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SEED GERMINATION BEHAVIOUR OF SIX MEDICINAL PLANTS FROM BANGLADESH

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Abstract

This paper focuses on seed germination of six indigenous medicinal plants of Bangladesh, namely *Adenanthera pavonina* L., *Helicteres isora* L., *Murraya paniculata* (L.) Jack, *Psoralea corylifolia* L., *Uraria lagopodioides* (L.) Desv. and *U. picta* (Jacq.) Desv. *ex* DC. The minimum days taken to germinate seeds in *Adenanthera pavonina* L., *Murraya paniculata* (L.) Jack, *Psoralea corylifolia* L., *Uraria lagopodioides* (L.) Desv. and *U. picta* (Jacq.) Desv. *ex* DC. are 12, 36, 10, 39 and 14, respectively. Seeds were not germinated in *Helicteres isora* L. indicating that seeds are not suitable for propagation, however, propagation through stem cutting in this species revealed that plants flowers and set fruits in the same year and take only six to seven months. Epigeal type of seed germination was observed in all cases.

Introduction

Medicinal plants play an important role in human life since they are employed as raw materials for the extraction of active constitution in pure form, as precursor for synthetic vitamins and steroids, and as preparations for herbal and indigenous medicines (de Padua *et al*., 1999). Yusuf *et al*. (2009) documented 747 species of medicinal plants occurring in Bangladesh. *Adenanthera pavonina* L., *Helicteres isora* L., *Murraya paniculata* (L.) Jack, *Psoralea corylifolia* L., *Uraria lagopodioides* (L.) Desv. and *U. picta* (Jacq.) Desv. *ex* DC. are six important medicinal plants commonly found in the country and used in traditional medicine. Seeds of *Adenanthera pavonina* L. (Fabaceae) are used in the treatment of boils, inflammation, cholera and paralysis (Ghani, 2003). Leaf paste of *Helicteres isora* L. (Sterculiaceae) is used in the treatment of eczema, while stem bark and roots are considered to be demulcent, expectorant, astringent and anti-galactagogue, and are employed for treating dysentery, diarrhoea and biliousness (Ghani, 2003). Leaves of *Murraya paniculata* (L.) Jack (Rutaceae) are astringent, and used in diarrhoea and dysentery; a decoction of leaves is taken in dropsy and powdered leaf is applied to fresh cuts (Yusuf *et al*., 2009). *Psoralea corylifolia* L. (Fabaceae) is claimed to be useful in skin disorders, eczema and hair loss; fruits are laxative, aphrodisiac and are used for the treatment of leucoderma and leprosy; while seeds are used as laxative, diaphoretic, stomachic and anthelmintic (Ghani, 2003). *Uraria lagopodioides* (L.) Desv. is used in remittent fever, asthma, dysentery and for treatment of inflammation in chest. Decoction of leaves is used in diarrhoea (Yusuf *et al.*, 2009). *U. picta* (Jacq.) Desv. *ex* DC. a source of antiseptic and leaves are used in gonorrhoea; roots are aphrodisiac and decoction of roots is used in fever and cough (Yusuf *et al*., 2009).

The germination response pattern of seeds is an important phenomenon in plant life history strategy (Mayer and Poljakoff-Mayber, 1989). In the recent past studies on seed germination and reproductive biology on different groups of plants have received considerable attention (Chauhan and Johnson, 2008; Liebst and Schneller, 2008; Vandelook and van Assche, 2009; Clements *et al.*, 2010; Han and Long, 2010; Kameneva and Koksheeva, 2013), however, very little is known on

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the seed germination pattern of medicinal plants (Hassan and Fardous, 2003; Liza *et al*., 2010; Rahman *et al*., 2012). Since medicinal plants are employed for primary healthcare system, emphasis to be given on seed germination patterns of medicinal plants, as in many cases they need to bring under cultivation. However, no earlier study has surveyed germination patterns in the medicinal plants employed in the present study. Therefore, the objective of the present work is to explore seed germination pattern and dormancy of seeds in *Adenanthera pavonina* L., *Helicteres isora* L., *Murraya paniculata* (L.) Jack, *Psoralea corylifolia* L., *Uraria lagopodioides* (L.) Desv. *ex* DC. which might help in bringing the plants under cultivation.

Materials and Methods

Six medicinally important plants selected for this study are *Adenanthera pavonina* L., *Helicteres isora* L., *Murraya paniculata* (L.) Jack, *Psoralea corylifolia* L., *Uraria lagopodioides* (L.) Desv. and *U. picta* (Jacq.) Desv. *ex* DC. Plants materials were collected from different areas of the country and planted in the Botanical Garden of Dhaka University for closer observation and critical study. The voucher specimens are deposited in Dhaka University Salar Khan Herbarium (DUSH).

Seeds of six species were collected from mature fruits and preserved under laboratory condition. Rahman *et al*. (2012) was followed for seed germination experiment. For sowing of the seeds earthen pots of 10 inch in diameter filled up with a mixture of soil and compost (2:1). In order to prevent fungal infection and microbial contamination seeds were treated with fungicides prior to sowing. Ten mature seeds for each taxon were sown in earthen pots at different time intervals to record dormancy and viability, suitable time for germination, percentage and type of germination. Propagation through stem cutting was performed in *Helicteres isora* as seeds were not germinated in this species.

Result and Discussion

Seed germination study on six species revealed that seeds of *Helicteres isora* did not germinate, while seeds of the remaining five species, *viz., Adenanthera pavonina*, *Murraya paniculata*, *Psoralea corylifolia*, *Uraria lagopodioides* (L.) Desv. and *U. picta* germinated.

