Indian Journal of Entomology, **78**(2): 170-173 (2016) DOI No. : 10.5958/0974-8172.2016.00047.X

SUSCEPTIBILITY OF WATERMELON GENOTYPES TO FRUIT FLY *BACTROCERA CUCURBITAE* (COQUILLETT)

SHRAVAN M HALDHAR*, B. R. CHOUDHARY AND R. BHARGAVA*****

**Department of Crop Protection, ICAR- Central Institute for Arid Horticulture, Bikaner*
Email: haldhar80@gmail.com

ABSTRACT

Host plant resistance is an important component for management of the melon fruit fly, *Bactrocera cucurbitae* (Coquillett) owing to difficulties associated with its chemical and biological control. A total of 27 watermelon varieties/ genotypes were evaluated for their susceptiblity to the fruit fly in hot arid region of Rajasthan. The results showed that the varieties/ genotypes *viz.* percentage of fruit infestation and larval population per fruit varied significantly. Pooled data showed that the varieties/genotypes *viz.*, AHW/BR-60, BSM-1, IC 582909, AHW/BR-9, AHW/BR-137, Durgapura Kesar, AHW/BR-10, AHW/BR-18, AHW/BR-8, AHW/BR-21, AHW/BR-20 and YF-4 can be categorized as susceptible with considerable fruit infestation (55.72%, 59.28%, 53.05%, 67.20%, 60.43%, 61.83%, 63.87%, 63.62%, 59.45%, 59.62%, 62.52% and 55.68%, respectively) and with larval population per fruit *viz.* 17.12, 17.85, 16.45, 19.23, 17.90, 18.48, 18.38, 18.32, 18.40, 17.57, 17.93 and 17.70, respectively. The varieties/ genotypes Asahi Yamato, AHW/BR-16 and Thar Manak had 12-18% fruit infestation (12.75%, 15.05% and 18.18%, respectively) with 1-1 lawal per fruit (10.13, 10.82 and 11.08, respectively) and declared which can be considered resistant. Lower values of host plant susceptibility indices based on fruit infestation (HPSI) were recorded on resistance varieties/ genotypes, *viz.*, Asahi Yamato, AHW/BR-16 and Thar Manak (28.85%, 34.05% and 41.14%, respectively). These could be used as a source of resistance for developing watermelon varieties/ genotypes resistant to fruit fly.

Key words: *Citrullus lanatus, Bactrocera cucurbitae, infestation, density, HPSI*

Watermelon [*Citrullus lanatus* (Thunb.) Mansf.] is a popular desert crop and fruit fly, *Bactrocera cucurbitae* (Coquillett) (Diptera: Tephritidae: Dacinae) is its economically important pest. This fruit fly has more than 81 plant species as its hosts (Dhillon *et al.*, 2005a), but plants of family Cucurbitacae are considered to be its preferred hosts (Allwood *et al.*, 1999). Development of varieties resistant to melon fruit fly is an impotent component of integrated pest management (Panda and Khush, 1995). But development of watermelon varieties/ genotypes resistant to fruit fly has been limited in India owing to inadequate information on the sources of plant traits associated with resistance. The present study was designed to screen of watermelon varieties/ genotypes for resistance against melon fruit fly in terms of fruit infestation and larval density under field conditions.

MATERIALS AND METHODS

Twenty seven varieties/ genotypes of watermelon *viz.*, RSS-1, AHW/BR-18, AHW/BR-8, AHW/BR-21, AHW/BR-20, YF-4, AHW/BR-19, AHW/BR-96, YF-5, YF-7, AHW/BR-10, Durgapura Kesar, AHW/BR-137, Durgapura Lal, AHW/BR-9, Sugar Baby, AHW-65, AHW-19, IC 582909, BSM-1, AHW/BR-16, Charleston Grey, Asahi Yamato, Arka Manik, AHW/BR-60, AHW/BR-12 and Thar Manak were sown at experimental farm of Central Institute for Arid Horticulture (CIAH), Bikaner (28°06'N, 73°21'E). The crop was sown in summer, 2012 and kharif, 2013 with three replicates (blocks) for each variety/ genotype following a randomized block design. The area of each bed was 5 m × 2 m and the plant to plant distance was maintained at 50 cm with drip irrigation system. All the recommended agronomic practices (e.g. weeding, fertilization, hoeing, etc.) were performed equally in each experimental bed. Three pickings were done for the entire growing season of watermelon fruits. Ten fruits were randomly selected from each picking from each experimental bed; a total of 30 fruits were taken from each picking of each genotype and were brought to the laboratory for examination of infestation. The infested fruits were sorted and the % infestation was calculated. Ten fruits from all infested fruits from each picking of each genotype were then randomly selected for further examination, and the number of larvae were

