators in *Cassia glauca* Lamb. *Acta. Bot. Indica*, 17: 68-75.

Singh, C. and Murty, Y.S. 1987. Effect of some growth regulators on the seed germination and seedling growth of *Cassia obtusifolia* Linn. *Acta. Bot. Indica*, 15: 74-79.

Suresh, D. 2008. Perpetuation level and regeneration strategies for the poorly established plant species in four grasslands of Nilgiris, the Western Ghats, India. *Ph.D., thesis*, Bharathiar Univ., Coimbatore, India.