

FLOWERING, VIVIPARY AND NATURAL SEEDLING OF *BAMBUSA CACHARENSIS*, MAJUMDAR – A SOCIO ECONOMICALLY IMPORTANT ENDEMIC SPECIES OF NORTH EAST INDIA

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ABSTRACT

Bamboo flowering brings about inevitable death and destruction of the parental culm cluster in its long natural life cycle. Sporadic but massive and synchronized flowering in the cluster population of *Bambusa cacharensis*, Majumdar was recorded during the year 2009 - 2010 and 2010 - 2011 in different areas of west district of Tripura. Morphometric measurements of floral parts revealed characteristic variations. Percentage of pollen viability recorded in three different flowering populations of *B. cacharensis* was found to vary from 20.32 ± 8.75 to 58.92 ± 10.90 . Natural seedling leading to wilding establishment was very poor in the species. Viviparous germination in the species was first recorded and described. Natural restriction of poor wilding and culm destruction are the significant contributing factors to the threatened status of the taxon.

Key Words: *Bambusa Cacharensis*, Flowering, Vivipary, Threatened Species, North-East India

INTRODUCTION

Bamboo is an important non-timber forest resource in Tripura and growing mostly scattered through out the state. Out of the 78 species of bamboo in the North East region of India (Biswas 1988., Hore, 1998), 17 species are growing wild in the state. Among them *Bambusa cacharensis* locally known as Boam bans is extensively used by local bamboo artisans for their domestic as well as commercial purpose in making furniture, incense stick and mats. The species is reported to be endemic to Assam (Majumdar, 1983; Barooah and Barthakur, 2003) but also widely distributed in the west and Sipahijala district of Tripura. In the last few years, Tripura is experiencing gregarious flowering of *Melocanna baccifera* (Muli bamboo) causing natural death of muli bamboo stands (Sethi, 2003) - a characteristic habit of many bamboo species. Thus, the consequence of flowering event is of great concern to the existence of many bamboo populations (Liese, 2008). Moreover, natural flowering of bamboo is a rare occurrence with a very long flowering cycle. Characterization of bamboo with floral parts is also uncommon and depends on the availability of flowering bamboo clusters. In the present communication we report a case study on flowering, floral characters and vivipary of *B. cacharensis* recorded in Tripura.

MATERIALS AND METHODS

Tripura is one of the Northeastern State surrounded by Bangladesh in the north, west and south and is only connected with rest of the India through cachar district of Assam and Aizawal district of Mizoram in the east. The coordinates of geographical location of Tripura is $23^{\circ}50'24''$ N and $91^{\circ}16'48''$ E with an area of $10,492\text{km}^2$ (Fig1A). The state has eight (8) districts. with a total of 60% forest area, out of which 14.92% represent bamboo growing clusters of different species (Naithani, 2008). Bamboo resource study including visits to different forest areas and villages of West district of Tripura were carried out. The exact location of particular bamboo species and their assessment were carried out with the GPS handset. Different morphometric measurements of flower and floral parts of the *B. cacharensis* were carried out and described. As many as 100 bamboo clusters distributed at different locations were investigated. Rural peoples of respective villages were also interacted for local information on bamboo clusters and

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flowering. Aceto-carmin technique was adopted for pollen viability test of the present species. Not less than 4,000 pollen cells was scanned for each population.

RESULTS AND DISCUSSION

Field visit at different locations in west district of Tripura were carried out during the years 2009 -2010 and 2010-2011 to explore bamboo diversity and nature of bamboo clusters. Massive and synchronized flowering of *Bambusa cacharensis* clusters were recoded in many populations at different places during the month of May –August. Out of twenty four villages visited in west district of Tripura, three villages namely Mokam, Birmohan and Suryamaninagar reveled sporadic flowering of *B. cacharensis* under Mohanpur and Dukli RD Block of west Tripura having geographical coordinates 23°56'13.5" N and 91°24'05.1"E, 23°56'10.9"N and 91°24'18.5" E, 23°45'53.0" N and 91°15'59.6" E, respectively. The average altitude of Mokam and Birmohan is 38.5 meters and that of Suryamaninagar is 24 meters.

