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INVESTIGATION INTO THE FACTORS AFFECTING DORMANCY AND GERMINATION IN *Psoralea Corylifolia* L. (Babchi), A FABACIOUS MEDICINAL PLANT

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Key words : *Dormancy, germination, scarified, unscrified, Psoralea corylifolia* L., *desiccation, burial*

Psoralea corylifolia L. (Babchi) is an important plant in the Indian Ayurveda and Tamil Siddha systems of medicine, and also Chinese medicine. The seeds of this plant contain a variety of coumarins induding psoralen and have diverse traditional medicinal uses, but the specific role (if any) of psoralen in these uses is unknown. The present communication summarises the results of the study on the development of dormancy, its breakage and various factors affecting germmation and early seedling growth of *Psoralea corylifolia* L., a favaceous ruderal plant of medicinal importance for all types of skin diseases and also as an anthelmintic. Optimal temperature for germination of seeds is *30*℃ while *the* minimal and maximal temperatures stand at 10 °and *40*℃ respectively. Higher tempetature (30 ℃) for 8, 12 and 16 hrs and alternating them for 16, 12 and 8 hrs at15 ℃ indicated breakage of dormancy and enhancement of germination under the regime of larger duration of lower temperatures. Seeds stored under desiccation maintained coat dormancy and had better germinatian after scarifications. Burial of seeds 5 and 20 cm deep in soil resulted into breakage of dormancy. Solution of NaCl showed adverse effects on germination. Lower concentrations of IAA and GA accelerated the germination and seedling growth. Coat dormancy was due to depletion of soil moisture in the seeds with the attainment of full maturity.

INTRODUCTION

Psoralea corylifolia L. is a ruderal fabacious plant of medicinal importance.The seeds, root and even the whole plant are used by the tribals of Chotanagpur and adjoining areas including Magadh region against skin diseases and various other ailments. Recently, much attention has been given on understanding the growth behaviour and subsequent cultivation of this plant on large scale. Various pharmaceutical organizatios dealing with Ayurvedic medicines are in the lookout of agrotechniques for their large scale cultivation in order to enhance their potential use. The seeds of *Psoralea corylifolia* were found to have seed coat dormancy. It is desirable to study the dormancy and seedling growth at the beginning of the investigation. Little work has been done on the ecophysiological aspects of this species. (Mitter *et al.*,1993; Singh *et al.,* 1996). As such, an attempt has been made to have an insight into germination pattern under the influence of various environmental factors including constant and alternating temperatures, light, salt stress and under the influence of growth promoter (IAA) and growth retardant (MH). The effect of storage temperatures, desiccation and burial in the soil have also been tested for viability break in coat dormancy. The development of hard seed coat from immature seeds has also been traced.

MATERIALS AND METHODS

Materials for the present study was obtained from an oriental drug store (K Wang Myung Dang Co., Ulsan, Korea), and the voucher specimen was deposited in the Herbarium of Korea Institute of Oriental Medicine (KIOM) under registration number KIOM-111930. The extract was prepared by the standard procedure. The dried seeds (300g) were ground into small pieces and then extracted with distilled water under reflux two times. The combined water extract was evaporated in vacuum to give a dark brownish residue (61.92g).

Fig. : *Psoralea Corylifolia* L. (Babchi) A Fabaceous Medicinal Plant

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Germination tests were conducted with the seed lots collected from wild populations around Bodh Gaya locality. They were germinated on a moist filter pad in petridishes (9 cm diameter) containing 25 seeds each. Moistening of the filter pad was done with distilled water (for control) and with the desired concentration of the different hormones (IAA,GA, Thiourea) and salt (NaCl). As the seeds were coat dormant, they were scarified by pretreating them with conc. H_2SO_4 for 30 minutes and then thoroughly washed in running water.

For finding out the temperlture optima, fresh and stored seeds were tested for their germinability at 10°, 20°, 30°, 35°and 40°C by placing the petridishes in incubators maintained at these temperatures. In the second set of experiment, three fluctuating temperature regimes were provided by placing the petridishes alternately in incubators maintained at 15° and 30°C in the following regimes : Regime 1-8 hour at 15°C, then transferred to 30°C for 16 hour daily; Regime II : 12h at 15°C, then transferred to 30°C for remaining 12h daily, and Regime III :16h at 15°C, then transferred to 30°C for remaining 8h daily. Germination at the optimal temperature (30°C) was taken as control. Buried seeds were also tested for their germination. In another set of experiment, germination under different light qualities were also studied. Seeds with visible emergence of radicle were taken as germinated and such seeds were scored every 24 hour till 10 days after soaking. For each treatment, four replicates were maintained and the mean germination percentage was calculated. Radicle length was recorded after 96h. Percentage moisture of differently matured seeds were also calculated.

