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Short Note

Efficacy of New Insecticide Molecules against Cucurbit fly *Bactrocera cucurbitae* Coq. (Tephritidae: Diptera) in Cucumber

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In field experiment carried out at Entomology section farm, College of Agriculture, Pune-5 (Maharastra, India) spinosad (0.002%) was the most effective for control of fruit fly with the highest yield of marketable fruits in cucumber. It was followed by cartap hydrochloride (0.05%) and NSKE (5%). which were, at par with each other in effectiveness. For maximum net additional returns, spraying of spinosad (0.0025%) was suggested for the control of *B.cucurbitae* on cucumber.

Key words: *Cucumber, Bactrocera cucurbitae*, cartap hydrochloride, NSKE, spinosad

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Cucumber (*Cucumis sativus* L.) is one of the oldest amongst the cultivated vegetable crops belonging to the family *Cucurbitaceae.* Cucumber is thought to be indigenous to India, from where it spread to Asia, Africa and Europe. It is one of the most popularly grown vegetable during *Kharif* and summer seasons in all parts of the country including hilly parts of the North India. Cucumber is the second most widely cultivated cucurbit after watermelon. The fruit is also used as an astringent and anti pyretic. Fruits are also good for constipation, jaundice and indigestion. Fruits are used as a breakfast fruits and as ingredient of salads. It contributes significantly to dietary intake of carbo hydrates, thiamine, niacin and vitamin C. It can, therefore, help to alleviate deficiencies of vitamins and minerals in the diet of average people.

The major insect pests recorded on cucumber are whitefly (*Bemesia tabaci* Gennadius), jassid (*Amrasca biguttula biguttula* Ishida), aphids (*Aphis gossypi* Glover and *Myzus persicae* Sulzer), fruit fly (*Bactrocera cucurbitae* Coq), American serpentine leaf miner (*Liriomyza trifolii* Burgess) and red pumpkin beetle (*Raphidopalpa foveicollis* Lucas). Out of these pests, the American serpentine leaf miner (*L. trifolii*) and fruit fly (*B. cucurbitae*) are the most destructive pests.

The cucurbit fly (*Bactrocera cucurbitae* Coq.) (Tephritidae: Diptera) is a serious pest of cultivated cucurbits in the tropical and sub-tropical regions of the world. Fruits are severely damaged by its attack and often more than 50 per cent of the fruits are damaged either partially or totally rendering them unsuitable for human consumption. Fruit fly damages cucumber in three ways: i. Oviposition injury by the female (white elongate eggs are laid singly or in groups of 4 to 10 into flowers or tender fruits, that causes gummy or resinous material

oozing out from the punctures which later hardens) on cucumber fruits. Larval feeding damage on fruit pulp (after hatching, the maggots feed on the pulp and seeds of the fruit, the spot at which the eggs are laid sinks and forms a shallow depression covered by greyish brown thin membrane, fruits become crooked, malformed, and result in premature dropping and also becomes unfit for consumption). Decomposition of fruit tissue by invading of saprophytic microorganisms (the invading micro-organisms make the tissue brown, rot and smelly). The pest has become a major limiting factor in the successful cultivation of many cucurbits.

Materials and Methods

The experiment was carried out at Entomology section farm, College of Agriculture, Pune-5 (Maharashtra, India) and was laid out in randomized block design with three replications, eight treatments including untreated control, in plot size of 1.5 x 3.0 m and net plot size of 1.5 x 2.0 m, with plant to plant spacing of 0.5 m x 0.5 m and row to row spacing of 1.5 m x 1.5 m. The soil was medium black and well drained. Seeds of the variety Himangi were dibbled and irrigated immediately after sowing and at 8 days interval. All the recommended agronomical practices were followed in raising the crop and uniform plant population was maintained.

For preparing 5 per cent of NSKE solution 500 gram of neem seed kernels was well ground and soaked in 100 ml of water overnight. Next day it was filtered and squeezed by giving 2-3 washings and finally 10 l of volume was made by adding water. Soap was used as spreading agent at the rate of 20 g/10 l of solution. Before each spraying fresh NSKE solution was prepared. The quantity of spray volume required per treatment was determined by spraying water with hydraulic knapsack sprayer on the control plot.

Spraying was undertaken in the morning hours (7.00-9.00 a.m.) using manually operated hydraulic

knapsack sprayer. Three sprays of each insecticide were given at fort-nightly interval. Observations on fruit fly incidence were recorded at each picking of cucumber fruits at an interval of 8 days. The infested and healthy fruits on number and weight basis were recorded during each picking for working out percentage of infestation of fruit fly. The number and weight of healthy and infested fruits per plot recorded separately were added at the end of harvesting and percentage of damaged fruits on number and weight basis was worked out. The percentage figures were transformed to arc sine angles (Alder and Roessler, 1972) for statistical analysis.

At the time of harvest, yield of marketable healthy fruits was recorded and expressed as kg/plot. The data on percentage of number and weight of healthy and infested fruits due to *B.cucurbitae* and yield were analyzed by using RBD design.

Results and Discussion

The data regarding efficacy of newer insecticides collected on number and weight basis of infested/ healthy fruits are presented in Table 1.

Percentage of infested fruits on number basis

The data pertaining to percentage of infested fruits/plot showed maximum in untreated control, (63.81%) whereas the lowest infestation was recorded in spinosad 0.002% (16.73%). Among the other insecticidal treatments, thiomethoxam (0.005%) recorded significantly higher percentage of infested fruit (27.8%) followed by imidacloprid 0.01% (25.3%), acetamiprid 0.005% (24.55%) and buprofezin 0.025% (24.46%), respectively.

