Available online at www.ijpab.com

DOI: http://dx.doi.org/10.18782/2582-2845.8815

ISSN: 2582 – 2845

Ind. J. Pure App. Biosci. (2021) *9*(5), 47-51

Indian Journal of Pure & Applied Biosciences

Peer-Reviewed, Refereed, Open Access Journal

Research Article

Evaluation of Certain Insecticides and Botanicals for their Efficacy Against Melon Fruit Fly *Bactrocera cucurbitae* (Coquillet) in Bitter Gourd

Raunak Singh, Rajnish Kumar and Gyan Prakash Morya*

Department of Entomology, B.R.D.P.G. College, Deoria, U.P., India

*Corresponding Author E-mail: gyanprakash978@gmail.com

Received: 12.09.2021 | Revised: 18.10.2021 | Accepted: 24.10.2021

ABSTRACT

Field experiments conducted to evaluate the bioefficacy of selected insecticides and botanicals against melon fruit fly, B. cucurbitae in bitter gourd revealed that Cypermethrin 10 EC @ 0.005 %, followed by Spinosad 45 SC @ 0.015% and Imidacloprid 17.8 SL @ 0.036 % proved most effective in checking fruit fly infestation in bitter gourd. Application of Malathion 50 EC @ 0.05 %, Carbaryl 50 WP @ 0.1 % with Jaggery @ 2 % and Carbaryl 50 WP @ 0.1 % only were moderately effective, while NSKE @ 5% and Neem oil @ 5% were slightly effective. A decreasing trend of fruit infestation was recorded after subsequent spray. Maximum fruit yield was also recorded in plot treated with Cypermethrin @ 0.005 % followed by Spinosad @ 0.015 %, while minimum with Neem oil @ 5 %. Application of all the treatments were found economical too but three sprays of Cypermethrin 10 EC @ 0.005 % was found most economical, followed by Malathion 50 EC @ 0.05 %. Hence, it can be used as alternative insecticides for the management of B. cucurbitae infesting bitter gourd.

Keywords: *Melon fruit fly, Bitter gourd, Evaluation, Insecticides, Botanicals.*

INTRODUCTION

Cucurbit fruit fly (*Bactrocera cucurbitae*) is most devastating insect pest of cucurbitaceous vegetables. Among cucurbits, bitter gourd (*Momordica charantia* L.) in which fruit fly damage is the major limiting factor in obtaining good quality fruits and high yield. The extent of damage caused by B. cucurbitae varies from 30-100 % depending upon cucurbit species and season (Dhillon et al., 2005). It has been reported that fruit flies infest 95 percent bitter gourd in Solomon Islands (Hollingworth et al., 1997). In India average fruit infestation of 31.27 percent are partially or completely damaged by fruit flies in bitter gourd (Singh et al., 2000).

Cite this article: Singh, R., Kumar R., & Morya, G. P. (2021). Evaluation of Certain Insecticides and Botanicals for their Efficacy Against Melon Fruit Fly *Bactrocera cucurbitae* (Coquillet) in Bitter Gourd, *Ind. J. Pure App. Biosci. 9*(5), 47-51. doi: http://dx.doi.org/10.18782/2582-2845.8815

The damage is caused by maggots which tunnel in the fruits contaminating then with frass and providing entry points for fungi and bacteria, which cause fruit rot. Attacked fruits may also become curved and twisted.

Several management techniques are being applied to overcome this pest. Since three of its life stages (egg, maggot and pupa) are hidden, So only adult stage is the usual target in the pest control activities. A number of insecticides of various groups have been evaluated against this fly with moderate success to unsuccessful control. The information about suitable and effective insecticides is very is scanty in this region. There is need to evaluate possible available insecticides and botanicals to manage this pest economically and effectively.

