
Effect of date of sowing on flowering and incidence and damage of melon fruit fly in snap melon *Cucumis melo* var. *momordica* genotypes

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A B S T R A C T

The present experiment on snap melon [*Cucumis melo* (L.)var. *momordica* Duth.&Full.], was carried out during 2004-2005 to determine the best sowing date for higher female flower production and more number of fruits as well as lower fruit fly incidence. Three sowing dates viz. S₁=25 November, 2004, S₂=25 January 2005 and S₃ =25 March, 2005 were selected to evaluate performance of eight genotypes, named as BCSM-1 to BCSM-8. The experimental design was factorial RBD with 3 replications. Observations on days to first male and female flowers, node number of first male and female flowers, total number of fruits and number of melon fruit-fly [*Bactrocera cucurbitae* (Coquillett),Diptera: Tephritidae] infected fruits were recorded. Snap melon being a monoecious and warmth loving crop, tends to bear increasing number of female flowers with time; days to first female flower gradually lessened from the first to the third sowing, which signify longer fruiting period from the first to the third sowing. The infestation level of fruit fly has been found to be higher in March sowing than the other two sowing dates, irrespective of the genotypes, and BCSM-4 was affected the least when sown in January or March by fruit fly. Considering earliness, total number of fruits per plant and moderately lower fruit fly incidence, BCSM-4 and BCSM-8 may possibly perform better than the other genotypes in the lower Gangetic plain if sown during end of January.

Keywords: Snap melon, sowing dates, flowering, fruit fly infestation.

Introduction

Snap melon [*Cucumis melo* (L.)var. *momordica* Duth.&Full.] is a common and popular cucurbit in southern parts of West Bengal. It is mainly cultivated as a spring-summer crop. Growth and flowering of the crop coincide with high temperature (30-40°C) during April-May; and the result is predominance of male flower and higher flower drop. Three different sowing dates were chosen to find out the most suitable one for higher female flower production and more fruits as well as less Melon fruit fly [*Bactrocera cucurbitae* (Coquillett), Diptera: Tephritidae]

incidence. This fly is a serious problem and reduces the number of marketable fruits. Snap melon is a preferred host of melon fruit fly (Narayanan 1953; Narayanan & Batra 1960; Doharey 1983; Allwood *et al.* 1999; Weems & Heppner 2001); among all the damaging fruit fly species found in India, *Bactrocera cucurbitae* is the most common, destructive and polyphagous in nature (Butani 1975) and has a host range of over seventy species (Batra 1953; Doharey 1983). The host list includes the cucurbits-the most preferred herbs, some other vegetables, legumes and fruit crops (Dhillon *et al.* 2005).

This Dipteran insect lays eggs in young ovaries just below the skin, only to hatch into maggots, which feed from within the fruits to cause fruit rotting and reduce fruit yield significantly.

Materials and Methods

The experiment was carried out during 2004-2005, at the Central Research Farm of Bidhan Chandra Krishi Viswavidyalaya, Gayespur, Nadia; it was set out in factorial RBD to evaluate the performance of eight genotypes (treatments) named as BCSM-1 to BCSM-8, with respect to three sowing dates ($S_1=22$ November, 2004, $S_2=22$ January, 2005 and $S_3=22$ March, 2005) with three replications. Each plot measured 3m x 1.5m and the spacing given was 1m x 1m, accommodating six plants per plot. The crop was raised following standard agronomic practices. Observations at weekly intervals on days to first male flower, days to first female flower, node number of first male flower, node number of first female flower, days to first harvest, total number of fruits per plant, number of fruit-fly infected fruits per plant and percentage of infested fruits were recorded and collected data were subjected to analysis of variance. Data on different parameters were recorded from randomly selected three plants per genotype in each replication. No insecticidal measure was taken. Number of infested fruits was counted and its percentage out of total number of fruits per plant was calculated and analyzed statistically.

Results

The data on flowering pattern, fruit fly incidence and damage in different genotypes in three different seasons have been furnished in

the Table 1. Days to first male and female flowers ranged from 31.78 to 82.55 and 46.21 to 101.22, respectively, irrespective of sowing dates. The male flower always appeared well in advance of female flower in all the seasons and genotypes tested. Appearance of first female flower took longer days (83.78–101.22 days) in the first sowing than in the following two sowings (49.33–79.44 days and 46.21–64.43 days, respectively). The same trend is also noticed in case of the first male flower production. Node number of 1st male flower did not vary significantly in different seasons. However, in case of 1st female flower, it varied significantly having lower values in January sowing (10.43–18.11). In case of days to first harvest, the earliest harvest was recorded in March sowing (76.6–100.9 days) followed by January sowing (81.8–115.1 days). In November sowing, days to first harvest (129.7–151.9 days) were much higher than other two sowings. When total number of fruits per plant is considered, it is found that highest number of fruit was obtained in January sowing (9.46/plant), closely followed by March sowing (8.20/plant) and the least in November sowing (7.01/plant).