Total weight of fruits

The data regarding total yield of fruits in indicated that it was significantly superior with spinosad 0.0025% (122.26 q/ha) followed by cartap hydrochloride 0.005 % (115.40 q/ha) and NSKE 5% (109.49q/ha). These two treatments were on par with each other but spinosad (0.0025%) was significantly superior over rest of the treatments. Cartap hydrochloride (0.05%) was on par with NSKE 5%, thiomethoxam 0.005% (102.96 q/ha) but superior over acetamiprid 0.005% (96.99 q/ha), imidacloprid 0.01 % (91.83 q/ha) and buprofezin 0.025% (86.66 q/ha), respectively. The lowest yield of fruits was recorded in the control plot (65.53 q/ha).

Percentage of infested fruits on weight basis

The data pertaining to percentage of infested fruits in q/plot was the lowest in spinosad 0.002% (10.61%). This was followed by cartap hydrochloride 0.05% (12.46%) NSKE 5% (12.63%) and buprofezin 0.025% (15.63%).

Effect of newer insecticides on yield of cucumber

Spinosad recorded significantly higher yield of 122.26 q/ha, which was 86.57 per cent more than the control. The next higher yield of 115.40 q/ha was obtained from the treatment with cartap hydrochloride, which was 76.0 percent more than the control. Another subsequent better yield of 109. 49 q/ha was obtained from the plots treated with NSKE (5%), which was 67.08 per cent more than control, respectively. Thiomethoxam (0.025%), acetamiprid (0.0025%) and imidacloprid (0.01%) caused 57.11, 48.00 and 40.13 percent increase in the yield over control recording 102.96, 96.99 and 91.83 q/ha yield of fruits, respectively. The lowest yield of 86.66 q/ha was recorded in buprofezin (0.025 %), which was 32.54 percent more than untreated control. The untreated control plot yielded only 65.53 q/ha fruits per hectare.

Thus, on the basis of fruit infestation as recorded in terms of number, weight and yield of harvested fruits, it could be clearly seen that spinosad (0.0025%) was the most promising and effective treatment for the control of fruit fly on cucumber. It has been observed significantly superior over all the treatments by recording minimum percentage of fruit infestation on the basis of number (16.73%) and weight (10.61 %) and highest yield of fruits (122.26q/ha). There is no published report regarding the efficacy of this insecticide against fruits fly for comparison. However, these results are supported by the findings of Walunj *et al* (2001) who reported spinosad 2.5 SC giving minimum cabbage head infestation by *Plutella xylostella* Linn. Similarly Siddegowda *et al.* (2003) found that spinosad @ 73 g a.i./ha recorded significantly lower pod damage and higher grain yield due to infestation of *Helicoverpa armigera* Hub. on pigeon pea.

Next in the order of effectiveness was cartap hydrochloride (0.05 %) which recorded fruit infestation on the basis of (19.53 %) number and weight (12.46%) and yield of fruit (115.40 q/ha). Reddy (1997) used cartap hydrochloride, triazophos, malathion, deltamethrin, cypermethrin and among these insecticides, cartap hydrochloride was moderately effective against this pest.

Neem seed kernel extract (NSKE 5%) recorded (21.79 %), fruit infestation on the basis of in number and (12.63%) in weight and yield of fruits (109.49 q/ ha). These results are supported by the findings of Chandramani *et al.* (2000) who reported that the fruit fly damage was minimum in NSKE treated mandarin trees. Nevertheless, the present findings could be favourably compared with those of Babu *et al.* (2002) who reported that neem seed kernel extract recorded 70.55per cent reduction in fruit fly incidence in watermelon.

The highest cost: benefit ratio was recorded from NSKE sprays (1:27.7) and was closely followed by acetamiprid and cartap hydrochloride with cost: benefit ratio of 1: 18.3 and 1: 15.4, respectively. The least cost: benefit ratio (1:5.93) was obtained from buprofezin (0.025%).

Table 1. Effect of newer insecticides on yield of healthy cucumber fruits on weight basis

Insecticide	Fruit infestation (No.basis) (%)	Yield weight of fruits (q / ha)	Percentage of infested fruits / plot on weight basis	% increase over control
Cartap Hydrochloride 0.05%	19.53 *(26.21)	115.40	12.46 (20.62)	76.10
Acetamiprid 0.005%	24.55 (29.67)	96.99	16.98 (24.27)	48.00
Spinosad 0.0025%	16.73 (24.12)	122.26	10.61 (19.00)	86.57
Imidacloprid 0.01%	25.3 (30.26)	91.83	17.21 (24.50)	40.13
Buprofezin 0.025%	24.46 (29.60)	86.66	19.71 (26.35)	32.54
Thiomethoxam 0.005%	27.8 (31.82)	102.96	15.63 (23.34)	57.11
NSKE 5%	21.79 (27.83)	109.49	12.63 (20.79)	67.08
Untreated control	63.81 (53.01)	65.53	56.15 (48.50)	-
SE m $\pm$	2.87	5.95	2.47	-
CD at 5%	8.71	18.06	7.37-	

* Figures in parentheses are arc sin values.

Spinosad (0.002%) was the most effective for control of fruit fly infestation and also recorded the highest yield of marketable fruits. It was followed by cartap hydrochloride (0.05%) and NSKE (5%). Which were, at par with each other in effectiveness. For maximum net additional returns, spraying of spinosad (0.0025%) may be suggested for the control of *B.cucurbitae* on cucumber. In general, spraying of cartap hydrochloride at the rate of 0.05% can be recommended as most effective chemical for control of fruit fly, *B. cucurbitae*.

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