**Horticultural Science, ***Plant Physiology

Table 1. Larval density and % fruit infestation of fruit fly on varieties/ genotypes of watermelon

S. No.	Varieties/ genotypes	2012 year (Summer season)		2013 year (Rainy season)		Pooled data 2012-13		Resistance category
		Larval density/ fruit	Fruit infestation (%)	Larval density/ fruit	Fruit infestation (%)	Larval density/ fruit	Fruit infestation (%)	
1	Thar Manak	11.00	17.80 (24.85)	11.17	18.57 (25.41)	11.08	18.18 (25.17)	R
2	AHW/BR-12	13.60	28.90 (32.49)	13.90	30.83 (33.70)	13.75	29.87 (33.10)	MR
3	AHW/BR-60	16.97	55.57 (48.18)	17.27	55.87 (48.35)	17.12	55.72 (48.27)	S
4	Arka Manik	14.30	33.90 (35.51)	14.57	34.70 (36.03)	14.43	34.30 (35.77)	MR
5	Asahi Yamato	9.97	12.60 (20.59)	10.30	12.90 (20.83)	10.13	12.75 (20.75)	R
6	Charleston Grey	14.57	38.03 (38.05)	15.20	39.23 (38.77)	14.88	38.63 (38.41)	MR
7	AHW/BR-16	10.60	14.73 (22.54)	11.03	15.37 (23.04)	10.82	15.05 (22.80)	R
8	BSM-1	17.73	58.20 (49.70)	17.97	60.37 (50.97)	17.85	59.28 (50.33)	S
9	IC 582909	16.43	52.70 (46.53)	16.47	53.40 (46.93)	16.45	53.05 (46.73)	S
10	AHW-19	15.23	48.97 (44.39)	15.60	49.30 (44.58)	15.42	49.13 (44.48)	MR
11	AHW-65	14.00	35.33 (36.46)	14.73	36.97 (37.43)	14.37	36.15 (36.94)	MR
12	Sugar Baby	13.23	26.70 (31.10)	12.77	26.93 (31.25)	13.00	26.82 (31.17)	MR
13	AHW/BR-9	19.10	66.90 (54.91)	19.37	67.50 (55.31)	19.23	67.20 (55.04)	S
14	Durgapura Lal	11.90	22.70 (28.28)	12.33	23.07 (28.48)	12.12	22.88 (28.38)	MR
15	AHW/BR-137	17.70	59.33 (50.37)	18.10	61.53 (51.65)	17.90	60.43 (51.01)	S
16	RW-187-2	18.23	61.53 (51.68)	18.73	62.13 (52.04)	18.48	61.83 (51.86)	S
17	AHW/BR-10	17.97	63.33 (52.72)	18.80	64.40 (53.35)	18.38	63.87 (53.03)	S
18	AHW/YF-7	14.20	31.30 (34.00)	14.10	32.00 (34.43)	14.15	31.65 (34.22)	MR
19	AHW/YF-5	13.03	26.90 (31.23)	13.30	27.47 (31.58)	13.17	27.18 (31.41)	MR
20	AHW/BR-96	14.60	41.57 (40.13)	15.33	41.90 (40.32)	14.97	41.73 (40.22)	MR
21	AHW/BR-19	15.27	40.90 (39.74)	15.63	42.50 (40.67)	15.45	41.70 (40.21)	MR
22	AHW/YF-4	17.43	55.23 (47.99)	17.97	56.13 (48.51)	17.70	55.68 (48.24)	S
23	AHW/BR-20	17.70	62.43 (52.22)	18.17	62.60 (52.28)	17.93	62.52 (52.24)	S
24	AHW/BR-21	17.07	59.03 (50.19)	18.07	60.20 (50.87)	17.57	59.62 (50.53)	S
25	AHW/BR-8	18.33	58.27 (49.74)	18.47	60.63 (51.12)	18.40	59.45 (50.43)	S
26	AHW/BR-18	18.20	63.83 (53.02)	18.43	63.40 (52.76)	18.32	63.62 (52.88)	S
27	RSS-1	15.17	44.60 (41.88)	15.77	45.60 (42.46)	15.47	45.10 (42.17)	MR
SEm+		0.60	1.29	0.57	1.24	1.60	1.10	
CD (P = 0.05)		1.70	3.67	1.63	3.54	0.56	3.12	