MATERIALS AND METHODS

Field experiments were conducted at farmer's field at Sonughat, Deoria (U.P.) during summer 2014 and 2015. Sowing of bitter gourd variety "Arka Harit" was done directly in the experimental plots 2.5 to 3.0 cm deep in pits. Seeds were sown in the last week of March during both the years. Before showing the pits, seeds were soaked overnight in water to sprout faster. The experiment was laid out in randomized block design with three replications. The plot size of each treatment was 4 m x 3 m. The distance between row to row and plant to plant was maintained at 1 m x 60 cm. Seeds were placed in small pits at proper specified place. All the recommended package of agronomical practices were followed to raise good crop. The bioefficacy of eight insecticidal treatments including bio-pesticidal treatments viz., Imidacloprid 17.8 SL @ 0.036%, Spinosad 45 SC @ 0.015%, Cypermethrin 10 EC @ 0.005%, Carbaryl 50 WP @ 0.1% + Jaggery @ 5%, Malathion 50 EC @ 0.05 %, Carbaryl 50 WP @ 0.1%, NSKE @ 5% and Neem oil @ 5% were evaluated against fruit fly infestation. A total of three foliar sprays were applied at 12 days interval commenced with fruit setting stage of bitter guard. At each fruit picking, the healthy and infested fruits sorted out separately, counted and recorded on the basis of percent fruit infestation. Cumulative percent fruit infestation for each treatment per spray as well as mean for entire cropping season was analysed. Finally, the data were subjected to ANOVA to determine the impact of treatments on percent fruit damage due to fruit fly. The yield of marketable fruits from net plot area was converted in hectare basis and economics were worked out in terms of increase in yield over control (q/ha), additional income (Rs/ha) and C:B ratio (Rupees per rupee invested).

RESULTS AND DISCUSSION

Fruit infestation

Data presented in table-1 clearly indicated that fruit infestation significantly reduced by using insecticides over untreated check in both the years. Mean infestation was lowest in plot treated with Cypermethrin (17.67% and 19.39%) followed by Spinosad (20.32% and 24.55%) and Imidacloprid (20.80% and 28.49%) remained at par to each other during both the years. These results are supported by Sood and Sharma (2004) and Sharma et al. (2016) who reported lowest fruit infestation in Cypermethrin treated plots in cucurbits. Spinosad as most effective treatment against fruit fly also reported by Bhowmik et al. (2014) and Sunil et al. (2016). Among the best treatment against melon fruit fly infestation Imidacloprid has been reported by Waseem et al. (2009) and Ullah et al. (2015).

The next best treatment in the present studies was Malathion, Carbaryl with Jaggery and Carbaryl during both the years. These findings got support from the findings of Khursheed and Raj (2012) who reported similar performance. Both botanicals (NSKE 5% Neem oil 5%) showed less effective than synthetic insecticides in reducing fruit infestation but, significantly superior over untreated check during both the years. Sood and

Sharma (2004) also reported that the neem derivatives although statistically superior over control, were less effective than synthetic insecticides in suppressing fruit infestation because of lower persistent toxicity. Spray intervals also exhibited difference in mean fruit infestation. A significant decreasing trend in fruit damage was noticed at subsequent spray in both the years.

Fruit Yield

The yield of bitter gourd (kg/plot) recorded under different insecticidal treatments were significantly higher after each three sprays in comparison to untreated check during both the years (table- 2). Maximum marketable yield was obtained in Cypermethrin treated plot (6.87 kg and 6.09 kg) during both the years, followed by Spinosad (6.86 kg and 5,79 kg). the treatments like Carbaryl with Jaggery, Carbaryl and Malathion treated plots showed better yield performance in both the years. Fruit yield (kg/plot) recorded minimum in plots treated with NSKE (6.07 kg and 5.06 kg) and neem oil (5.69 kg and 4.50 kg) during both the years but were far superior over untreated check (4.29 kg and 3.72 kg).