In all the three sowing dates, BCSM-4 took the least days (S_1 -83.78, S_2 - 49.33, S_3 -46.21) for appearance of the first female flower, which were significantly different from those in other genotypes. The appearance of earliest female flower was recorded in third sowing in BCSM-4. BCSM-7 took longest days for appearance of the first female flower in all the sowings. In the first sowing, earliest female flower appeared on the node number 11.21 in BCSM-4, which was

significantly lower than that in the other genotypes. In the second sowing the lowest female flower producing node number was recorded in BCSM-2 (10.43), closely followed by BCSM-4 (11.00). In the third sowing, BCSM-6, though recorded the lowest node number (11.89), it was found to be at par with BCSM-1 (12.22), BCSM-2 (12.43) and BCSM-4 (12.21). In case of node number of first female flower appearance, BCSM-7 recorded higher values in all the sowing dates (19.11, 18.11 and 18.67, respectively).

It is interesting to note that in all the three sowings, BCSM-4 recorded the least days and lower node numbers for appearance of the first female flower. BCSM-7 produced both male and female flowers lately irrespective of sowing dates. It has been noted in this experiment that days to first harvest was less in case of the genotypes BCSM-4, 6 and 8. Among them, the earliest yielder was BCSM-4 (129.74, 81.80 and 76.65 days in S_1 , S_2 and S_3 respectively). The interaction between sowing dates and genotypes was found to be insignificant both for the days to first male and female flower production. Total number of fruits per plant was the highest in the BCSM-4 genotype in the second and third sowings (13.89 & 12.00 per plant respectively), which, though significantly higher, was closely followed by BCSM-8 in the same sowing dates (10.33 and 10.11 per plant, respectively).

It is also found from the Table.1 that the overall percentages of infested fruits of

different genotypes in all the sowings dates ranged between 24.05 and 43.93. The fruit fly infestation in different sowing dates varied significantly. If averaged, the percentages of infested fruits become 28.46, 30.89 and 35.08 in the 1st, 2nd and 3rd sowings, respectively. The incidence of fruit fly was comparatively higher in March sowing and lower in November and January sowings. The worst fruit fly infested genotype was BCSM-5 (43.93% in March and 33.68% in January sowing) and the lowest infestation was noted in BCSM-8 in November sowing. In both January and March sowings, the percentage fruit infestation was the lowest in BCSM-4 which was at par with BCSM-2, BCSM-6 and BCSM-7 in January sowing and with BCSM-1 and BCSM-8 in March sowing.

Discussion

Both endogenous and environmental factors influence the coordination of flowering in a population of plants (Thomas 1993). A close perusal of the data on days to first male and female flower clearly indicates that the flowering of the genotypes did vary significantly in all the three sowings. Most of the monoecious cucurbits like snap melon tend to bear increasing number of female flowers as the plant ages and continues up to active fruiting and then declines; such transitions in flowering pattern is primarily conditioned by temperature and high light incidence (Matsuo 1968). In the present investigation, the significant variation in first flowering node number of female flower, particularly in different sowing dates is in tune with the findings of Cantliffe (1981) and Matsuo (1968). Appearance of first female flower in

Table 1.

Effect of sowing dates on flowering, incidence and damage of fruit fly in snap melon