Data presented are mean of three replications; Figures in parentheses are angular transformed value

Table 2. Host plant susceptibility indices (HPSI %) for fruit fly on varieties/ genotypes of watermelon

S. No.	Varieties/ genotypes	HPSI based on larval population (%)			HPSI based on fruit infestation (%)		
		2012	2013	Pooled 2012-13	2012	2013	Pooled 2012-13
1	Thar Manak	71.80	72.04	71.51	40.69	41.58	41.14
2	AHW/BR-12	88.77	89.68	88.71	66.06	69.06	67.57
3	AHW/BR-60	110.75	111.40	110.43	127.01	125.12	126.06
4	Arka Manik	93.34	93.98	93.12	77.49	77.72	77.60
5	Asahi Yamato	65.06	66.45	65.38	28.80	28.89	28.85
6	Charleston Grey	95.08	98.06	96.02	86.93	87.87	87.41
7	AHW/BR-16	69.19	71.18	69.78	33.68	34.42	34.05
8	BSM-1	115.75	115.91	115.16	133.03	135.20	134.13
9	IC 582909	107.27	106.24	106.13	120.46	119.60	120.02
10	AHW-19	99.43	100.65	99.46	111.92	110.41	111.16
11	AHW-65	91.38	95.05	92.69	80.76	82.79	81.79
12	Sugar Baby	86.38	82.37	83.87	61.03	60.32	60.67
13	AHW/BR-9	124.67	124.95	124.09	152.91	151.18	152.04
14	Durgapura Lal	77.68	79.57	78.17	51.89	51.66	51.77
15	AHW/BR-137	115.54	116.77	115.48	135.62	137.81	136.73
16	RW-187-2	119.02	120.86	119.25	140.65	139.16	139.89
17	AHW/BR-10	117.28	121.29	118.60	144.76	144.23	144.49
18	AHW/YF-7	92.69	90.97	91.29	71.54	71.67	71.61
19	AHW/YF-5	85.07	85.81	84.95	61.49	61.52	61.50
20	AHW/BR-96	95.30	98.92	96.56	95.01	93.84	94.42
21	AHW/BR-19	99.65	100.86	99.68	93.49	95.18	94.34
22	AHW/YF-4	113.79	115.91	114.19	126.25	125.72	125.98
23	AHW/BR-20	115.54	117.20	115.70	142.70	140.20	141.44
24	AHW/BR-21	111.40	116.56	113.33	134.93	134.83	134.88
25	AHW/BR-8	119.67	119.14	118.71	133.18	135.80	134.50
26	AHW/BR-18	118.80	118.92	118.17	145.90	141.99	143.93
27	RSS-1	99.00	101.72	99.78	101.94	102.13	102.04

counted. The varieties/ genotypes were categorized by following the rating system given Nath (1966) for fruit infestation as: immune (no damage), highly resistant (1–10%), resistant (11–20%), moderately resistant (21–50%), susceptible (51–75%) and highly susceptible (76–100%).

The host plant susceptibility indices determine the role of varieties/ genotypes towards susceptibility in percentage within the test materials. The HPSI was calculated by the following formula (Aziz and Hasan, 2010).