The spray intervals also indicated a significant difference in mean fruit yield (kg/plot) during both the years. An increasing trend of fruit yield was observed at subsequent spray interval. Increased yield in treated plots over untreated check may attributed to that, the insecticides lowered down the fruit infestation which resulted in corresponding increase in yield. The efficacy of various groups of insecticides and biopesticides in reducing fruit infestation results in increased yield had also been reported by several workers (Sapkota et al., 2010; Rana & Kanwar, 2014 & Sharma et al., 2016).

Economics of Insecticides Application

In present studies application of three sprays of all the insecticidal treatments were found profitable at different extent during both the years (table-3). Application of Cypermethrin was found most economical at it gave maximum return of Rs. 20.10 and Rs. 20.36 per rupee invested during first and second year, respectively. It was followed by Malathion (19.44:1 and 17.37:1) and Carbaryl (11.22:1 and 11.85:1). The extent of total benefit achieved is mainly depends on the total cost of treatment application and corresponding yield. Although application of Spinosad and Imidacloprid were much effective but were less economical than other insecticides. Similar trends of cost : benefit ratio with application of Spinosad was also reported by Sunil et al. (2016) in bitter gourd.

Table 1: Effect of insecticides on fruit infestation of *B. cucurbitae* in bitter guard during *Zaid*, (2014 and 2015).

Treatment	Conc. (%)	Fruit infestation (%)							
		2014				2015			
		After spray I	After spray II	After spray III	Mean	After spray I	After spray II	After spray III	Mean
Imidacloprid 17.8 SL	0.036	23.49 (28.92)	21.00 (27.28)	17.91 (25.28)	**20.80 (27.08)**	32.64 (34.84)	29.38 (32.81)	23.47 (28.95)	**28.49 (32.20)**
Spinosad 45 EC	0.015	22.51 (28.33)	20.53 (26.94)	17.93 (25.06)	**20.32 (26.78)**	26.49 (30.97)	24.34 (29.55)	22.84 (28.54)	**24.55 (29.69)**
Cypermethrin 10 EC	0.005	18.53 (25.50)	16.93 (24.29)	17.55 (24.76)	**17.67 (24.85)**	23.43 (28.95)	19.66 (26.33)	15.09 (22.85)	**19.39 (26.04)**
Carbaryl 50 WP + Jaggery	0.10	26.07 (30.70)	22.40 (28.25)	20.64 (27.02)	**23.03 (28.65)**	34.74 (36.11)	31.65 (34.23)	31.11 (33.91)	**32.50 (34.75)**
Malathion 50 EC	0.05	24.62 (29.75)	19.26 (26.03)	19.08 (25.86)	**20.98 (27.21)**	37.47 (37.74)	29.68 (32.99)	22.69 (28.43)	**28.94 (33.05)**
Carbaryl 50 WP	0.10	25.36 (30.24)	21.49 (27.62)	22.44 (28.28)	**23.09 (28.71)**	36.56 (37.21)	33.26 (35.99)	28.53 (32.28)	**32.78 (34.90)**
NSKE	5.0	30.45 (33.48)	33.93 (35.65)	34.40 (35.91)	**32.92 (35.00)**	32.30 (34.63)	35.68 (36.67)	38.53 (38.70)	**35.50 (36.55)**
Neem oil	5.0	32.78 (34.91)	34.95 (36.24)	36.60 (37.27)	**34.77 (36.12)**	33.37 (35.28)	36.18 (36.97)	37.45 (37.74)	**35.66 (36.66)**
Control (Untreated check)	--	46.57 (43.02)	43.57 (41.30)	48.22 (43.99)	**46.12 (42.77)**	51.36 45.78	53.69 47.09	55.85 48.35	**53.63 47.07**
Mean	--	**27.82 (31.65)**	**26.00 (30.39)**	**26.08 (30.35)**	--	**34.26 (35.72)**	**32.61 (34.65)**	**30.61 (33.26)**	--
Treatment (T)		0.61		0.216		0.95		0.338	
Spray interval (I)		1.06		0.374		1.66		0.585	
T×I		1.83		0.647		2.87		1.01	
--		**CD (0.01)**		**SE(m)**		**CD (0.01)**		**SE(m)**	

Figures in parentheses are arcsine transformed values.

