

IPM for Fruit fly in Cucurbitaceous Vegetable Crops

Devaramane Raghavendra and MN Bhat

ICAR-National Research Institute for Integrated Pest Management, New Delhi



India has the wide diversity for growing variety of vegetables right from down South to mid and high hills of Kashmir. This includes mainly the cucurbitaceous and solanaceous crops which are mainly the gourds such as bottle gourd, bitter gourd, sponge gourd, snake gourd, cucumber and melons such as watermelon and muskmelon. These vegetables are grown mainly in spring summer and rainy seasons across the country. Among several pests inflicting crop loss in these valuable crops, fruit fly, *Bactrocera* sp is one of the major pests, which alone cause > 50% if not properly attended. It is estimated that 30-40 per cent yield is lost due to pest attack in different horticultural crops which may be worth more than Rs 10000 crores. The management strategies for pests in vegetable/fruit crops, however, remain largely confined to pesticides only. In view of severe losses in vegetables caused due to insects, diseases, nematodes and weeds amounting to about 30%, pesticides are being used indiscriminately, especially in peri-urban areas so as to make vegetables the third largest consumer of pesticides i.e. about 14-15% while occupying about 5 per cent cultivable area. Thus, the pesticides consumption per unit area is more in vegetables than all other crops including rice. So far, there is no effective way of managing *Bactrocera* sp with farmers spraying indiscriminately at least once in a week without getting the desired result. The only effective way is to install lures and traps in large acreage in community approach. Cucurbitaceous, particularly cucumber, bitter gourd, sponge gourd and muskmelon are widely grown and are popular among the farmers of Karnal district, Haryana. ICAR-NRIIPM was involved in synthesis and validation of IPM in bitter gourd was successfully taken up at Padhana during 2014-19 and subsequently with the help of Dept. of Horticulture, Govt, of Haryana, wide area spread of fruit fly management in cucurbitaceous crops was successfully taken up during 2022-23 in > 1000 acres in Karnal district.

Seven villages viz; Samora, Padhana, Rambha, Ganger, Shamgarh, Takana and Sandheer have been identified and beneficiary farmers' growing cucurbitaceous crops viz; cucumber, muskmelon, bitter gourd, sponge gourd & bottle gourd have been selected. In Total an area of about 850-900 acre during 2019 & 2020 and 900-1000 acre during 2022 & 2023 under different cucurbitaceous crops has been taken for implementation of the Project.

IPM interventions

- Installation of used water bottle/plastic boxes cue lure traps baited with (as MAT) saturated wooden blocks (ethanol: cuelure: contact insecticide in a ratio 6:4:2) @ 25 traps/ha prior to flower initiation
- Soil raking to expose fruit fly pupae to sunlight
- Field sanitation - collect and destroy all damaged fruits
- Installation of delta and yellow sticky traps @25/ha
- Use Bait application technique (BAT) - Spray liquid of 0.1% insecticide and 10% jaggery or 10% ripe banana at 200 spots/ha (Homemade baits) –Both male and females will be trapped (MAT+BAT)
- Spray repellent (NSKE 5%) or Neem oil (1500 ppm) to enhance trapping and luring in bait spots
- Drench with *Metarhizium anisopliae*
- Apply need based label claim insecticides giving sufficient waiting period

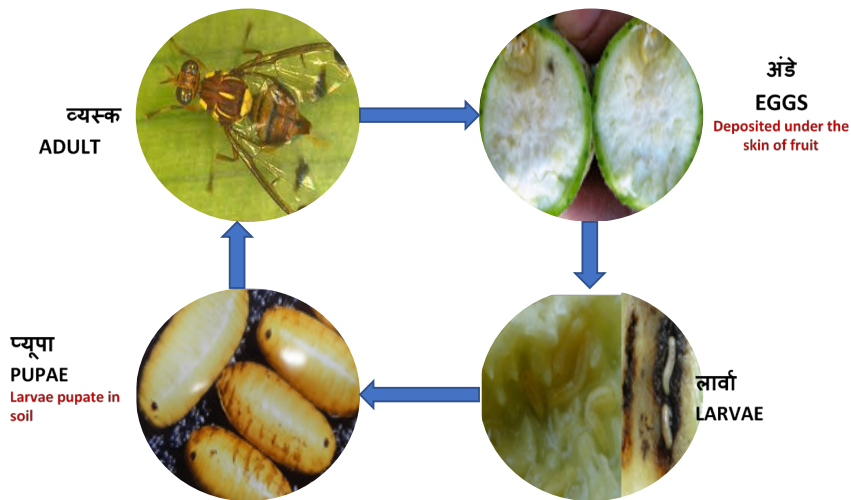
Weekly data on fruit fly catches, no. of fruits infested with fruit fly, no. of chemical sprays used and total cost of cultivation incurred by farmers' practice were recorded. Farmers' meetings were organized to create awareness among farmers about fruit fly, its damage & management during pre-season, mid-season & post-season. The publications (leaf folder) regarding IPM in cucurbits was prepared and distributed among farmers.

