Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2018; 6(4): 1778-1781

Received: 04-05-2018
Accepted: 06-06-2018

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# Bio-efficacy of newer molecules against slug caterpillar (*Parasa lepida* L) on mango

**Chaudhary Nirav J, PH Rabari, VS Rajput and RK Patel**

**Abstract**
The present experiment was carried to out to evaluate bio-efficacy of newer molecules against slug caterpillar (*Parasa lepida* L) on mangounder field condition at Horticulture Instructional Farm of Chimanbhai Patel College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University Sardarkrushinagar during kharif 2015-16. Based on two spray applications of different insecticides against slug caterpillar the results clearly indicated that flubendiamide 480 SC @ 0.14 percent proved as the most effective treatment to control the slug caterpillar larvae under field conditions. The lowest larval population was observed in the treatment of flubendiamide 480 SC @ 0.14 percent (4.50 larva/tree) and was at par with chlorantraniliprole 18.5 SC @ 0.006 percent (5.04 larva/tree) and spinosad 45 SC @ 0.014 percent (5.49 larva/tree). The higher larval population (14.63 larvae/tree) was observed in the treatment of chlorpyriphos 20 EC @ 0.04 percent, which indicated that this treatment is not effective to control the slug caterpillar.

**Keywords:** Slug caterpillar, *P. lepida*, bio-efficacy, insecticides

## 1. Introduction
Mango (*Mangifera indica* L.) is the national fruit of India [1]. Mango truly a "King" of fruits has been cultivated for about 4,000 years and its production and consumption has gradually increased as its popularity has grown [3]. Among the total world production, India rank first by producing 54 percent of total world production of mango. It is a commercial fruit crop occupies an area of 22, 09, 000 hectare with an annual production of 1, 86, 43, 000 million tonnes in India [2]. There is a regular attack of different insect pests on mango trees in nature and about 150 species of insect pests have been reported but, hardly half a dozen pest species having major important [4]. The insect pest is geographically distributed in Bangladesh, Burma, China, Hong Kong, India, Indonesia, Japan, Kampuchea, Laos, Malaysia, Pakistan, Sri Lanka, Thailand and Vietnam [8].
The larvae of slug caterpillar are the destructive stage of this insect and the young larvae feed on the lower epidermis of the leaf [5]. As they mature, the whole leaf blade is eaten leaving the mid ribs. In heavy infestation, the larvae defoliate whole mango plant. The larvae of *P. lepida* observed on young leaves of mango at Indore (Madhya Pradesh). The leaves of younger plant damaged up to 52.6 percent in mango [5]. *P. lepida* (Cramer) is wide spread in Asia and Africa [6]. It causes severe damage in tea plantation in form of leaf destruction and some time to the extent of skeletonization [5]. The caterpillars are also a great nuisance, because they cause extreme discomfort to the workers who pluck the tea or carryout other operations on affected plantation. The larvae pupate in the soil often shed their stinging hairs on the ground surface so that workers cannot enter the plantations without wearing shoes [6]. Hence, the experiment was carried out to test the efficacy of newer molecules against slug caterpillar (*Parasa lepida* L) on mango under field condition.

## 2. Material and Methods
A field experiment was conducted during kharif 2015-16 at Horticulture Instructional Farm of Chimanbhai Patel College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar. The experimental details to study the bio-efficacy of different insecticides against slug caterpillar are given below.

**Experimental details**

| Location | Horticultural Instructional Farm, S.D.A.U., Sardarkrushinagar. |
|---|---|
| Year | 2015 |
| Crop | Mango |
| Variety | Rajapuri |
| Age of tree | 10 year old |
| Design | Completely Randomized Design |
| Replication | 3 |
| Spacing | 10 m x10 m |
| Treatment | 10 |

**Method of application**

To evaluate the efficacy of various insecticides against slug caterpillar on mango, a field experiment was carried out at Horticultural Instructional Farm, Sardarkrushinagar and three mango trees per treatment were selected in the same. For insecticidal application commercial formulation of various insecticides at various doses was prepared. Liquid insecticide was measured with measuring cylinder. Five liter spray solution / tree was prepared for each treatment. Insecticides were applied at respective dose with the help of Gator sprayer. The sprayer was cleaned thoroughly before subsequent application of insecticides. Total sprays were applied to evaluate the bio efficacy of different insecticides against slug caterpillar. First spray application was done when the population of slug caterpillar was observed and second spray application was given after 15 days. The insecticidal application was applied during morning hours.