Percent HPSI = 100 – (B-A)/ B × 100

Where, A is larval population per fruit or % fruit infestation in individual genotype of watermelon and B is larval population per fruit or % fruit infestation on all varieties/ genotypes of watermelon on average basis.

Transformations (angular) were used to achieve normality in the data before analysis (Steel *et al.,* 1997) (but untransformed means are presented in tables). The data on % fruit infestation and larval density per fruit were analyzed through one-way ANOVA using SPSS 16 (O'Connor, 2000). The means of significant parameters, among tested varieties/ genotypes, were compared using critical difference (CD) tests for paired comparisons at probability level of 5%.

RESULTS AND DISCUSSION

Significant differences were found in % fruit infestation and larval density per fruit among the 27 tested varieties/ genotypes. The larval density per fruit had a significant positive correlation with % infestation. Pooled data showed that the Thar Manak, Asahi Yamato and AHW/BR-16 were the most resistant; AHW/BR-12, Arka Manik, Charleston Grey, AHW-19, AHW-65, Sugar Baby, Durgapura Lal, YF-7, YF-5, AHW/BR-96, AHW/BR-19 and RSS-1 were moderately resistant whereas AHW/BR-60, BSM-1, IC 582909, AHW/BR-9, AHW/BR-137, Durgapura Kesar, AHW/BR-10, AHW/BR-18, AHW/BR-8, AHW/BR-21, AHW/BR-20 and YF-4 were the susceptible varieties/ genotypes (Table 1). Pooled data showed that the larval density ranged from 10.13 to 19.23 larvae per fruit which was found to be significantly low in resistant varieties/ genotypes than the susceptible varieties/ genotypes. The larval density was highest in genotype AHW/BR-9 (19.23 larvae/ fruit) followed by Durgapura Kesar (18.48 larvae/ fruit). The minimum larval density was found in Asahi Yamato (10.13 larvae/ fruit) followed by AHW/BR-16 (10.82 larvae/ fruit) and Thar Manak (11.08 larvae/ fruit). The % fruit infestation was lowest in Asahi Yamato (12.75 %) followed by AHW/BR-16 (15.05%) and Thar Manak (18.18%) and highest in AHW/BR-9 (67.20 %) followed by AHW/BR-10 (63.87%). The infestation ranged from 12.75 to 67.20 % and significantly low in resistant varieties/ genotypes and high in susceptible varieties/ genotypes (Table 1).

The results on the HPSI in different genotypes of watermelon based on the larval population per fruit and % fruit infestation during 2012, 2013 and pooled of 2012-13 are given in Table 2. The genotype AHW/BR-9 showed maximum HPSI based on larval population *i.e.*, 124.67% followed by Durgapura kesar showing 119.25 % HPSI. The minimum HPSI based on larval population was 65.38% for Asahi Yamato which was found to be resistant followed by AHW/BR-16 (71.51% HPSI). On the basis of fruit infestation, the highest HPSI was recorded in AHW/BR-9 (152.04%) categorized as highly susceptible and lowest HPSI was found in Asahi Yamato (28.45 %) categorized as resistance. The results conclude that Asahi Yamato, AHW/BR-16 and Thar Manak were found to be resistant against fruit fly. However, further investigations are required to elucidate the response of morphological and biochemical factors against fruit fly.

ACKNOWLEDGEMENTS

Authors are thankful to Dr. S. K. Sharma, Director, Central Institute for Arid Horticulture, Bikaner, for providing seeds of watermelon varieties/ genotypes, land and other inputs required for experimentation and Dr. R. Swaminathan, Associate Professor, Department of Entomology, MPUAT, Udaipur for critical discussion and suggestions.

REFERENCES

Aziz, M.A. and Hasan, M. 2010. Sustainable management of *Earias* spp. on okra in Punjab, Pakistan. VDM Publishers Germany.

Nath, P. 1966. Varietal resistance of gourds to the fruit fly. *Indian Journal of Horticulture*, **23**: 69–78.

Panda, N. and Khush, G. S. 1995. *Host plant resistance to insects*. Wallingford, UK. C.A.B. International, pp. 431.

(Manuscript Received: November, 2014; Revised January, 2016)