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FLORAL BIOLOGY, FRUITSET AND FRUIT DEVELOPMENT IN SWEET LOVI-LOVI (*FLACOURTIA CATAPHRACTA* ROXB.)

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Abstract : Sweet lovi-lovi, *Flacourtia cataphracta* Roxb., is dioecious with male and female flowers borne on separate trees. The male tree flowers two weeks earlier than the female during October and the female in mid November. The flowers in male appear as axillary or terminal cymose clusters while those in female trees are in fascicles. In the male trees, 25 days are required for the complete flower development and in the female it takes 18-20 days. About *19* per cent of pollen are viable with a maximum pollen germination of (80.7%) with pollen tube length of (132.6 µm) in 4 per cent sucrose + 0.25 per cent agar media. The fruit development from fruitset requires 78-80 days. The fruits are harvested in February taking 98-100 days from flower initiation. The shelf life of the fruit is very low and proper harvesting methods and storage devices are required to prolong the shelf life of the fruits.

Key words: Floral biology, fruit development, sweet lovi-lovi.

INTRODUCTION

Lovi-lovi (*Flacourtia* spp.) which belongs to the family Flacourtiaceae is an under exploited minor fruit crop grown in the homesteads of Kerala. The crop is distributed throughout the warmer parts of Asia (CSIR, 1956). It produces very attractive edible fruits, reddish or purple in colour when ripe and known as lovi-lovi. About eight species are recorded in India, of which *F. inermis* the sour lovi-lovi and *F. cataphracta* Roxb., the sweet lovi-lovi are the commonly grown species (George *et al.*, 1998). The fruits of *F. inermis* are sour and astringent, mainly used for pickling. The trees of *F. cataphracta* are medium sized, thorny and spreading with dark green leaves. The fruits are red to dark purple in colour having pleasant tart flavour with medium sweetness and are good for jams, jellies, marmalades and preserves. Details on floral biology and fruiting habit in lovi-lovi are lacking. Therefore, an attempt was made to study the floral biology, flowering, fruitset and fruit development in *F, cataphracta* Roxb. the sweet lovi-lovi, as part of the ICAR adhoc scheme on under exploited minor fruits of Kerala.

MATERIALS AND METHODS

Studies on floral biology, fruitset and development in F, *cataphracta* were carried out in 15 year old bearing trees at the College of Horticulture, Trichur, Observations on average number of flower clusters per flowering shoot, number of inflorescence in a node, the number of flowers in an inflorescence, flower description, flower development and fruitset and development were recorded. The observations on fruit development were taken at fortnightly intervals. The measurements on fruit length, circumference and weight of fruits at different stages of development were recorded. Pollen viability studies were undertaken using aceto-carmine dye and pollen number per anther was counted using haemocytometer. Studies on pollen germination were conducted using different concentrations of sucrose and agar. The concentrations of sucrose tried were 2%, 4% and 6% with 0.25% agar.

RESULTS AND DISCUSSION

Sweet lovi-lovi, *F. cataphracta* Roxb. is dioecious in nature, with male and female flowers on separate trees. The trees are 6-10 m high, with sharp decompound spines on the trunk of both male and female. The male and female trees can be distinguished only once it reaches flowering stage. The season of flowering in male trees was found to be earlier by two to three weeks compared to female. The flower buds started appearing in the month of mid October. In female trees flower buds appeared only by mid November. In both male and female trees the flowers are small in size and appear as terminal or lateral cymose clusters on past season wood. In male trees, flowers appear on almost all the past season shoots. In male, flowering extended for a longer period, till January, whereas it was only for a shorter period of two weeks in female. Variation was observed in the time taken from flower bud emergence to flower opening. The male flowers took 25 days and female, 20 days for complete development.

Inflorescence characteristics of male and female trees shewed that the mean number of inflorescence per shoot in male tree was 15.5 which was almost double of that in female (Table 1). Mean number of inflorescence per node and mean number of flower per inflorescence were also found to be higher in male trees (3.0 and 12.0 respectively) compared to

Table 1. Inflorescence characters of *F. cataphracta*

Type of the tree	Inflorescence per shoot	Inflorescence per node	Flowers per inflorescence
Male tree	15.5	3.0	12.00
Female tree	7.0	2.8	10.88

Table 2. Effect of different concentration of sucrose on pollen germination of F. *cataphracta*

Sucrose %	Agar %)	Germination %	Tube length , µm
2	0.25	65.1	88.3
4	0.25	807	132.6
6	0.25	71.1	97.0

Table 3. Fruit development in *F. cataphracta*

Days from fruitset	Colour	Length, cm	Circumference, cm	Weight, g
14	Green	0.30	1.20	0.12
28	Green	0.83	2.80	0:47
42	Green	1.18	4.00	1.19
56	Yellow	1.30	5.25	2.30
70	Pink	1.74	7,28	5.69
80	Red	1.85	7,36	5.8.1

female (2.8 and 10.9 respectively). Male flowers appear as axillary or terminal cymose clusters. They have five perianth lobes which are green in colour and arranged in imbricate aestivation (Fig. 1). Androecium consists of numerous stamens with a mean of 20 anthers per flower. The anthers are two celled and dehiscence is longitudinal. Filaments are dorsifixed.