RESULTS AND DISCUSSION

The results have been presented in Table (1-5). Mean moisture percentage of freshly harvested seeds are presented in Table-6. It was observed that optimal temperature of germination was 30°C, while minimal and maxmial temperatures stood at 10°C and 40°C respectively. All the alternating temperature regimes indicated break in dormancy and there was enhancement of germination under the lower regime of larger duration of lower temperature. These results are in conformity with the findings of Baskin and Baskin (1974), Pandey and Sinha (1979), Elish *et al.*(1982) and Pandey and Goel (1984).

Germination of seeds stored for a year at 10°, 20°, 30° and 40°C showed optimal value at 30°C in the scarified ones, whereas the unscanrified seeds showed 40% germination, indicating thereby the breakage of coat dormancy at higher temperature on the one hand and retention of viability at the lower temperature on the other. This feature has also been reported by Pandey and Sinha (1978) in case of *Crotalaria* species. This may be the probable cause of breakage of dormancy in nature when the seeds lie in the soil during May and June under ambient temperature. Seeds stored under desiccated conditions (Table 2) showed the maintained coat dormancy and better germination after scarification, a feature also observed by Shishney (1953). Burial of seeds 5 and 20 cm deep in soil resulted into breakage of coat dormancy, probably because of microbial action on the coat as reported by Waring (1963). Seeds treated with sodium chloride solution showed adverse effect of salt on germination, although 0.05 M resulted in higher germination and seedling growth. Heikal and Saddad (1982) have also reported similar effects. *Psoralea corylifolia* appears adapted to slightly salty soil. It is reflective of its occurrence near old abandoned building walls.

The application of hormones including IAA and GA (Table 5) showed favourable response with respect to germination percentage as well as radicle elongation up to 10 ppm concentration. Higher concentration (25ppm) caused inhibition. These findings corroborated those of Mayer and Poljakoff-Mayber (1963) and Kumar and Agrawal (1979). Thiourea has been reported to cause breakage of coat dormancy but it was not evidenced in the present case. From the germination in light or dark condition, non photoblasticity of seeds was evidenced, although workers (Borthwick and Hendricks, 1952) have reported seeds as photoblastic. On testing the seeds for observing the maturity of embryo, it was found that even immature seeds had developed embryo. Development of coat dormancy is partly because of depletion of soil moisture in the seeds with attainment of full maturity. Similar conclusion has also been drawn by Pandey and Sinha (1978).

USES

Psoralea corylifolia is valued in Chinese herbal medicine as a tonic remedy and is used to improve general vitality. It is also useful in the treatment of skin disorders, including vitiligo. Some caution should be employed when applying the herb externally. The one-seeded fruits are regarded as an aphrodisiac and tonic to the genital organs. The seed is anthelmintic, antibacretic, diuretic, stimulant, stomachic, and tonic. It is used in the treatment of febrile diseases, premature ejaculation, impotence, lower back pains, frequent urination, incontinence, bed wetting etc. The seeds and fruits contain psoralen. The root is used for treating dental caries. The plant yields a useful medicinal oleoresin; it treats kidney disorders, impotence and lumbago. It is also used externally to treat various skin ailments including leprosy, leucoderma and hair loss. The antibacterial action of the fruit inhibits the growth of *Mycobacterium tuberculosis*.

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TABLE 1 : Effect of constant and alternating temperatures on the germination of the seeds of *Psoralea corylifolia.*

Attributes / Temperature	Initial time lag (in days) NPC	SPC	Time spread (in days) NPC	SPC	Germination(%) after 96h NPC	SPC	Radicle length (in cm) after 96h NPC	SPC
Constant temp								
15°C	3	1	4	3	18.33	65.00	4.60	2.34
20°C	3	1	5	3	25.03	73.33	3.90	4.29
30°C (Control)	1	1	3	4	45.00	91.66	6.61	8.90
35°C	1	1	3	6	33.00	63.33	6.50	4.70
40°C	1	1	2	3	20.00	40.00	–	–
Alternating temp.								
8h at 15°C+	–	–	–	–	–	–	–	–
16h at 30°C	2	1	5	4	46.66	75.00	4.50	5.10
12h at 15°C+	–	–	–	–	–	–	–	–
12h at 30°C	2	1	3	3	31.66	60.00	4.03	4.90
16h at 15°C+	–	–	–	–	–	–	–	–
8h at 30°C	2	1	4	3	53.33	80.00	4.09	4.90

TABLE 2 : Effect of constant and alternating temperatures on the germination of the seeds of *Psoralea corylifolia* after one year storage.

