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Distribution record of *Ensete glaucum* (Roxb.) Cheesm. (Musaceae) in Tripura, Northeast India: a rare wild primitive banana

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ABSTRACT

Ensete glaucum **recently recorded in Tripura during floristic investigations, which is an additional banana species for the flora. We observed very limited population in the wild and recorded necessary information on its distribution, habitat association and pollen structure. Present information will be useful for future population assessment, regeneration and other ecological studies to manage its wild stock and to protect this primitive banana from regional extinction.**

Keywords: Rare wild banana, habitat ecology, distribution extension, Tripura

INTRODUCTION

Cheesman (1947) was first drawn the distinct differences of genus *Ensete* Horan. as single-stemmed monocarpic waxy herbs, with pseudostems dilated at the base, persistent green bracts, large seeds (≥ 1 cm. in diameter) irregularly globose and smooth which distinctly retaining more primitive characters and, hence differ from *Musa* Linn. Twenty five species of *Ensete* was listed by him of which twenty were African origin, five described as extra - African species (e.g. *E. superbum*) and one not described with a prediction that others yet to be discovered in South East Asia (Cheesman, 1947). Whereas, it was concluded that the genus is much smaller and less distinctively in Africa with a checklist of six species (+ 1 unidentified) instead of the twenty five species (Simmonds, 1960). Finally, seven species were recognized within the genus *Ensete* Horan. (Krees, 1990).

Only *Ensete superbum* (Roxb.) Cheesm. was reported from India in early 1960s from Western Peninsula region, Bombay to Madras (Cheesman, 1947; Simmonds, 1960). *Ensete glaucum* (Roxb.) Cheesm. naturally distributed in Burma, Thailand, China, Laos, Viet Nam, Philippine, Papua New Guinea, Solomon Islands up to Java and its probable existence in India was reported by Simonds (1960). He also mentioned that it was a Burmese plant rather than an Indian in the modern sense of the world. He argued that this species occurred in Barnihat District of Assam (Assami name- *Ramkal*), cultivated from seeds actually collected from Garo Hills of Meghalaya (Khasia Name-*Adumutong*) and Kalimpong Agricultural Station in West Bengal which might collected from Burma. Whereas in both case, the growing plants were immature and hence, the natural distribution of this species in Indian sub continent was not sure in early 1970s. Other early records of this species from adjacent geographical ranges were from Inle Lake, Shan States of Burma and Tap Tao Cave, Muang Fang, Chiengrai Province of Thailand, where it was observed to be planted by Buddhist Monks for religious purposes (Simmonds, 1960). Although, natural occurrences of this banana in India was confirmed from Visakhapatnam and Errakonda of Andhra Pradesh in Eastern Ghats (Subbarao and Kumari, 1967) and Khasi Hills of Meghalaya in Eastern Himalayan region (Rao and Hajra, 1976).

J. G. Baker (1893) placed *E. glaucum* as *Musa glauca* Roxb. in his subgenus *Eumusa* because of cylindrical stem and flowers like *M. superba* (Cheesman, 1947). Whereas, Sagot (1887) placed it accurately and finally placed it with *M. glauca* Roxb. with a synonym (Teodoro, 1915). Schumann (1900) listed two Indian species in the *Musa* subgenus *Physocaulis* - *M. superba* Roxb. and *M. nepalensis* Wall., and placed *M. glauca* Roxb. in *Eumusa*. However, the Asian *E. glaucum* and the African *E. ventricosum* not so different; but it was ultimately proven necessary to reduce *E. ventricosum* to a synonym by Simmonds (1960). N. Wallich described *M. glauca* Roxb. under the name of *M. nepalensis* (Wall.) Cheesm. collected from lower slopes of Himalaya below Nepal which might *E. glaucum* and misattributed as to origin (Cheesman, 1947; Simmonds, 1960; Hara *et al.,* 1978). Nevertheless, *M. agharkarii* A. K. Chakravorti was described from Chittagong Hill tracts of Bangladesh which later on conformed and concluded as *E. glaucum* (Subbarao and Kumari, 1967; Rao and Hajra, 1976). Whereas, the synonym of *E. glaucum* given by Rao and Hajra (1976) was apparently ignored; and transferred *M. agharkarii* into *E. agharkarii* (Hore et al., 1992).

Despite of its wild occurrences in Eastern Ghats and Eastern Himalayan region of India (Subbarao and Kumari, 1967; Rao and Hajra, 1976; SPGRFAI, 2007; Lalrinfela and Thangjam, 2012) and reports in modern floras of India and Nepal; still uncertainty exists regarding its wild existence. Many consider it does not occur in Northeast India as a wild plant and possibly it just creeps into Mizoram from Burma, into Meghalaya from Chittagong Hill tracts of Bangladesh (Hore *et al*., 1992) or might cultivated in north eastern India (Constantine

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and Rossel, 2001). This species was also recently recorded from Southern Taiwan (Chen *et al.,* 2007). But, it has been recorded over a wider geographical range; from Burma to the Philippine Islands, Java and possibly several other areas of uncertainty (Cheesman, 1947). Since *E. glaucum* is very rare, relict and its natural distribution in Northeast India still doubtful; hence this species specially deserves further investigation.