Female flowers appear in fascicles. Perianth consists of two to six perianth lobes arranged in imbricate aestivation (Fig. 1), Ovary is 5-7 carpelled, syncarpous and 5-7 loculed with single basal ovule in each chamber. Ovules are arranged in axile placentation, style 3 to 8 with capitate stigma.

Five stages could be identified in the sequence of development of male flowers in sweet lovi-lovi. From flower bud initiation, 25 days were required for complete flower development. Buds were green and dome-shaped in the early stage, which lasted for 14 days. In the second stage, the calyx just opened and anthers were visible, which were green and intact. After one day, spreading started and colour of anthers changed to yellow from green. Green filaments could be seen as the calyx opened fully which was marked as the third stage. Flowers remained in second and third stage for 4 days. In the next stage, the anthers beeamc creamy yellow in colour in 3 days and cream coloured filaments attained maximum length. This was the fully developed stage of male flower in which anther dehiscence occurred. The time of dehiscence was around 6 a.m. Flowers remained in stage 4 for 2-3 days and then the anthers turned brown and flowers shed.

In female flowers, number of stages during development were less than in male. Buds appeared were green and dome-shaped with the calyx closed in the first stage. In 7-10 days, the calyx split opened and gynoecium became visible marking the second stage. At the final

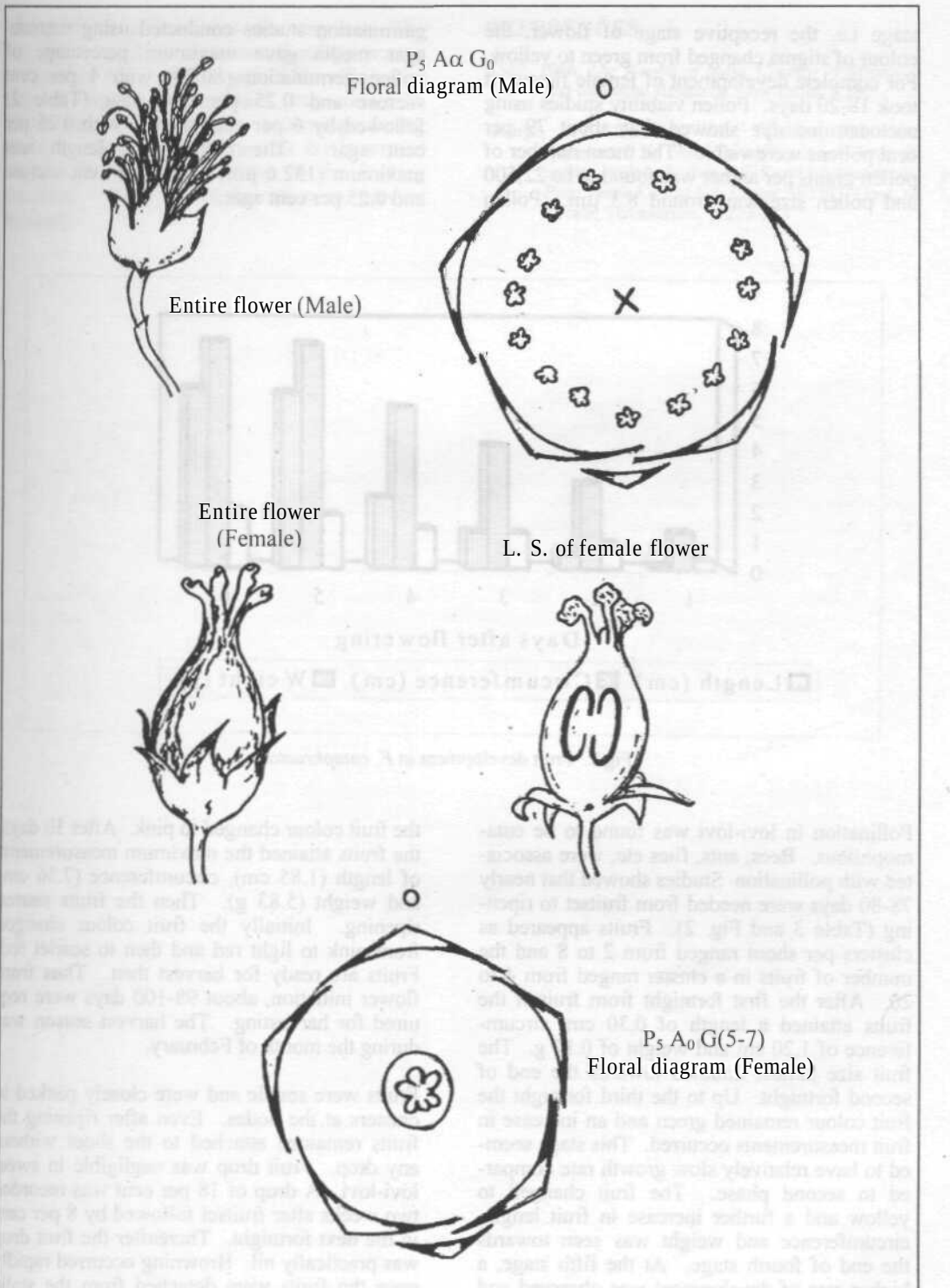

Fig 1. Structure of male and female flowers of sweet lovi-lovi

stage i.e. the receptive stage of flower, the colour of stigma changed from green to yellow. For complete development of female flower, it took 18-20 days. Pollen viability studies using acetocarmine dye showed that about 79 per cent pollens were viable. The mean number of pollen grains per anther was found to be 22,500 and pollen size was around 8.3 um. Pollen germination studies conducted using sucrose-agar media gave maximum percentage of pollen germination (80.70) with 4 per cent sucrose and 0,25 per cent agar (Table 2) followed by 6 per cent sucrose with 0.25 per cent agar. The pollen tube length was maximum (132.6 µm) with 4 per cent sucrose and 0.25 per cent agar.

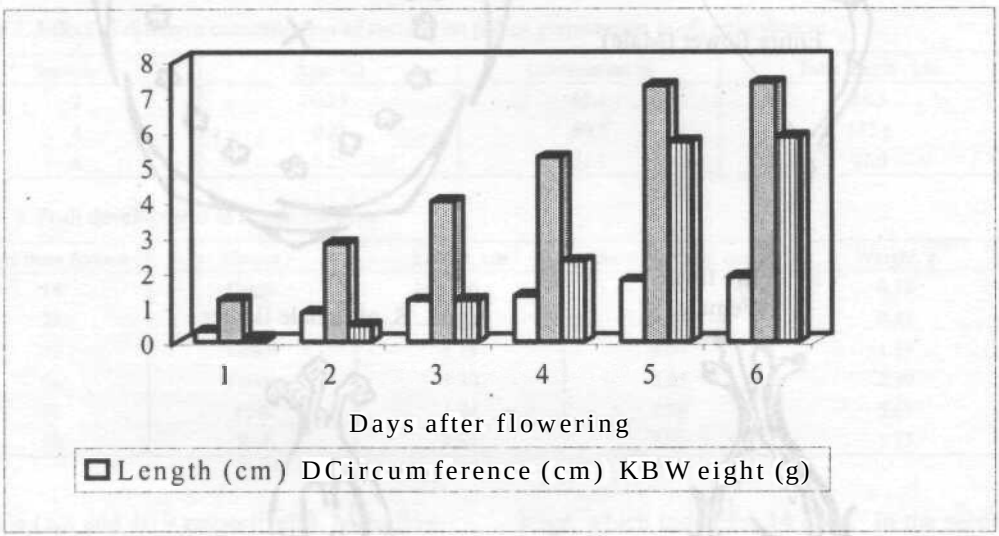

Fig.2, Fruit development in *F. cataphracta*

