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BIORATIONAL MANAGEMENT OF FRUIT FLY ON SPONGE GOURD (*LUFFA CYLINDRICA*)

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Abstract: The current research titled "Biorational management of fruit fly on sponge gourd (*Luffa cylindrica*)" was carried out at Raj Mohini Devi College of Agriculture and Research Station, Ajirma, Ambikapur (C.G.). The study tested six different bio-pesticides and chemical insecticides against fruit fly. Emamectin Benzoate 5% SG (1 gm/lit) was found to be the most effective, recording the fewest ovipositional punctures (1.01/fruit), the lowest number of maggots (9.23/fruit),and the least fruit infestation(17.97%),along with the highest marketable yield(212.76q/ha)and acost-benefit ratio of 3.05.This treatment showed similar results to Acetamiprid 20SP(2gm/lit).On the other hand, the control treatment had the highest ovipositional punctures(1.05/fruit),the highest number of maggots (9.36/fruit), the highest fruit infestation (18.51%), the lowest marketable yield (153.24 q/ha), and the lowest cost-benefit ratio (2.09) was recorded.

Keywords: Sponge gourd, Insect pest, Biorational, Fruit fly

INTRODUCTION

Sponge gourd (*Luffa cylindrica*) belong to family Cucurbitaceae, is a native to Tropical Asia, probably India and South-East Asia. It is widely grown as a summer and rainy season vegetable in India especially in northern states. In Hindi it is known as Ghia Tori. Sponge gourd is highly nutritive vegetable and contains moisture 93.2g, protein 1.2g, fat 0.20g, carbohydrate 2.9g, vitamins (thiamine 0.02mg, riboflavin 0.06mg, niacin 0.4mg and carotene 120mg), minerals (Calcium 36mg, phosphorus19mg and ferrous1.1 mg) and fibers 0.20g per 100g of edible portion (Gopalan *et al.* 1999). The tender fruits are used as vegetable which are easily digestible and increase appetite when consumed. It is said to be useful for patients of malaria. Besides a vegetable, the sponge gourd is good source of fiber which is used in industries for filter and cleaning the motorcar, glasswares, kitchen utensil, etc. Sponge gourd is an annual climber and monoecious vegetable, but different sex form like hermaphrodite, staminate, pistillate etc., are commonly found in nature. The flower of sponge gourd is yellow and anthesis takes place in morning at 4.00 to 8.00 A.M. The skin of sponge gourd is smooth and green. The seed are black with smooth surface. There is wide variability in size (ranging from a few centimeters to one meter long), shape and colour of fruits. Like the other cucurbitaceous crops there is ample scope for its improvement particularly in yield through the breeding techniques. But very little systematic attempts have been made to improve the existing land races.

In India, it occupies an area of about 7.21 lakh ha with production of 12.87 lakh tonnes. The productivity of this crop is 10.52 tonnes per hectare (Anonymous 2022). China, Korea, India, Japan, Nepal and Central America are the top cucurbits producing countries. In India, top cucurbits growing states are Uttar Pradesh, Punjab, Bihar, Gujarat, Rajasthan, Jharkhand, Haryana and Karnataka. In Chhattisgarh, it occupies an area of about2876hawithproductionandproductivityof25614 metric tonne and 8.40 tonne (Anonymous 2020-21) respectively. (source- directorate of agriculture Chhattisgarh, Raipur).

Such important cucurbitaceous crops are attacked by different pests and diseases, causing a reduction in crop development and yield. Fruit fly *Bactrocera cucurbitae* and red pumpkin beetle *Aulacophora foveicollis* are two of the regular pests observed in these crops. Aphids, banded blister beetle, dudhibugs, black pumpkin beetle *Aulacophora atripennis*, pumpkin caterpillar *Margarona indica*, American serpentine leafminer *Liriomyzatrifoli*, bottle gourd moth *Sphenarches anisodactylus* are the most common pests, causing losses each year. Various 3 species of pumpkin beetles have been identified to feed on cucurbitaceous vegetables in

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India, including the red pumpkin beetle *Aulacophora foveicollis*, grey pumpkin beetle *Aulacophora cincta* and black pumpkin beetle *Aulacophora atripennis* (Atwal and Dhaliwal, 2002).

Fruit flies are economically important pests of cucurbits and geographically distributed throughout the tropics of the world, especially in most of the country of South East Asia. Plants of family cucurbitaceae are considered to be their preferred hosts. Presently 199 fruit fly species are known to occur in India (Kapoor, 1970).