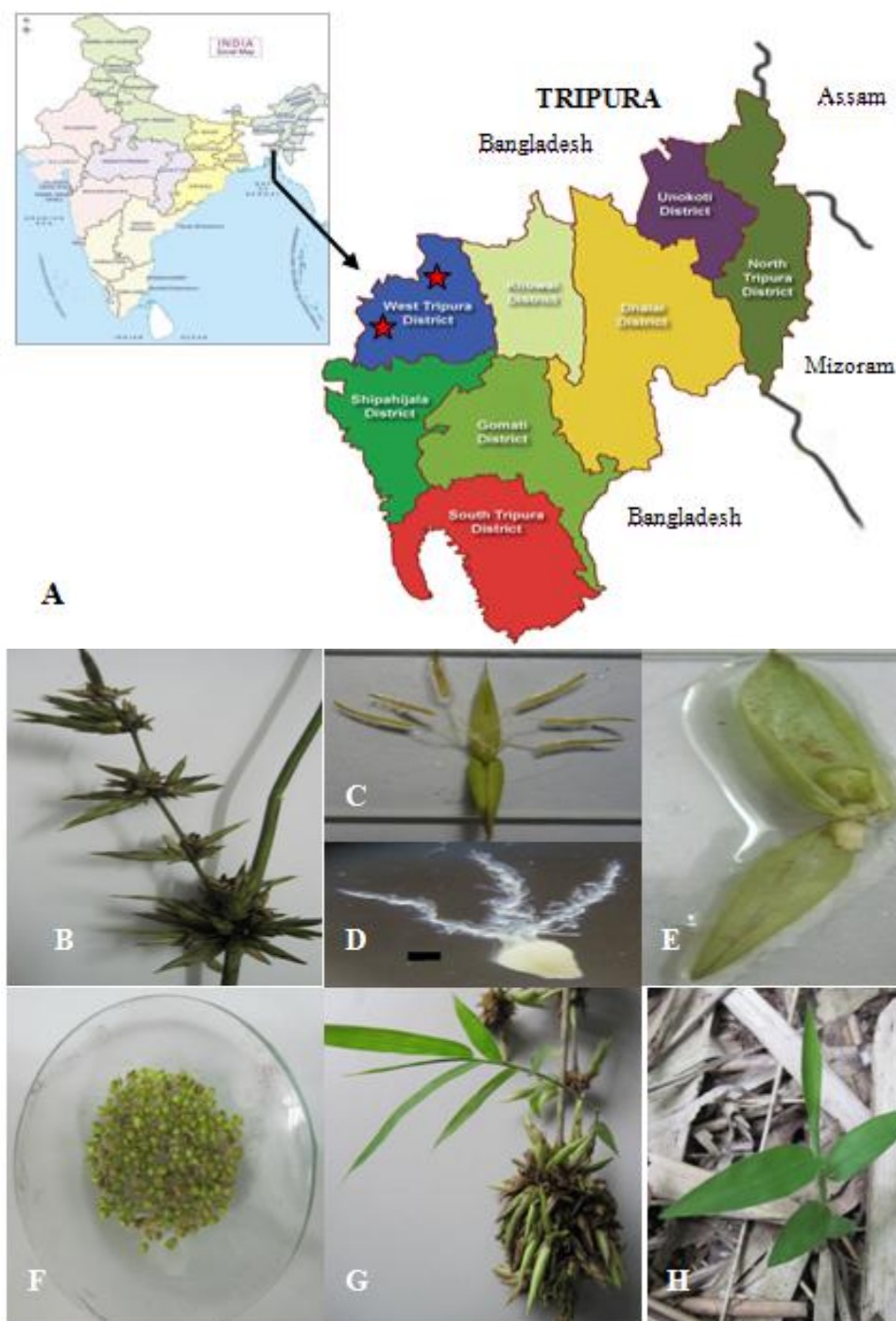
Flowering of *B. cacharensis* in Tripura is recorded after 30 years of interval in a sporadic way at different locations of west Tripura and the infrequent blooming event is still continued in other districts. This event is very significant as it causes destruction of the whole cluster population after flowering. Flowering and fruiting cluster of *B. cacharensis* is very characteristic having very close compaction at the fruiting base on the flowering branch. Generally many floral buds are arranged in distichously fashion with a tight capitate-wise clusters of spikelets at base of the nodes (Figs. B). Number of synflorescence per branchlet varied from 4 to 7. Spikelets are linear and subterate in nature. Mature spikelets measuring 2.52 ± 0.57 cm in length were aggregated at the base with 3 to 5 fertile florets. Diminishing nature of the florets was recorded at the apex. Breaking and disarticulation into palea and lemma was observed during maturation of floret (Fig. E). The androecium measuring 1.52 ± 0.44 cm with six anthers were exposed on maturity (Fig.C). Two anthers lobes measuring 7×1 mm in length and breadth were basifixed in nature.

