

PRECOCIOUS FLOWERING OF RUBBER SEEDLINGS IN TRIPURA

In general, seedlings of tropical trees pass through a juvenile phase marked by characteristic differences in form and behaviour from the mature (adult) phase. Juvenility can be defined as a period during which the plants are insensitive to conditions, which later promote floral initiation. As is well known, the seedlings of the tree species lack the ability to flower during juvenile phase which may last for many years. Rubber trees, in general, have a juvenile phase of three to four years. The present report is on the flowering observed in juvenile rubber seedlings grown at Taranagar Research Farm (23° 53' N; 91° 15' E; 30 m above msl) of the Regional Research Station, RRII, Agartala, Tripura (Fig. 1). This is the first report on precocious flowering in seedlings of *Hevea brasiliensis*.

For plants, in general, the reproductive success depends on their flowering time being adapted to the environment in which they grow. This adaptation involves the regulation of flowering by environmental stimuli such as temperature, dry spell and day length. *Hevea*, being a perennial crop requires four or more years for natural flowering (De Silva and Chandrasekera, 1959; Saraswathyamma, 1975). Flowering in rubber clones is dependent on wintering, which in turn is dependent on the age of trees, location in which they grow as well as climatic factors (George *et al.*, 1967). Rubber trees usually flower twice a year under the climate of Tripura where the main



Fig. 1. Juvenile flowering in a seedling
flowering occurs around March (pre-monsoon) after wintering and secondary flowering around September (post-monsoon). Agrometeorological data revealed a monthly mean photoperiod of five to six hours per day together with low rainfall, high evaporation and low soil moisture content prior to the flowering season of rubber trees in Tripura during 1998. The inflorescence in *Hevea* arises from the upper scales of terminal shoots in the axils of new flush leaves (Fig. 2). Inflorescence of the secondary flowering season appears randomly in smaller number



Fig. 2. Flowering in a mature tree mainly confined to the top branches during September-October after the primary seed fall. Similar flowering pattern in *Hevea* has been reported from Malaysia (Van Haaren, 1969). Rare occurrence of off-season flowering was also reported in the traditional rubber-growing region of India (George *et al.*, 1980).

Initiation of floral meristem was observed for the first time in one seedling during the first week of June 1998 in a seedling nursery of 15,000 seedlings raised from the seeds collected from the Taranagar Experiment Station during August 1997. Subsequently, five more seedlings precociously flowered at random. The terminal meristems of tender seedlings were seen modified into inflorescence, which appeared in panicles with long internodes. The flowers were monoecious with strong scent similar to those borne on mature trees. Small slender male flowers were confined to the lower branches and large sized female flowers were seen at the tip of the main and side branches of the inflorescence. Except slight variation in size no major difference was observed in the juvenile flowers compared to the flowers of mature trees. Female flowers showed normal tricarpellary pistil and the male flowers had

ten anthers arranged on a staminal column. The number of female flowers in each seedling ranged from one to sixteen. The male/female flower ratio was 20:1. Acetocarmine staining technique of the pollen grains showed 50 per cent sterility. Mature female flowers of the seedlings were hand-pollinated with pollen from mature budded trees as well as seedlings to explore the possibility of fruit development. Similarly, chances for open pollination were also given. No fruit set was seen in the tender seedlings. However, one fruit was obtained on a mature tree of clone RRII 105 hand-pollinated with pollen from the male flower of one of the precociously flowered seedlings. Out of the three seeds planted, two germinated and developed into seedlings. To study the reproducibility of the peculiar phenomenon, seeds were collected and a seedling nursery was raised during August 1998. Out of the 7000 seedlings raised, a total of three seedlings flowered precociously at random during the last week of May 1999. The flowering was observed both in the leaf axils and at the terminal position in these seedlings. The recurrence and the random occurrence of this rare phenomenon revealed the possibility of the involvement of an internal genetic mechanism rather than environmental effect.

Prolonged breeding cycle is one of the major constraints faced by rubber breeders. Several attempts have been made previously to induce early flowering in *Hevea* (Ong, 1972; Saraswathyamma, 1975; Najib and Paranjothy, 1978; Rohani and Paranjothy, 1980; Wang and Huang, 1981; Yeang and Samsuddin, 1986). Early induction of flowering was reported in 12 to 18 month old budded plants by bark ringing and application of coumarin within six

months (Ong, 1972; Wang and Huang, 1981). Induction of flowering was found to be ineffective for young seedlings by mechanical as well as chemical treatments (Najib and Paranjothy, 1978). In the present report, the actual cause of precocious flowering of juvenile seedlings is not clear.

However, the random occurrence of the phenomenon in six seedlings during 1998 and three during 1999 reveals the chance of a very rare allelic combination in certain fruits and the expression of the phenotype (precocious flowering) in a conducive environment.

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