The female fruit fly drums on the skins of young fruits by her oviposit and sometimes on the young leaves or stems of the host plants and make punctures for laying eggs (Chaudhary *et al*. 2007). Afterward, fruit juice oozes out which transforms into resinous brown deposit. After hatching in the fruit, the larvae feed into pulpy tissue and make tunnels in fruits and cause direct damage. They also damage the fruits indirectly by contaminating with frass and accelerated rotting of fruits by a pathogenic infection. Infested fruits if not rotten, become deformed and hardly which make it unfit for consumption.

Sponge gourd farmers require sustainable management of fruit flies. In this regard, biopesticides could playa vital role. Biopesticides are the biological agents orplant-basedproductsusedtocontrolthepopulationofinjurious organismsinthe ecosystem. They are non-toxic substances derived from living organisms or their products (microbial products, phytochemicals) as well as theirby-products (semio- chemicals). They are considered as minimal risk products safe to humans and their environment. They have moderate residual effects, long-lasting activity and are safe forfarmers. Also, mechanical and cultural practices such as field sanitation, infested fruit picking, bagging of fruits, ploughing of soil are very effective control measures of this pest (Akhtaruzzaman, 1999). Collection and destruction of infested fruits helped population reduction of fruit flies (Nasiruddin and Karim, 1992). Covering of fruits by polythene bag is an effective control of fruit fly in teasel gourd. The lowest fruit flyincidence in teasel gourd occurred in baggingof fruit (4.2 %) while the highest (39.38%) was recorded in the fruits of control plots (Anonymous,1988). Unfortunately, no single method has so far been proved to be an effective and reliable to control this pest (Kapoor, 1993).

MATERIALS AND METHODS

The experiment was conducted at Agriculture Research Farm of Raj Mohini Devi College of Agriculture and Research Station, Ambikapur (C.G.) during *Kharif* 2024. The experiment was conducted in simple randomized block design. There were seven treatment including control and each replicated three times.

Table 1. Treatment details.

Sr. No.	Treatmentdetails	Formulation	Dosage/litofwater
1	Neemoil (*Azadirachta indica)*	0.03%EC	5 ml
2	Karanjoil (*Millettia pinnata)*	1%	10 ml
3	Emamectin benzoate	5 %SG	1 gm
4	Acetamiprid	20 SP	2 g/lit
5	*Beauveria bassiana*	10% (1x10^8CFU/ml min.)	10 ml
6	*Metarhizium anisopliae*	10% (1x10^8CFU/ml min.)	10 ml
7	Control	-	-

Application

Field evaluation for determining the efficacy of insecticides were conducted. Two sprays of insecticides were applied separately on the crop at an interval of 15 days besides the control. With the help of a battery-operated knapsack sprayer all insecticides were applied. Insecticidal solutions were prepared by taking recommended quantity of insecticides and mixed with water to obtain desired concentration of spray solution. Spraying was done during morning hours.

Method of recording observation

The observations on the fruit fly damage were recorded as per the method followed by Bhatnagar and Yadava (1992) with slight modifications. The plot was exposed for the natural infestation of pests. Further, two pheromone traps were installed in the field to trap the adult fruit flies and workout the economic threshold level of the fruit fly perday. The observations were recorded before spraying and three, seven and tendays after spraying. In each plot, three plants were selected randomly to record observation of fruit fly damage and per cent fruit damaged was also worked out by using formula.

$$Percent fruit damage = \frac{Numbers\ of\ Fruits\ Damaged}{Total\ Numbers\ of\ Fruit\ Observed} \times 100$$

Furthermore, five infested fruits from each treatment were randomly selected, plucked and brought to the laboratory to count the number of maggots. These infested fruits were cut open near the damaged part of the fruit and the number so maggots in the pulp of the infested fruit were recorded.

RESULTS AND DISCUSSION

Bio-efficacy of insecticides against fruit fly egg laying at first and second spray (number of ovipositional punctures/fruit)

A significant difference was observed among different treatments with respect to mean ovipositional punctures from first and second spray. The mean ovipositional punctures per fruit varied from 1.01 to 2.52. Among different treatments, T3 (Emamectin benzoate 5% SG 1gm/lit) was superior to all other treatments by recording the lowest number of ovipositional punctures (1.01/fruit). The next better treatment was T4 (Acetamiprid 20 SP @ 2 gm/lit) (1.05/fruit) followed by Treatments T5 (*Beauveria bassiana* 10% 1x10^8 CFU/ml min.) (1.31/fruit), and T6 (*Metarhizium anisopliae* 10%1x10^{8}CFU/mlmin.) (1.34/fruit). Further, T2 (Karanj oil 1%) and T1(Neem oil 0.03% EC) recorded higher Ovi punctures which is (1.56/fruit) and (1.52/fruit). However, T7 which is control treatment recorded significantly highest ovipositional punctures (2.52 /fruit)

Effectofinsecticidaltreatmentsagainstfruitflymaggots at first and second spray.

