A NOTE ON THE FLOWERING PERIODICITY AND THE SEED GERMINATION IN BARA BET

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Flowering periodicity and seed germination of Bara bet, *Calamus viminalis* willd. var. *fasciculatus* Becc.; were studied. It was observed that this species flowers twice in a year i.e. from February to April and again from August to October. Seed ripens after 18 to 22 weeks of flowering. A single plant may yield 2·0 - 2·5 kg of fruits in each flowering. A single fruit, on the average, has a diameter of 0·92 cm and weighs 0·40g. Seeds germinated after 10 to 18 weeks of sowing. An average of 10 and 26 percent seeds of the first (autumn) and the second (spring) phases of flowering respectively, germinated.

INTRODUCTION

Bara bet (a variety of Rattan), an important minor forest produce, is a valuable raw material for the cottage industries of Bangladesh. It, usually, is an undergrowth in the natural forests of Bangladesh and other tropical forests of the world. The natural forests, in the present practice, are clear felled and replanted with some major timber species. As a result, the population of this natural undergrowth is diminishing gradually. So, to maintain and replenish the stock of this group of plants, a proper investigation of sexual periodicity and seed germination is of importance. To start with, a study was undertaken on the flowering periodicity and the seed germination of Bara bet.

MATERIALS AND METHODS

Fifty two plants of Bara bet, growing in and around the Forest Research Institute (FRI) Campus, Chittagong, were selected for

recording observational data from the initiation of flowers till ripening of fruits. Sexual nature of the plants, total seed output and their germination capacity were studied. The scaly epicarp of the fruits was removed before the seeds were sown in polythene bags containing soil collected from the natural habitat of Bara bet.

OBSERVATIONS AND RESULTS

Bara bet is an evergreen Rattan palm which normally shows erect bushy habit (2 to 3 m long) in a sunny place but develops a climbing habit (7 to 15 m long) in shady conditions. A fully grown bush may develop 7 to 16 stems. Generally, this species thrives well on gentle hill slopes indicating that it has an affinity for moist but well drained soil. In Bangladesh, the plants are mostly found in the depleted forests of Chittagong, Chittagong Hill Tracts and Sylhet districts, where the annual rainfall varies from 330 to 380 cm.

The male and the female inflorescences in this plant develop seperately in two different individuals. In the female inflorescence flowers are arranged in two rows along the axis of the spikelets. At the base of each female flower though there is a male flower with 6 stamens, they are sterile (staminodes) and are not associated with pollination. There are also staminodes forming a tube in the female flower whose stigma are 3-fid and are fertile. Anthers are dorsifixed, sagittate and yellow in colour. The filaments are white. There are also rudiments of the pistillum consisting of three small bodies. So, pollination is accomplished only from the pollens of the fertile stamens of the male inflorescence bearing plants. After anthesis and completion of pollination in the female flowers, the sterile male flowers wither and drop off. At the time of anthesis many black ants were seen moving around the flowers. The ants might be associated with pollination.

Of the 52 plants observed, 20 were male (38.46%) and 32 were female (61.54%). So, nearly two-thirds of the population were female. The inflorescence was spadix arising on the stem opposite the base of the leaf, elongate, ending in a long recurved spiny flagellum. Length of the inflorescence varied from 110 to 140 cm. On the main axis of the inflorescence, spikes (primary branches) were arranged alternately. The number of spikes varied from 5 to 7. On each spike, there were 11 to 25 spikelets (secondary branches) arranged alternately. It was noticed that 11 plants produced 27 inflorescences ranging from two to three in each bush. The details are given in Table 1.

The results show that in the inflorescences the spikes and spikelets are arranged in an acropetal succession i.e. older and longer spikes at the base of the rachis, gradually getting shorter toward the apex (Table 1). The number of spikelets and fruits are maximum at the lowermost spike and minimum at the uppermost one. The number of fruits produced per inflorescence varied considerably. The maximum of 2281 fruits were recorded from one inflorescence while the minimum of 193 were recorded from another. Fruits are drupe, sessile with persistent perianth. The average diameter and

Table 1. Quantitative data on inflorescence and fruits of Bara bet

*Spike Nos.	Average length of spikes (cm)	Average no. of spikelets	Max. no. of fruits		Min. no. of fruits	
			per spike	Total	per spike	Total
1	24.54	22.50	491		32	
2	22.75	18.66	476		30	
3	20.82	16.66	435	2281	64	193
4	19.82	14.16	300		26	
5	18.82	13.50	340		26	
6	15.35	11.75	239		15	

* Recorded from base to top

weight of a fruit were found to be 0.92 cm and 0.40 g respectively.