MATERIALS AND METHODS

Several exhaustive field collections and new records were made during floristic studies in Jampui Hills of North Tripura (Majumdar *et al.,* 2012). Plant specimens were deposited in the herbarium of Botany Department, Tripura University. During herbarium investigation and critical taxonomical observation on the collections, it has came to notice that a wild banana species identified as *E. glaucum* collected from Jampui Hills of North Tripura was not reported earlier from Tripura. In this paper we report a new locality of wild occurrence of *E. glaucum* with other additional information especially on pollen morphology worked out following standard methodology (Erdtman, 1969; Faegri and Iverson, 1992). Habitat ecological observations were also noted and discussed. Detailed taxonomic description largely based on the original descriptions (Subbarao and Kumari, 1967; Constantine and Rossel, 2001) with present additional field observation is discussed under this study. Field photographs are provided to facilitate easy identification and further locating its wild population.

OBSERVATION

This plant was observed growing on hill slope relatively in open areas in February 2011 during floristic exploration in Jampui Hills of North Tripura. The locality was recorded as Vanghmun, GPS location 23º59'02.6" North Latitude and 92º16' 27.7" East Longitude with an altitude of 1741 ft. Vegetation of this locality was mainly moist deciduous to semi-evergreen with sparsely distributed deciduous and evergreen trees. Only 3 individuals were observed within a 5 km distance and out of which only one was in fruiting condition. After literature study and scrutiny of specimen, this wild banana species was identified as *Ensete glaucum* and so far, this species was not reported in the Flora of Tripura State (Deb, 1983).

Ensete glaucum (Roxb.) E. E. Cheesm. Kew Bull. 2 (2): 101 (1947). *Ensete calospermum* (F. J. H. von Mueller) E. E. Cheesm. Kew Bull. 2 (2): 102 (1947). *Musa glauca* Roxb. Hort. Beng. 19. (1814) (nomen), Corom. Pl. t. 300, 96-98 (1819-1820), Flora Indica 2:490 (1824) (descr.); ibid. ed. 2, 1:669 (1832). *Musa nepalensis* Wall. in Roxb., Flora Indica 2: 490 (1824) and *ibid.* ed. 2 vol. 1: 669 (1832). *Musa troglodytarum* L. var. *dolioliformis* Blanco. Flora de Filipinas: 855 (1837); ed. II : 174 (1845) & ed. III: 312 (1877). *Musa gigantea* Kuntz. Revisio Generum Plantarum 2: 691 (1891). *Musa wilsonii* Tutcher. Gardeners' Chronicle series 3, 32: 450 [fig. 151: 451] (1902), and Revue Horticole 34 (1903). *Ensete wilsonii* (Tutch.) Cheesm. Kew Bull. 2 (2): 103 (1947).*Musa agharkarii* Chakravorti. J. Indian Bot. Soc. 27 (2): 93 (1948). *Ensete nepalensis* (Wall.) Cheesm. *err. cal.* Simmond. *Kew Bull.* 14 (2): 212 (1960). *Ensete agharkarii* (Chakravorti) Hore, Sharma and Pandey (1992).

Monocarpic herb, nonstoloniferous, pseudostem 3.5-4 m tall, glaucous grey-green and waxy, swollen at the base. Watery juice quickly turns into rusty- orange on air exposure fades slowly to a dirty grey-black. Sheaths glaucous abaxially, pinkish-brown adaxially. Petioles stout, glaucous-green, 25-50 cm. long, shallow and broad channeled in mature leaves. Leaves green-glaucous, waxy, 1-1.5×0.4-0.5 m, oblong-lanceolate, acute, unequal base, entire, midrib yellowish green. Infloresence cylindrical, pendulus peduncle glabrus. Bracts ovate-lanceolate, acute and persistent, glaucous-green to dull-green, integral with flower and axis, 25-30×15-18 cm. Basal flower hermaphrodite, neuter middle and slowly transforming to staminate towards the end. Flowers closely packed usually 10-16 two rows in a bunch, white or translucent, 5.5-6.5 cm. Outer perianth 4-5×0.9-1.3 cm, acute, entire, 3 narrow lobes. Inner perianth 1.5-2.3×0.8-1cm, membranous, 3 lobed, middle one narrow, long apiculate, outer lobes suborbicular, largely irregularly dentate lateral lobes enfolding the filaments. Stamens 5, filiform, 4-4.5 cm long; anthers 2.5-3 cm long. Stigma 4-5.5 cm, 3-lobed, both style and stigma persistent. Fruit bunch tightly packed, oblong, 5-9 cm long, yellowish when ripe, pulp white, containing 10 - 25 seeds. Seeds black, smooth, asymmetrically sub-globose to irregular due to pressure in packed fruit, 1-1.3 cm accross, with a depressed hilar pit with the hilum at the bottom of the pit and an umbo with apical pit opposite to hilum **(Figure 1).**

Flowering and fruiting observed under present study during March - April.