The mean ovipositional punctures from the first and second sprays showed a significant difference between treatments. There was a range of 9.23 to 17.68 mean ovipositional punctures per fruit. The treatment with the lowest quantity of fruit fly maggots (9.23/fruit) was T3 (Emamectin benzoate 5% SG 1gm/lit), which outperformed all other treatments. T4 (Acetamiprid 20 SP @ 2 gm/lit) was the second-best treatment (9.36/fruit), followed by T5 (10.71/fruit) (*Beauveria bassiana* 10% 1x10^8 CFU/ml min.) and T6 (10.82/fruit) (*Metarhizium anisopliae* 10% 1x10^8 CFU/ml min.). Additionally, T2 (Karanj oil 1%) and T1 (Neem oil 0.03% EC) had higher fruit fly maggot counts (12.15/fruit) and (11.97/fruit), respectively. The control treatment, T7, however, had the noticeably greatest quantity of fruit fly maggots (17.68/fruit).

Effect of insecticidal treatments on per cent fruit infestation by fruit fly at first spray and second spray

The percentage of fruit infection from the first and second sprays showed a substantial difference between the treatments. The range of the mean percentage of fruit infestation was 17.97 to 46.52. By registering the lowest percentage of fruit infestation (17.97%), T3 (Emamectin benzoate 5% SG 1gm/lit) outperformed all other treatments. Treatments T5 (*Beauveria bassiana* 10% 1x10^8 CFU/ml min.) (25.04%) and T6 (*Metarhizium anisopliae* 10% 1x10^8 CFU/ml min.) (25.64%) were the next best, followed by T4 (Acetamiprid 20 SP @ 2 gm/lit) (18.51). Additionally, T2 (Karanj oil 1%) and T1 (Neem oil 0.03% EC) had greater fruit infection percentages, 32.65% and 32.65%, respectively. But according to Table 4.8, the control treatment, T7, had the noticeably greatest percentage of fruit infestation (46.52%).

Table 2. Bio-efficacy of insecticides on fruit fly

Treatment no.	Formulation	Dosage/Lit of water	Pooled mean of first and second Spray		
			numberof ovipositional punctures/fruits	Number of maggots/fruits	Percent fruit infestation
T_1(Neem oil)	0.03%EC	5 ml	1.52 (1.42)	11.97 (3.53)	31.91 (34.37)
T_2(Karanj oil)	1%	10 ml	1.56 (1.43)	12.15 (3.56)	32.65 (34.81)
T_3(Emamectin benzoate)	5 %SG	1 gm	1.01 (1.23)	9.23 (3.12)	17.97(25.07)
T_4 (Acetamiprid)	20 SP	2g/lit	1.05 (1.24)	9.36 (3.14)	18.51 (25.45)
T_5 (*Metarhizium anisopliae*)	10% (1x10^8 CFU/ml min.)	10ml	1.31 (1.34)	10.71 (3.35)	25.04 (30.01)
T_6 (*Beauveria*	10% (1x10^8	10 ml	1.34 (1.36)	10.82 (3.36)	25.64 (30.41)

bassiana)	CFU/ml min.)				
T_7	-	-	2.52 (1.74)	17.68 (4.26)	46.52 (43.00)
Sem (±)			**0.03**	**0.04**	**1.22**
CD (5%) =			**0.08**	**0.13**	**3.64**

Figures in the parentheses of number of ovipositional punctures/fruits and number of maggots/fruits are in square root transformation.
Figures in the parentheses of percent fruit infestation are in angular root transformation.

CONCLUSION

Among different seven treatments treatment T3 which is emamectin benzoate 5% SG is found to be the best among others. The treatment showed a best result with lowest mean number of ovipositional fruits/plants (1.01), number of maggots/fruit (9.23) andpercentfruitinfestationwhichis17.97percentrespectively. The second-best treatment found tobe T4which is acetamiprid 20 SP which also recorded the lowest mean numbers of ovipositional fruits/plants (1.05), number of maggots/fruit (9.36) and percent fruit infestation which is18.51percentrespectively. And other treatments are relatively less effective in compare with these two treatments.

From the results it is clearlyobserve that these two treatments are best with closely similar with each other.

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