The fruits are globose or oval and are covered with thin imbricating straw coloured scales. The fleshy mesocarp of a ripe fruit is dark or brownish red and possesses a sweet sour taste. The stony endocarp (seed) is blackish red and has irregular and deeply grooved wrinkles. Fruits are generally one-seeded. Out of 573, only 17 fruits were found to be double seeded (3%).

Flowering Nature : Flowering occurs twice in a year - the first flowering phase continues from February till April and the second phase from August till October. Fruit formation and development starts within one month of flowering and requires 4 to 5 months for ripening. As a result, fruits produced in first phase of flowering overlap the next flowering phase.

Seed germination : Matured fruits of both the flowering phases were collected and sown in the nursery, in the open. The average germination percentages as recorded are shown in Table 2.

Table 2. Germination percentages of Bara bet seeds collected from both the phases of flowering

Flowering phases	Seed sown		Germination		Remarks
	Number	Date	Period (weeks)	Percentage	
1st (February-April)	400	September	9-18	10	Sown after 2 weeks of harvest
2nd (August-October)	100	February	12-17	26	Sown after 1 week of harvest

DISCUSSION

Bara bet like other members of palm family, requires long time for seed germination. Dransfield (1974) reported that it takes one to six months to germinate. The result shows that in *Calamus viminalis* willd. var. *fasciculatus* Becc. seed started germination in two to three months and the germination was completed in about four months (Table 2) after sowing. Monokaran (1978) studied the germination behaviour of 12 *Calamus* spp. and found that germination periods were different. It was six to eight weeks in the case of *C. distichus* Ridley and 24 to 32 weeks for *C. pallidulus* Becc. From the present study and the past reports it is evident that Bara bet seeds need a reasonable long time for germination. Stony endocarp might be a mechanical barrier for the emergence of radicel and plumule from the embryo. Besides other factors this might be also a reason for low germination rate in *Calamus* spp. During the germination process a long tap root emerges from the seed at the beginning and then an upright cylindrical outgrowth or ligule is developed. The plumule inside the ligule utilizes the cotyledonary food materials for its growth. After a month the shoot portion starts producing leaves. During this time the length of the shoot is nearly 50 cm and that of tap root is 135 cm --- approximately three times longer than the shoot. The long tap root also develops many secondary roots.

It is evident from Table 2 that the species has two different flowering phases in a year and germination capacity of seeds of each time is not the same. The germination rate of the seeds is higher in the second flowering phase than in the first. Seed development in the first phase takes place from May -- August, a period when the stored food is mostly used by the plant for vegetative growth. Hence, least amount of food is utilized by the plant for seed development. This may create a deficiency in physiological maturity of seed resulting in poor germination. At this phase seeds generally ripe in August – September and germination starts in November – December (winter season). The low temperature and low atmospheric humidity in the winter might be ecologically an unfavourable condition for breaking of embryo dormancy and stony endocarp. On the other hand, seed development in the second flowering phase starts from October and continues upto January, a period of maximum food storage and slow vegetative growth. The higher amount of food reserve might be helpful in proper physiological maturity of seeds ultimately resulting in a good germination percentage. Germination starts in March – April when the atmosphere is hot and humid. This condition might be an advantage for higher germination percentage in the second phase.

CONCLUSIONS

The study reveals that seeds of Bara bet can be harvested twice (September and Feb-

ruary) in a year ; but it is preferable to collect seeds during February in consideration of high germination of the seeds at that time. A maximum of only 26 percent germination was found in seeds capacity cllected from the second phase of flowering. This needs to be improved by some pretreatment or other scientific methods for better and economic use of seeds for Bara bet plantation.

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