Pollination in lovi-lovi was found to be entamophilous. Bees, ants, flies etc. were associated with pollination Studies showed that nearly 78-80 days were needed from fruitset to ripening (Table 3 and Fig. 2). Fruits appeared as clusters per shoot ranged from 2 to 8 and the number of fruits in a cluster ranged from 4 to 20. After the first fortnight from fruitset the fruits attained a length of 0,30 cm, circumference of 1.20 cm and weight of 0.12 g. The fruit size almost doubled towards the end of second fortnight. Up to the third fortnight the fruit colour remained green and an increase in fruit measurements occurred. This stage seemed to have relatively slow growth rate compared to second phase. The fruit changed to yellow and a further increase in fruit length, circumference and weight was seen towards the end of fourth stage. At the fifth stage, a higher rate of development was observed and the fruit colour changed to pink. After lOdays, the fruits attained the maximum measurements of length (1.85 cm), circumference (7.36 cm) and weight (5,83 g). Then the fruits started ripening. Initially the fruit colour changed from pink to light red and then to scarlet red. Fruits are ready for harvest then. Thus from flower initiation, about 98-100 days were required for harvesting. The harvest season was during the month of February.

Fruits were sessile and were closely packed in clusters at the nodes. Even after ripening the fruits remained attached to the shoot without any drop. Fruit drop was negligible in sweet lovi-lovi. A drop of 18 per cent was recorded two weeks after fruitset followed by 8 per cent in the next fortnight. Thereafter the fruit drop was practically nil. Browning occurred rapidly once the fruits were detached from the stalk.

The shelf life of fruits was also very less. The scarlet coloured ripe fruits lost their appearance within one hour of harvest. Shrivelling was noticed from the second day onwards. Therefore, to lessen the browning during transportation, the fruits are to be harvested along with terminal portions of the fruiting branches. Care should be taken to prevent bruising

REFERENCES

CSIR, 1956. *The Wealth of India*, Council of Scientific and Industrial Research, New Delhi, p.287

George, S.T., Samitha, V.S., Mathew, K.L. and Rajeevan, P.K. 1998. Variability in lovi-lovi,, an under exploited fruit of Kerala homesteads. *Proc.Tenth Kerala Sci. Congr.* STEC, Govt. of Kerala, Trivandrum, p,222-223