Results of seed germination in *Adenanthera pavonina*, *Murraya paniculata* and *Psoralea corylifolia*, *Uraria lagopodioides* and *U. picta* are presented in Table 1. The minimum days taken for germination of seeds in *Adenanthera pavonina* are 12 and the suitable time for seed sowing is April when the germination rate is the highest. Seeds of *Murraya paniculata* required minimum 36 days to germinate and the germination rate is found to be higher in April. In *Psoralea corylifolia* seeds were sown in different months but the highest percentage of seed germination was noted in July and the best time for seed sowing for this species is June. The minimum days taken to germinate the seeds were 10.

The present study reveals that in *Uraria picta* seeds sown after collection in December (12.12.2011) did not germinate, whereas seeds sown in mid of April (15.4.12) took 14 days indicating the minimum time for its germination. It is evident that in *Uraria lagopodioides* seeds sown after collection in December (12.12.2011) were not germinated as well. The minimum days required for seed germination in this species is 39 when seeds sown near mid April (Table 1).

Table 1. Results of seed germination of five species of medicinal plants.

Species	Date of seed collection	Date of seed sowing	No. of seeds sown	No. of seeds germinated	Days taken to germinate	% of germination
Adenanthera pavonina L.	19.12.2010	4.3.2011	10	4	42-45	40%
		25.3.2012	10	6	15	60%
		15.4.2012	10	10	12	100%
Murraya paniculata (L.) Jack	29.1.2012	1.2.2012	10	2	42	20%
		27.2.2012	10	2	36	20%
		13.3.2012	10	3	38	30%
Psoralea corylifolia L.	5.5. 2012	5.5.2012	10	2	12	20%
		19.6.2012	10	4	10-17	40%
		14.9.2012	10	2	13	20%
Uraria lagopodioides (L.) Desv.	29.11. 2011	12.12.2011	10	0	-	-
		1.1. 2012	10	0	-	-
		14.2.2012	10	1	80	10%
		12.4.2012	10	1	39	10%
U. picta (Jacq.) Desv. *ex* DC.	7.12. 2011	12.12.2011	10	0	-	-
		1.1. 2012	10	0	-	-
		27.2.2012	10	1	33	10%
		15.4.2012	10	1	14	10%

In *Helicteres isora*, seeds were not germinated indicating that they are not suitable for propagation through seeds. Consequently other mode of propagation like stem cutting was done for this species. Table 2 shows result of stem cutting experiment for *Helicteres isora*. The result indicates that *Helicteres isora* can be propagated by stem cutting. Therefore, propagation should be done by stem cutting method. The study also indicates that plant from stem cutting takes only 5-6 months to flowers and set fruits. The development of seedlings from seeds/ stem cutting up to maturity in the taxa studied is displayed in Plate 1.

Table 2. Result of stem cutting experiment in *Helicteres isora* L.

Date of stem cutting	Length of the stems (cm)	Date of leaf bud formation	Time taken to appear leaf bud (days)	Average time (days)	Date of flowering	Date of fruit formation
17.4.2012	25	18.5.2012	32	34.5	29.9.2012	22.10.2012
	25	18.5.2012	32		3.10.2012	1.11.2012
	25	22.5.2012	36		Died	Died
	25	25.5.2012	38		Died	Died

Plate 1. Development stages of six medicinal plants. A-D *Adenanthera pavonina* (A. seeds; B. seedling; C. mature plants with flowering stage; D. fruiting stage). E-H *Murraya paniculata* (E. seeds; F. seedling; G. mature plants with flowering stage; H. fruits). I-L *Psoralea corylifolia* (I. seeds; J. seedling; K. mature plants with flowering stage; L. fruits). M-P *Uraria lagopodioides* (M. seeds; N. seedling; O. mature plants with flowering stage; P. fruiting stage). Q-T *Uraria picta* (Q. seeds; R. seedling; S. mature plants with flowering stage; T. fruiting stage). U-X *Helicteres isora* (U. stem cuttings; V. initiation of leaves; W. flowering; X. fruiting stage).

In the present study we investigated seed germination of six medicinal plants. The present study reveals that epigeal germination is found in *Adenanthera pavonina*, *Murraya paniculata*, *Psoralea corylifolia*, *Uraria lagopodioides* and *U. picta*, whereas seeds of *Helicteres isora* failed to germinate. Time taken by the seeds to germinate varies from 10 days in *Psoralea corylifolia* to 80 days in *Uraria lagopodioides* (Table 1). Important factors controlling the variation in seed dormancy within species include the environment of the mother plant during the time of seed maturation and environmental conditions (Liebst and Schneller, 2008). Certain environmental conditions may be required to break dormancy, and other conditions are often required to permit germination after dormancy is broken (Foley, 2001). Seeds of many species require days, weeks, or months at low temperatures to break dormancy (Bewley and Black, 1994; Vleeshouwers *et al.*, 1995), whereas others require warm temperatures for after-ripening to germinate when permissive conditions arrive (Baskin and Baskin, 1972). In the present study it required around two weeks to break the seed dormancy in *Psoralea corylifolia*, whereas, in *Uraria lagopodioides* it took one to three months to break the dormancy.

The environmental factors that could affect seed dormancy are time of seed harvest, length of seed storage, relative humidity and photoperiod (Baskin and Baskin, 1973). In this study seeds of different taxa were not collected at the same time because of the differences in the period of seed production among the taxa. Therefore, the level of dormancy observed may be affected by environmental factors. The level of dormancy observed may be affected by environmental factors. The number of days for germination is related to the size of seeds, the largest seeds germinated faster than the smaller seeds (Gerry and Wilson, 1995). However, our results were found incongruent with Gerry and Wilson (1995). Since different environmental factors affect on seed germination therefore it is necessary to carry out a detailed study considering the factors that might through more light on germination patterns which are considered to be of taxonomic importance (Vogel, 1980).

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