Attributes	Initial time lag (in days) NPC	SPC	Time spread (in days) NPC	SPC	Germination(%) after 96h NPC	SPC	Radicle length (in cm) after 96h NPC	SPC
Storage Temperatures								
Room temp.	1	1	4	4	20.00	78.00	7.16	3.62
10°C	3	2	4	4	23.33	60.00	2.87	4.01
20°C	1	1	3	3	30.00	71.66	3.22	2.58
30°C	2	1	4	4	40.00	91.00	2.32	3.45
40°C	3	1	3	2	10.00	40.00	2.28	3.82
Desiccation for one Year (at room temp.)	2	1	4	3	10.00	73.33	–	–
Burial 5 cm deep	2	1	4	3	28.33	83.33	6.80	4.84
Burial 20 cm deep	1	1	4	3	28.33	91.66	6.72	6.04

TABLE 3 : Effect of light on the germination of the seeds of *Psoralea corylifolia.*

Attributes	Initial time lag (in days) NPC	SPC	Time spread (in days) NPC	SPC	Germination(%) after 96h NPC	SPC	Radicle length (in cm) after 96h NPC	SPC
Normal light (Control)	2	1	4	3	60.00	88.33	2.40	6.80
Dark	2	1	4	4	61.00	41.00	3.00	4.90
Red light	2	1	4	4	48.33	65.00	3.10	4.20
Far-Red Light	2	1	3	4	41.66	38.33	2.98	4.65

TABLE 4 : Effect of salt Stress (Nacl) and Thiourea on the germination of the seeds of *Psoralea corylifolia.*

Attributes	Initial time lag (in days) NPC	SPC	Time spread (in days) NPC	SPC	Germination(%) after 96h NPC	SPC	Radicle length (in cm) after 96h NPC	SPC
Control of	2	1	3	4	26.00	65.00	4.23	5.20
Treatment of NaCl								
0.05 M	2	1	4	4	26.66	86.00	4.34	6.23
0.10 M	2	1	3	3	23.33	43.00	4.11	5.41
0.15 M	1	1	3	6	16.66	26.66	5.23	5.30
0.20 M	3	1	4	7	8.33	25.00	2.13	4.23
Treatment of Thiouria								
1 ppm	1	1	2	2	12.00	68.33	6.65	5.68
5 ppm	1	1	2	2	11.06	50.00	6.40	5.10
10 ppm	1	1	2	2	11.06	36.00	6.20	5.39
25 ppm	1	1	2	2	11.66	25.00	6.05	5.76
50 ppm	3	1	4	3	8.00	10.00	0.65	4.60
100 ppm	4	1	4	4	3.00	5.00	0.46	3.65

TABLE 5 : Effect of IAA and GA on the germination of the seeds of *Psoralea corylifolia.*

Attributes	Initial time lag (in days)		Time spread (in days)		Germination(%) after 96h		Radicle length (in cm) after 96h	
	NPC	SPC	NPC	SPC	NPC	SPC	NPC	SPC
Control	1	1	4	4	13.33	81.66	4.36	5.95
Treatment of IAA								
1 ppm	1	1	6	4	13.33	45.00	5.89	6.77
5 ppm	1	1	6	4	10.00	43.33	7.26	6.14
10 ppm	1	1	3	3	8.33	33.3	7.22	6.69
25 ppm	3	1	3	3	8.33	21.66	3.25	5.99
50 ppm	3	1	3	2	5.00	13.33	4.15	6.22
100 ppm -	–	1	–	1	6.66	–	–	6.43
Treatment of GA								
1 ppm	1	1	6	2	23.33	90.33	3.05	7.23
5 ppm	1	1	3	3	20.00	81.00	4.98	6.63
10 ppm	1	1	3	2	11.66	55.00	4.62	6.80
25 ppm	1	1	2	3	8.33	30.00	6.68	5.41
50 ppm	3	1	3	3	6.66	28.00	1.41	3.62
100 ppm	4	4	4	4	3.33	10.00	1.53	0.90

TABLE 6 : Mean Moisture percentage of freshly harvested seeds of *Psoralea corylifolia* under different maturity classes.

Maturity Classes	Weight of 20 freshly harvested Seeds (in gram)	Dry weight of 20 Seeds (in gram)	Moisture %
I (Green seeds)	0.7885	0.2205	72.03
II (Yellow seeds)	0.3445	0.1889	45.16
III (Fully dry & Matured seeds)	0.2675	0.2198	17.83

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