

FLOWERING BEHAVIOUR AND FLOWER MORPHOLOGY OF PASSION FRUIT (*Passiflora edulis* Sims)

M.B. BANU¹, M.Q.I. Matin², T. Hossain³, M.M. Hossain⁴

^{1&2}Scientific Officer, Regional Agricultural Research Station, Bangladesh Agricultural Research Institute (BARI), Jessore,

^{3&4}Professor, Bangha Bandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU), Gazipur, Bangladesh.

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ABSTRACT

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An experiment was conducted at Crop Botany Department of Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU), Gazipur, Bangladesh to study flowering behaviour and flower morphology of passion fruit grown from cutting and grown from seed. Flowers opened within 10:52 to 12:25 hr. in plants grown from cuttings and within 10:55 to 12:31 hr. in seeded plants. From visible flower bud to full bloom requires 14.17 days for plants grown from cutting and requires 13.33 days for plants grown from seeds. Flowering started earlier in case of plants grown from cutting which continued 152 days as against 99 days in case of plant grown seed. Average size of floral parts was recorded more or less similar in both types of plants. Percentage of fruit set was higher under hand pollination than under natural pollination.

Key words: *Passion flower, passion fruit, pollination, fruit set*

INTRODUCTION

Passion fruit (*Passiflora edulis* Sims.), a perennial woody climber, belongs to the family of Passifloraceae. It originated in the Amazon region of Brazil, but has been commercially cultivated in Hawaii, Australia, New Zealand, Fiji, South Africa and Kenya. (Rashid *et al.*, 1987). The bisexual solitary flower is borne at leaf base of new growth and is about 4-5 cm diameter and very conspicuous, colourful and fragrant. It has five whitish petals and two purplish rows of thread like rays called corona. The pistil consists of an ovary tripartite style, each branch terminating in a sticky stigma. The parts of flower supposedly represent the implements of the crucifixion. The fruit is round or oval, about 4-5 cm long and greenish yellow or purple when ripe and smooth. It consists of a thin, shell like rind within numerous small black or brown seeds are enclosed in a yellow or orange aromatic juicy pulp which has an acidic but pleasant flavour. Rashid *et al.* (1987) mentioned that passion fruit is used not only as fresh fruit also juice, jam and jelly. It contains 700-2400 IU carotene and 20-30 mg vitamin C per 100g of juice. It has been suggested that passion fruit is a long day plant, requiring day lengths in excess of 10.5 h to flower and fruit (Watson and Bowers, 1965; Vallani *et al.*, 1976). Duarte and Sierra (1997) mentioned that except for self pollination (0% fruit set), manual pollination gave greater fruit set than natural pollination (about 55% VS 44.6%), resulting in 90g fruits (20-25% heavier than those of the control). The agro-climatic conditions of hill tract regions of Bangladesh are very much congenial to passion fruit cultivation. The vacant places around the homesteads can be brought under cultivation through growing the plant, as it requires on no extra care. Passion fruit is gaining popularity in Bangladesh for its lucrative colour, flavour and tasty yellow juice day by day. The nice flowering behaviour and flower morphology can fulfill one's aesthetic need. General awareness can be created among the people about the fruit. In view of above mentioned importance, the present study was undertaken to observe the flowering behaviour and flower morphology.

MATERIALS AND METHODS

The experiment was carried out during 2002-2003 at the experimental farm of Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur. Two types of plant materials were used e.g., (i) Plant grown from seeds, (ii) Plant grown from cutting. Land preparation, manuring & fertilization and re-transplanting were done accordingly. Days to appearance of flower bud, first flowering node number, days to first flowering, floral morphology, time of anthesis and fruit set percentage were recorded.

RESULT AND DISCUSSION

Time of flowering and nodal position

In passion fruit, there was particular time for flowering, i.e. flowering took place only during day especially between 10:52 hr. to 12:40 hr. In case of plant grown from cutting flowering started within 10:52 hr. to 12:25 hrs, and full blooming occurred within 11:00 hr. to 12:30 hr. On the other hand, plants grown from seed, flowering started within 10:55 to 12:31 hr. and full blooming was recorded within 11:00 hr. to 12:40 hrs. Nazrul *et al.* (2003) reported that flower opening of yellow passion fruit varied from 11:40 hr to 12:35 hrs. The present finding was more or less similar with their results. In plants grown from cutting first

flower opened in node number 9. On the other hand, first flower opened in node number 16.83 in case of plants grown from seeds.

Table 1. Time of flowering in passion fruit grown from cutting and seed (hr.)

