



Original Research Article

Sepal Trimery in *Euryale ferox* Salisb. Germplasm Collected from Manipur, North-Eastern India

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Abstract: *Euryale ferox* plant grown at the ICAR Research Centre for Makhana, Darbhanga from a germplasm collected from Manipur (north eastern India) was found to develop a flower with only three sepals and three whorls of petals. Sepal trimery is considered a primitive character belonging to monocots as against the normal presence of tetramery that is a derived character found in dicots. The present finding establishes that *E. ferox* belongs to the group of basal angiosperms, having a combination of monocot and dicot characters and shows its similarity with another Nymphaeid genera like *Victoria*, *Cabomba* and *Brasenia*. While *Victoria* and *Brasenia* are reported to contain 3-4 sepals, *Cabomba* is reported to have an exclusive number of 3 sepals only. Thus, *E. ferox* shows its proximity to *Cabomba* so far as sepal trimery is considered.

Key words: Floral trimery, *Euryale ferox*, Nymphaeaceae

Introduction

E. ferox is an aquatic plant belonging to the family Nymphaeaceae. It is a monotypic genus. Generally it is an annual plant, but is reported as perennial also. Leaf stalks come out from rhizome. Its whole plant is spiny except roots. Leaves are large, round, green above and purple below. The plant develops 2 types of flowers-cleistogamous and chasmogamous. Flowers are large, solitary and emerge in an asynchronous way. The fruits are berry and spiny. The seeds are globose, rounded, hard and black. Utilization and conservation aspects of this plant, locally called as Makhana in Mithila area of Bihar, have been discussed elaborately by Jha *et al.*, (1991). In recent years the plant has attracted wider scientific attention in relation to its distribution, ecology, nutrition and pest aspects, post-harvest processing etc. (Mishra *et al.*, 2003).

During the course of a year round study of morphological characteristics of Makhana germplasm collected from Manipur (by scientists of ICAR Research Centre for Makhana, Darbhanga) in October 2010, one single flower in a plant in the plot was found to develop three sepals (Fig.1) during July 2012 instead of the normal four sepals. All other flowers of the same plant as well as of all other plants in the experimental plot were found to develop the normal four sepals. In Manipur generally mature fruits are harvested

(Jain *et al.*, 2010). In Bihar, only seeds are harvested from the pond bottom under an intricate system generally performed by the local fishing community. Manipur has wild population of *E. ferox* while in Bihar it is in the form of a cultivated aquatic crop.



Figure 1: An *E. ferox* flower showing only three sepals.

The seeds were planted in the Centre nursery in December 2010 from where the plantlets were transferred to the experimental plot. This single flower with sepal trimery was also found to have only three whorls of altogether 20 petals (7+5+8) (Fig.2). Presence of three sepals and three whorls of petals in a single flower was a chance discovery in only one plant out of a total of 140 plants, each developing an average of 10 to 12 flowers (Kumari 2013). Other flowers of

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E. ferox in the present study were found to have 30-45 petals arranged in 4-6 whorls.



Figure 2: Three whorls of petals collected from an *E. ferox* flower.

E. ferox is reported to have a combination of both monocot and dicot characters and as such has been referred to as a basal angiosperm. The monocot characters are visible in the form of fibrous roots, absence of cambium, hypogeal germination, scattered vascular bundle (Chen et al., 1991), honey comb aerenchyma (Jung et al., 2008) and envelope or envelope layered type of starch grains (Czaja 1978) etc. Dicot nature of this plant is characterized by the reticulate venation, concentrically organized continuing axial stem bundles (Weidlich 1980), presence of vessels in metaxylem tracheary elements of roots (Schneider and Carlquist 1996), differentiation of sepal mesophyll into palisade and spongy parenchyma (Chen et al., 1991) etc. Presence of sepal trimery is a primitive character found in monocots. It has been chance discovered along with the normal tetramerous sepals during present study.

The classification of water lilies dates back to Salisbury (1806) who first established the familial concept of Nymphaeaceae. The close relationship between *Victoria* and *Euryale* is the most widely accepted aspect of phylogeny in the Nymphaeales (Les et al., 1999). Li (1955) considered *Victoria* and *Euryale* to be closely related and so distinct from other genera that he assigned them to a separate family Euryalaceae.

Present findings suggest the closeness of *Euryale* with that of *Victoria* in the sense that the latter is also reported to have 3-4 sepals. Hu et al (2012) have also concluded that floral organogenesis of *Euryale ferox* is

most similar to *Victoria*. However, two other Nymphaeid genera *Cabomba* and *Brasenia* are also closer to having sepal trimery. While *Brasenia* is reported to have 3-4 sepals, *Cabomba* does have an exclusive report of 3 sepals only (Schneider et al., 2002).

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