The loduculate gynoecium was short and characterized with hairy tripartite stigmatic style (Fig. D). Palea is scabrous measuring $1.16 \pm 0.14 \times 0.38 \pm 0.05$ cm in length \times breadth while the lemma is $1.31 \pm 0.15 \times 0.63 \pm 0.11$ cm in length \times breadth. Number of sterile ovate glumes recorded in the present study is two to four with a size variation from 0.41 ± 0.08 to 0.97 ± 0.14 cm in length. The fruit is caryopsis with adherent pericarp and persistent stigma. Seeds of *B. cacharensis* collected from different sites were very small and their size varied from 1 to 3mm with an average size of 1.70 ± 0.06 mm.

The green seed weight is also varied from 1.0 to 4.0mg with an average weight of 2.16 ± 0.73 mg (Figs. F). Viviparous germination of seeds was recorded infrequently in some of the flowering populations of *B. cacharensis*. (Fig. G). Vivipary was also restricted to one or two seedlings per capitate of synflorescence in a particular cluster population. The phenomenon of vivipary is also known to be common in some

Table 1: Pollen viability records in three different flowering populations of *B. cacharensis* in west Tripura District.

Population (Village location)	Pollen Viability (%) mean \pm SD	Viable Size (μ m) mean \pm SD	Pollen Size (μ m) range	Sterile Size (μ m) mean \pm SD	Pollen Size (μ m) range
Population-I (Mokam)	20.32 \pm 8.75	52.86 \pm 7.01	33.93 - 67.86	39.81 \pm 5.59	30.16 - 49.01
Population-II (Birmohan)	43.59 \pm 8.89	52.04 \pm 9.65	37.70 - 79.17	43.35 \pm 7.08	33.93 - 67.86
Population-III (Suryamaninagar)	58.92 \pm 10.90	55.96 \pm 9.26	37.70 - 90.48	52.78 \pm 13.03	37.70 - 86.71



Figures 1A-H: Flowering and Vivipary of *Bambusa cacharensis* Majumder. A: Locational study areas (★) in West district of Tripura, B: Capitulate inflorescence. C: Staminal anthers. D: Enlarged view of hairy short gynoecium (bar = 1mm). E: Disarticulating floret with mature ovary. F: Mature green seeds. G: Vivipary from the capitulate spikelets. H: Natural sapling (wilding).

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other bamboo species like *Melocanna beccifera* (Roxb.) Kurtz ex Sheels (Sarma et al, 2010). Most of the aggregated fruiting clusters in *B. cacharensis* failed to produce viviparous germination of seeds in spite of massive flowering. However, successful viviparous germination is found to depend on the availability of moisture at the base of the capitate cluster of fruitings. Aceto-carmin technique of pollen viability analysis during anthesis revealed variation in viable pollen percentage from 20.32 ± 8.75 to 58.92 ± 10.90 in three different areas of flowering populations which shows variation from earlier report of pollen viability reported from Assam (Sinha, et al, 2003). Variability in pollen size was also recorded in viable and sterile pollens (table 1). In spite of massive synchronized flowering and reasonable pollen viability, *B. cacharensis* is found to produce very negligible numbers of natural seedling, known as wildings beneath and around the flowering bamboo cluster (Fig. H). Most of the wildings could not survive to maturity at their natural habitat due to heavy congestion of flowering rhizomatous clumps and heavy dry leaf biomass. Moreover, bamboo leaf is more silicacious (Motomura et al., 2004; Lybeer et al, 2006) and slowly degraded (Nath and Das, 2011), it creates a natural barrier to the seeds of bamboo for getting enough moisture from the soil as well as limited light source for the subsequent growth of wildings. Thus, the regeneration leading to wilding establishment is restricted in this species. This suggests the need of appropriate measure for conservation and propagation of the species through seedling macro proliferation technique.

The present study highlights on the flowering characteristics of *B. cacharensis* and a report on vivipary and wilding nature of the taxon.

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