Time		Plants grown from cutting	Plants grown from seed
Starting time (hrs.)	Range	10:52 – 12:25	10:55 – 12:31
	Mean	11:23 \pm 0.14	11:28 \pm 0.11
Full blooming time (hrs.)	Range	11:00 – 12:30	11:00 – 12:40
	Mean	11:44 \pm 0.13	11:48 \pm 0.11

\pm = Standard Error

Table 2. Nodal position of first flower

Plant types		Position of nodes
Plant grown from cutting	Range	7 - 10
	Mean	9 \pm 0.52
Plant grown from seeds	Range	15 - 19
	Mean	16.83 \pm 0.65

Days required from visible bud to full blooming stage

In the present study the number of days required for opening of flower from visible appearance of flower buds in both types of plants varied a little. Plants grown from seed required slightly longer period (14.17 days) than plants grown from cutting (13.33 days) to open after visible appearance of flower bud (Table 3). Plants grown from seed required slightly longer time to open flower after visible appearance of flower buds. This might be due to early maturity of plants grown from cutting than plants grown from seeds.

Table 3. Days required to first flower opening after visible appearance of flower buds

Plants grown from		Days required to first flower opening
Cutting	Range	11 – 16
	Mean	13.33 \pm 0.81
Seed	Range	12 – 15
	Mean	14.17 \pm 0.48

Table 4. Flowering period and percent fruit set under natural condition

Characters		Plants grown from cutting	Plants grown from seed
Flowering period	Initiation	17 April 2002	09 June 2002
	Completion	15 September 2002	15 September 2002
Flowering period (in days)		152	99
Number of flowers tagged		120	132
Number of fruit set		18	16
Fruit set (%)		15	12.12

Plants grown from cutting flowered earlier with a flowering period of 152 days. Plants grown from seeds flowered later than plants grown from cutting and its flowering period was 99 days. Data presented in Table 4 showed that the flowering period of two types of passion fruit ranged from 99 to 152 days. Periodic observations were made on tagged flowers and number of fruit set was counted. The maximum percentage of fruit set was recorded in plants grown from cutting (15%) and minimum in seed grown plant (12.12%) under natural condition.

Hardin (1986) reported that honey bees (*Apis mellifera*) play vital role for pollination and up to 25% of open flower produce fruits. In the present study honey bees were found to visit frequently the open flower.

Table 4. Flowering period and percent fruit set by hand pollination

Characters		Plants grown from cutting	Plants grown from seed
Flowering period	Start	17 April 2002	09 June 2002
	Finish	15 September 2002	15 September 2002
Flowering period (in days)		152	99
Number of flowers tagged		80	80
Number of fruit set		66	45
Fruit set (%)		82.5	56.25

Eighty flowers were pollinated by hand in plants grown from cuttings as well as plants grown from seeds. But fruit set percentage was higher in plant grown from cutting (82.5%) and lower in plant grown from

seeds (56.25%). So, hand pollination showed better effect on fruit set percentage than natural pollination (Table 5).

Flower Morphology

Flower morphology of passion fruit is presented in Table 6. Among the studied characters, sizes of sepal, petal and ovary were larger in plant grown from seedlings. Total numbers of corona per flower were higher in seeded plant. Size of bract, anther and length of style, filament and corona were found larger in plant grown cutting. Length of androgynophore was more or less equal but breadth varied in cutting plant (0.28 ± 0.03) from seeded plant (0.22 ± 0.02). The passion flower is a fast growing vine and it needs two years to reach the bearing stage after planting (Rashid *et al.* 1987, Vanderplank 1991). Flowers appeared mostly on new shoots and were situated on the middle to upper portion of vine. Liao (1987) reported similar results.

Table 6. Floral morphology of passion fruit

Floral parts		Plant grown from cutting	Plants grown from seed
Sepal size (cm)	Length	3.46 ± 0.31	3.49 ± 0.28
	Breadth	0.78 ± 0.81	0.78 ± 0.13
Petal size (cm)	Length	3.37 ± 0.37	3.41 ± 0.28
	Breadth	0.67 ± 0.26	0.72 ± 0.25
Pedicel (cm)	Length	3.18 ± 0.20	3.18 ± 0.25
	Breadth	0.25 ± 0.04	0.24 ± 0.04
Bract/Epicalyx(cm)	Length	1.93 ± 0.33	1.87 ± 0.33
	Breadth	1.13 ± 0.21	1.16 ± 0.15
Androgynophore (cm)	Length	1.10 ± 0.41	1.1 ± 0.13
	Breadth	0.28 ± 0.03	0.22 ± 0.02
Anther size (cm)	Length	1.11 ± 0.05	1.09 ± 0.07
	Breadth	0.52 ± 0.08	0.53 ± 0.09
Style (cm)	Length	1.18 ± 0.17	1.17 ± 0.17
Filament (cm)	Length	1.30 ± 0.05	1.25 ± 0.20
Corona (cm)	Length	2.79 ± 0.03	2.44 ± 0.03
Number of corona/flower		1.65 ± 4.47	169 ± 2.38
Ovary size (cm)	Length	0.71 ± 0.05	0.77 ± 0.07
	Breadth	0.55 ± 0.05	0.52 ± 0.05

It may be concluded from the above study that, flowers opened within 10:52 to 12:25 hr. in plants grown from cutting and within 10:55 to 12:31 hr. in plants grown from seed. Flowering started earlier in case of plants grown from cutting which continued 152 days as against 99 days in case of plant grown from seed. Average size of all floral parts was recorded more or less similar in both types of plants.

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