Table 2: Effect of insecticides on fruit yield for *B. cucurbitae* in bitter guard during *Zaid*, (2014 and 2015).

Treatment	Conc. (%)	Marketable fruit yield (Kg/Plot)							
		2014				2015			
		After spray I	After spray II	After spray III	Mean	After spray I	After spray II	After spray III	Mean
Imidacloprid 17.8 SL	0.036	4.83	6.76	8.70	**6.76**	4.36	6.23	6.20	**5.59**
Spinosad 45 EC	0.015	5.13	7.66	7.80	**6.86**	4.03	6.76	6.60	**5.79**
Cypermethrin 10 EC	0.005	6.26	7.03	7.33	**6.87**	5.96	5.09	7.23	**6.09**
Carbaryl 50 WP + Jaggery	0.10	7.00	5.86	7.20	**6.68**	4.96	5.50	6.56	**5.67**
Malathion 50 EC	0.05	4.53	7.96	7.30	**6.50**	3.70	5.30	7.46	**5.48**
Carbaryl 50 WP	0.10	6.10	5.26	7.70	**6.35**	6.06	4.90	5.96	**5.64**
NSKE	5.0	4.13	5.83	8.26	**6.07**	4.70	5.43	5.06	**5.06**
Neem oil	5.0	5.73	6.00	5.36	**5.69**	3.26	4.33	5.93	**4.50**
Control (Untreated check)	--	3.43	4.40	5.06	**4.29**	2.80	4.30	4.06	**3.72**
Mean	--	**5.23**	**6.30**	**7.16**	--	**4.42**	**5.40**	**6.11**	--
Treatment (T)		0.49		0.174		0.46		0.162	
Spray interval (I)		0.85		0.301		0.79		0.281	
T×I		1.48		0.522		1.38		0.486	
--		**CD (0.01)**		**SE(m)**		**CD (0.01)**		**SE(m)**	

Figures in parentheses are arcsine transformed values.

Table 3: Economics of insecticidal application against *B. cucurbitae* in bitter gourd during *Zaid*, (2014 and 2015).

Treatment	Cost of Treatment application (Rs/ha)	2014					2015				
		Yield (q/ha)	Yield over check (q/ha)	Value of addition al yield (Rs/ha)	Gross income (Rs/ha)	Additional income (Rs/ha)	C:B ratio	Yield (q/ha)	Yield over check (q/ha)	Value of additional yield (Rs/ha)	Gross income (Rs/ha)	Additional income (Rs/ha)	C:B ratio
Imidacloprid 17.8 SL	3600.0	56.33	18.58	29728.0	90128.0	26128.0	**8.25:1**	46.58	15.58	24928.0	74528.0	21328.0	**6.92:1**
Spinosad 45 SC	4050.0	57.16	19.41	31056.0	91456.0	27006.0	**7.66:1**	48.25	17.25	27600.0	77200.0	23550.0	**6.81:1**
Cypermethrin 10EC	1552.0	57.25	19.50	31200.0	91600.0	29648.0	**20.10:1**	50.75	19.75	31600.0	81200.0	30048.0	**20.36:1**
Carbaryl 50 WP + jaggery	3060.0	55.66	17.91	28656.0	89056.0	25596.0	**9.36:1**	47.25	16.25	26000.0	75600.0	22940.0	**8.49:1**
Malathion 50 EC	1350.0	54.16	16.41	26256.0	86656.0	24906.0	**19.44:1**	45.66	14.66	23456.0	73056.0	22016.0	**17.37:1**
Carbaryl 50 WP	2160.0	52.91	15.16	24256.0	84656.0	22096.0	**11.22:1**	45.66	16.00	25600.0	75200.0	23440.0	**11.85:1**
NSKE	1890.0	50.58	12.83	20528.0	80928.0	18638.0	**10.86:1**	42.16	11.16	17856.0	67456.0	15966.0	**9.44:1**
Neem oil	1890.0	46.91	9.16	14656.0	75056.0	12766.0	**7.75:1**	37.50	6.50	10400.0	60000.0	8510.0	**5.50:1**
Control (Untreated check)	--	37.75	--	--	60400.0	--	--	31.00	--	--	49600.0	--	--