Damage symptoms of fruit fly

- Female fly punctures the skin of mature fruits with ovipositor and inserts white banana-shaped eggs (6–10/batch) in clusters into mesocarp.
- On hatching (after 1–2 days), the maggots tunnel into the fruit and feed on the pulp.
- The larvae pupate in soil (5–10 cm), and flies start emerging from April onwards with maximum population in July.



Life cycle



Impact of IPM

There was significant reduction of fruit fly infestation in IPM plots over farmers practice (FP) i.e., Bittergourd-50.29%, Bottlegourd-80.25%, Spongegourd-77%, Cucumber- 58.77% & Muskmelon-52.09% and per cent reduction of sprays was 28.44% (Bitter gourd), 39.43% (Bottle gourd), 33.77% (Sponge gourd), 34.14% (Cucumber) & 35.38% (Muskmelon) (Table 1.). Increase in yield was also observed in IPM compared to FP Bitter gourd-28.17%, Bottle gourd-16.36%, Sponge gourd-81.66%, Cucumber- 6.20% & Muskmelon- 13.88% besides registering highest BC ratio in IPM over FP (Table 1.).

Feedback from farmers of different villages was also collected. Majority of the farmers appraised our effort and impact of IPM and they were satisfied with the IPM activities in managing the fruit fly damage. Around 90 per cent of farmers accepted IPM interventions, its effect on reducing fruit fly damage and increased yield of the crop (Table 2).



Table 1. Average number of sprays and yield of IPM of fruit fly in Karnal

	% infested fruits	% reduction over FP	Number of sprays	% reduction over FP	Total amount spent on sprays (Rs)	Total yield (t/acre)	% increase over FP	Total Returns (Rs)	BC ratio
Bitter gourd (var. Vallabh)									
IPM	17.26%	50.29	4.68	28.44	3453	9.44	28.17	58240	2.05
FP	44.36%		6.54		5120	6.78		39220	1.38
Bottle gourd (var. Krishna)									
IPM	7.60%	80.25	3.84	39.43	2200	8.92	16.36	57400	2.14
FP	30.30%		6.34		4100	7.46		42620	1.72
Sponge gourd (var. Anokhi)									
IPM	14.24%	77	4.04	33.77	2300	4.20	81.66	89333	2.62
FP	41.40%		6.1		4200	0.77		68333	1.37
Cucumber (var. Tiranga)									
IPM	15.04%	58.77	5.40	34.14	4500	14.5	6.20	148100	3.73
FP	36.48%		8.20		8500	13.6		122400	2.70
Muskmelon (var. Madhu)									
IPM	22.23%	52.09	4.2	35.38	4200	3.6	13.88	45720	3.50
FP	46.40%		6.5		7200	3.1		39370	2.20

Table 2. Farmer’s feedback for integrated management of fruit fly in cucurbits

Village	Crop	Awareness about (% of farmers)						Yield increase (%)		Reduced no. of sprays (%)		Remarks
		Fruit fly damage & life cycle	Traps Cue-lure	Raking of soil	Yellow sticky traps	Neem oil spray	Bait spray	Yes	No	Yes	No	
Samora	Cucumber	82	96	15	100	97	75	85	15	100	-	
Padhana	Bitter gourd	92	96	78	100	100	82	100	-	100	-	-do-
	Bottle gourd	95	95	85	98	96	80	100	-	100	-	-do-
Sandheer	Bottle gourd	80	98	80	95	95	75	100	-	100	-	-do-
	Bitter gourd	90	85	95	100	85	78	100	-	95	5	-do-
	Sponge gourd	95	92	88	100	90	80	100	-	100	-	-do-
Gangar	Bitter gourd	95	95	85	100	100	85	100	-	100	-	-do-
Rambha	Bitter gourd	90	90	85	98	90	75	100	-	94	6	-do-
	Cucumber	80	90	20	95	90	70	100	-	100	-	-do-
Shamgarh	Bitter gourd	80	80	70	95	80	60	100	-	100	-	-do-
Average of overall feedback		88	92	70	98	92	76	97	1.5	99	1.1	-do-

Overall impact of Fruit Fly Management:

- Focus on fruit fly management, including the balanced use of other inputs resulted in increased yields of cucurbits at farmers' fields.
- IPM with a focus on judicious use of inputs especially chemical pesticides resulted in overall reduction in use of pesticides.
- Large area adoption of Integrated Management of fruit flies made IPM more and more acceptable and adoptable to farmers thereby fast increasing the spread and percolation of IPM technologies in Haryana.
- Training of farmers entailed increased levels of knowledge base for the adopted farmers.
- Database development and publications would further enrich the knowledge resources of researchers, extension workers and decision makers for overall strengthening of IPM programmes on environment friendly vegetable production systems in future.
- Environment friendly technologies encouraged the healthy growth of fauna and flora and hence resulted in increased biodiversity in general and natural enemies and pollinators in particular.
- The cumulative effect of reduced pesticides and increased biodiversity increased environmental health.



Fruit fly infestation

Fruit fly trap