Occurrence: Vanghmun to Phuldungshi in Janpui Hills, North Tripura.

Local Name: Chisau (Lusai); Saishu (Mizo)

DISCUSSION

Phyto-geographically *E. glaucum* is an important indicator plant as it linked several South Indian, Eastern Ghats and Eastern Himalayan rare floral elements (Balakrishnan, 1964; Subbarao and Kumari, 1967; Misra, 1980). Pseudostem also reported to eaten as vegetable in Meghalaya (Rao and Hajra, 1976). Ethno-medicinally, flower juice reported to be used in dysentery and in excess bleeding during menstruation period in young girls among the tribes in Paderu Division of Visakhapatnam (Padal *et al.,* 2010). Very young inflorescent locally cooked in several tribal dishes and seeds also used by local tribal children in traditional games. Ecologically, this plant serves as a suitable host and foraging habitat for many faunal species, especially both for diurnal and nocturnal animals and small insects.

Entomophilous, ornithophilous, and cheiropterophilous pollination occur in *E. glaucum*. Earwig insect (Order: Dermaptera) was observed to prefer for hosting, feeding and breeding sites inside the bracts of cylindrical inflorescent of this banana. Since, enough moisture and foraging materials are retained inside the bracts even during very dry periods on the hilly slope. Young flower, flower parts and pollen of *E. glaucum* were preferably eaten by earwig and also by predation on small pollinating agents earwig may influence normal pollination and

enough seed production in *E. glaucum*. The pollen grains of *E. glaucum* is large, rounded about 334.9-386.4 µm, with watery surface and thin exintina (Figure 1).

E. glaucum is generally prefers more open and relatively slope areas of undulating terrain, occasionally in the *Jhum* fallows and rarely seen within deep of the forest. The associated plants were *Caryota urens* L., *Derris robusta* (Roxb. ex DC.) Benth., *Dalbergia lanceolaria* L. f., *Duabanga grandiflora* (Roxb. Ex DC.) Walp., *Castanopsis* sp. etc. in the upper stories of the habitats. Whereas, middle stories consists of *Sterculia* sp., *Trema orientalis* (L.) Bl., *Ficus hispida* L., *Macaranga* sp., *Acacia pennata* (L.) Willd., *Leea* etc. and ground was covered by *Byttneria pilosa* Roxb., *Mikania cordata* (Burm.f.) B.L. Robinson. , *Combretum* sp., *Mucuna nigricans* (Lour.) Steud. and *Eupatorium odoratum* L. etc. were most common.

When ripe fruits dropped on the hill slopes, seeds generally spread around the base of the plant. The natural regeneration is very poor and perhaps seed takes long time for germination may due to its very hard shell and less water holding capacity of the soil on the hill slope. Large numbers of seeds are also simply destroyed by rove beetles, termites and ants activities etc. Many seeds typically shifts to the down of the slope and watery areas especially during rainy seasons. Seeds however, are simply washout by rain into the streams and may restrict its wider germination and distribution extension.

Figure 1. *Ensete glaucum* (Roxb.) Cheesm.; a- non stoloniferous habit, b- oblong-lanceolate leaf, c- waxy swollen base, d- rusty - orange juice on air exposure, e- cylindrical inflorescence with persistent bracts, f- staminate flower, g- hermaphrodite flower, h -stamen with outer and inner perianth, i- persistent style and stigma, j-young fruit, k- tightly packed Fruit bunch, l- white pulp, m- asymmetrically sub-globose to irregular black seeds, n-seed with a depressed hilar pit with the hilum and o- Staining with acetic carmine of viable pollen grains (Photo by: K. Majumdar).

CONCLUSION

As stoloniferous habit have a general tendency towards reduction in the size of the seeds, accompanied by an increase in their number and the development of rather more fleshy fruit etc.; which might helped to *Musa*, a genus with greater diversity, geographical extension and habitat adaptability (Cheesman, 1947). Whereas, primitive characteristics of *E. glaucum* e.g. nonstoloniferous monocarpic habit, persistence of bracts; hermaphrodite flowers, large seeds relatively few in number, long dormancy period of seed, unique habitat requirements and traditional use by local inhabitants etc. may responsible for its limited distribution and unsatisfactory population in the wild habitats. *E. glaucum* is under pressure, as only three individuals were observed within the present known large geographical area. The habitats were subjected to extensive *Jhum* cultivation and orange orchard by the inhabitants living in the marginal land. Hence, conservation measure is urgently required which includes survey of so far unknown wild populations, regeneration and population studies and selection of suitable habitats for potential future population establishments, propagation and nursery development as well as seed storage facilities to ensure its wild existence.

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