1. Amount of water used= 300 lit /ha/spray, 2. Sprayer rent= Rs. 50/day, 3. Labour cost= Rs. 200/day, 4. Sale price of product= Rs. 1600/q

REFERENCES

Bhowmik, P., Mandal, D., & Chatterjee, M. L. (2014). Chemical management of melon fruit fly, B. cucurbitae (Diptera: Tephritidae) on bitter gourd. *Pesticide Research Journal, 26*(1), 68-73.

Dhillon, M. K., Singh, R., Naresh, J. S., & Sharma, N. K. (2005b). The melon fruit fly, Bactrocera cucurbitae: A review of its biology and management. *Journal of Insect Science, 5*, 40-60.

Hollingsworth, R., Vagalo, M., & Tsatsia, F. (1997). Biology of melon fly, with special reference to the Solomon Islands. In: Management of fruit flies in the Pacific, Allwood, A. J., & Drew, R. A. I. (editors). *Proceedings of Australian Country Industrial Agricultural Research, 76*, 140-144.

Khursheed, S., & Raj, D. (2012). Bio-efficacy of certain insecticides and biopesticides against melon fruit flies Bactrocera spp. *Pest management in Horticulture Ecosystems, 18*(2), 143-148.

Rana, Kiran & Kanwar, H. S. (2014). Evaluation of eco-friendly techniques for management of fruit flies (Bactrocera spp.) in bitter gourd (Momordica charantia L.). *Pest Management in Horticultural Ecosystems, 20*(1), 100-102.

Sapkota, R., Dahal, K. C., & Thapa, R. B. (2010). Damage assessment and management of cucurbit fruit flies in spring summer squash. *Journal of Entomology and Nematology, 2*(1), 7-12.

Sharma, S. K., Punam & Kumar, R. (2016). Management of fruit fly (Bactrocera spp.) in cucumber (Cucumis sativus Linn) grown organically. Journal of Biopesticides, 9, 73-79.

Singh, S. V., Mishra, A., Bisan, R. S., Malik, Y. P., & Mishra, A. (2000). Host preference of red pumpkin beetle, Aulocophora foevicollis and melon fruit fly, Bactrocera cucurbitae. *Indian Journal of Entomology, 62*, 242-246.

Sood, Nitin & Sharma, D. C. (2004). Bioefficacy and persistent toxicity of different insecticides and neem derivatives against cucurbits fruit fly, Bactrocera cucurbitae Coq. on summer squash. *Pesticide Research Journal, 16*(2), 22-25.

Sunil, Tippaiah, M., & Jayaram, C. S. (2016). Seasonal incidence of fruit borers with special reference to melon fruit fly B. cucurbitae (coq.) on bitter gourd. *International Journal of Applied Biosciences, 4*(3), 87-92.

Ullah, F., Andar, A. U., Badshah, H., & Younus, M. (2015). Management of melon fruit fly (Myopardalis pardalina Bigot) in Badghis, Afghanistan. *Journal of Entomology and Zoology Studies, 3*(4), 24-27.

Waseem, M. A., Nagangoud, A., Patil, B. V., Prabhuraj, A., & Hussain, A. (2009). Efficacy of some insecticides against melon fruit fly, Bactrocera cucurbitae on cucumber. *Karnataka Journal of Agricultural Sciences, 22*, 701-702.