Sowing dates	Geno-types	Days to 1st ♂ flower	Days to 1st ♀ flower	Node no. of 1st ♂ flower	Node no. of 1st ♀ flower	Days to 1st harvest	Total no. of fruits /plant	No. of fruit fly infested fruits/plant	% of Infested fruits
S1 (25th November)	BCSM -1	75.66	94.89	5.89	13.34	143.52	6.55	1.67	25.50
	BCSM -2	76.89	92.22	5.33	12.00	141.84	6.89	2.24	32.51
	BCSM -3	77.22	92.54	5.55	12.89	144.85	5.56	1.78	32.01
	BCSM -4	72.44	83.78	5.21	11.21	129.74	8.33	2.37	28.45
	BCSM -5	69.68	91.78	6.43	13.78	138.54	7.33	2.22	30.29
	BCSM -6	71.78	90.67	7.33	12.33	140.61	8.67	2.44	28.14
	BCSM -7	82.55	101.22	11.44	19.11	151.90	4.33	1.22	28.17
	BCSM -8	76.89	90.33	9.22	16.00	131.14	8.44	2.03	24.05
	Total /Av.						56.1/ 7.01	15.97/ 1.99	28.46
S2 (25th January)	BCSM -1	53.70	63.22	6.21	14.78	109.26	8.00	2.60	32.50
	BCSM -2	50.89	63.45	5.22	10.43	102.05	7.67	2.20	28.68
	BCSM -3	50.99	61.55	6.33	12.44	98.16	7.78	2.56	32.90
	BCSM -4	43.77	49.33	5.44	11.00	81.80	13.89	3.87	27.86
	BCSM -5	42.44	59.77	5.88	13.89	92.14	8.67	2.92	33.68
	BCSM -6	54.89	64.11	7.33	11.77	97.49	9.67	3.00	31.02
	BCSM -7	64.78	79.44	10.78	18.11	115.14	9.67	2.89	29.88
	BCSM -8	57.44	69.66	8.89	16.10	97.15	10.33	3.34	32.30
	Total/Av.						75.68 /9.46	23.38 /2.92	30.89
S3 (25th March)	BCSM -1	45.32	55.89	6.00	12.22	87.18	6.00	2.00	33.33
	BCSM -2	45.11	54.89	6.89	12.43	85.38	7.22	2.55	35.32
	BCSM -3	31.78	55.89	6.33	14.88	86.07	7.33	2.67	36.99
	BCSM -4	40.86	46.21	5.22	12.21	76.65	12.00	3.67	30.60
	BCSM -5	37.78	53.43	6.00	15.11	79.69	7.33	3.22	43.93
	BCSM -6	41.78	57.44	7.22	11.89	87.40	10.00	3.44	34.40
	BCSM -7	53.78	64.43	11.88	18.67	100.92	6.00	2.33	38.83
	BCSM -8	42.11	55.10	8.22	17.44	81.89	10.11	3.27	32.34
	Total/Av.						65.99 /8.20	23.15 /2.89	35.08
CD (P=0.05)	S	3.04	4.06	NS	0.36	1.82	0.58	0.26	1.95
	V	4.96	6.63	0.43	0.58	2.96	0.95	0.43	3.19
	S x V	NS	NS	0.75	1.01	5.13	1.64	NS	5.52

NS- Not Significant

lower node number ensures early and higher fruit number which have a direct positive effect on total yield of snap melon. In the present experiment, it is found that in all the three sowings, BCSM-4 recorded the least days and lower node numbers for appearance of the first

female flower and yielded highest number of fruits in the second and third sowings and was at par with the highest yielder in the first sowing. Pandey *et al.* (2009) also noted the similar trend. Days to first female flower gradually lessened from the first to the third sowing,

which signify longer fruiting period from the first to the third sowing.

An average daytime temperature of 30°C is very congenial for fruit setting and subsequent fruit growth in melons (Ding and Ding 1998) and such a set of day time temperature condition, more or less coincides with the fruiting period of January-sown snap melon. In the present investigation, highest number of fruits was obtained in January sowing (9.46/plant) and was closely followed by March sowing (8.20/plant).

According to Singh *et al.* (2007), adult flies become active as summer approaches and temperature increases and they begin to emerge from the pupae in the soil and over-wintering flies also become active; such emergence increases from April onwards and touches the peak during May-July and then slowly declines from August to September after which it remains low up to March. So, here the March sown crop would naturally record higher melon fruit fly incidence; this finding is in tune with the earlier work of Lee *et al.* (1992). It is interesting to note that both the crop and the pest need the same sort of environment to thrive. The population build up of fruit fly is favoured by prevailing high temperature. Similarly, like most other melons, a long, warm weather with plenty of sunshine is favourable for growth of snap melon (Pandit *et al.* 2005). In the third sowing, the percentage of fruit fly infestation increased, since high temperature favours population growth.

The genotypes tested here, experienced

differential fruit fly attack. The worst fruit fly infested genotype was BCSM-5 (43.93% in March and 33.68% in January sowing) and the lowest infestation was noted in BCSM-8 in November sowing. In both January and March sowings, the percentage fruit infestation was the lowest in BCSM-4. These variations may be attributed to varietal susceptibility or resistance. Plant genotypes, either due to the environmental stress or genetic make up, possess physiological and biochemical variations, which alter the nutritional values (primary metabolites) for herbivores (Eckey-Kaltenbach *et al.* 1994; Mısırlı *et al.* 2000; Siemens *et al.* 2002; Goncalves-Alvim *et al.* 2004; Rafiq *et al.* 2008) and may also cause changes in the levels of either qualitative or quantitative secondary metabolites (Theis & Lerda 2003), that could affect the behaviour and physiology of insects (Karban *et al.* 1997; Mısırlı *et al.* 2000; Stadler 2002; Theis & Lerda 2003; Goncalves- Alvim *et al.* 2004; Aslam *et al.* 2005).

Considering earliness, total number of fruits per plant and moderately lower fruit fly incidence, it may be predicted that BCSM-4 and BCSM-8 possibly would perform better if sown during end of January in the lower Gangetic plain.

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