**Details of treatment**

| S. No. | Technical name | Concentration (%) | Dose (ml/10 lit) |
|---|---|---|---|
| 1. | Flubendiamide 480 SC | 0.14 | 3 |
| 2. | Chlorantraniliprole 20 SC | 0.006 | 3 |
| 3. | Novaluron 10 EC | 0.015 | 5 |
| 4. | Indoxacarb 15.8 EC | 0.007 | 5 |
| 5. | Chlorpyriphos 50 EC + Cypermethrin 5EC | 0.055 | 10 |
| 6. | Cypermethrin 3 EC + Quinalphos 20 EC | 0.023 | 10 |
| 7. | Spinosad 45 SC | 0.014 | 3 |
| 8. | Profenophos 40 EC + Cypermethrina 4EC | 0.044 | 10 |
| 9 | Chlorpyriphos 20 EC | 0.04 | 20 |
| 10. | Control | - | - |

**Method of observations**

To evaluate the bio efficacy of different insecticides against slug caterpillar on mango, 10 twigs (50 cm length per tree) were selected randomly from all the direction and number of larvae per twig was counted before and 1st, 7th and 15th days after application of respective insecticides and 3 trees per treatment were selected for recording the observations.

**Results and Discussion**

The data on larval population of slug caterpillar/tree before and after spray application are summarized in Table 1. The data showed that *P. lepida* population (larvae/tree) before spray was non-significant which indicated that *P. lepida* population in mango was uniformly distributed in whole experimental plot.

**Table 1:** Efficacy of various insecticides against slug caterpillar, *P. lepida* on mango

| S. No. | Treatments | Concentration (%) | Number of larvae/tree | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Before Spray | First spray | | | Second spray | | |
| | | | | 1 DAS | 7 DAS | 15 DAS | 1 DAS | 7 DAS | 15 DAS |
| 1. | Flubendiamide 480 SC | 0.14 | 3.82* (14.17) | 2.93 (8.06) | 1.89 (3.09) | 3.09 (9.56) | 2.40 (5.27) | 1.35 (1.33) | 2.21 (4.50) |
| 2. | Chlorantraniliprole 20 SC | 0.006 | 3.99 (15.50) | 3.00 (8.49) | 1.98 (3.21) | 3.10 (9.61) | 2.51 (5.85) | 1.47 (1.67) | 2.35 (5.04) |
| 3. | Novaluron 10 EC | 0.015 | 3.91 (14.83) | 3.46 (11.48) | 2.69 (6.76) | 3.59 (12.66) | 3.30 (10.43) | 2.67 (6.66) | 3.43 (11.25) |
| 4. | Indoxacarb 15.8 SC | 0.007 | 3.82 (14.17) | 3.42 (11.17) | 2.60 (6.27) | 3.55 (12.63) | 3.29 (10.41) | 2.61 (6.32) | 3.29 (10.44) |
| 5. | Chlorpyriphos 50% EC + Cypermethrin 5% EC | 0.055 | 4.00 (15.50) | 3.48 (11.61) | 2.75 (7.05) | 3.62 (12.76) | 3.31 (10.48) | 2.72 (6.96) | 3.52 (11.89) |
| 6. | Cypermethrin 5% EC + Quinalphos 20% EC | 0.023 | 3.73 (13.50) | 3.52 (11.87) | 2.82 (7.43) | 3.64 (12.92) | 3.33 (10.57) | 2.81 (7.40) | 3.57 (12.27) |
| 7. | Spinosad 45 EC | 0.014 | 3.95 (15.17) | 3.08 (9.22) | 2.11 (3.95) | 3.26 (9.69) | 2.60 (6.40) | 1.60 (2.08) | 2.47 (5.49) |
| 8. | Profenophos 40% EC + Cypermethrin 4% EC | 0.044 | 3.95 (15.17) | 3.59 (12.38) | 2.90 (7.91) | 3.68 (13.09) | 3.37 (10.89) | 2.91 (7.98) | 3.67 (12.99) |
| | Chlorpyriphos 20 EC | 0.04 | 4.08 (16.26) | 3.90 (14.73) | 3.21 (9.78) | 4.01 (16.16) | 3.93 (15.07) | 3.35 (10.73) | 3.88 (14.63) |
| | Control | - | 3.99 (15.50) | 3.97 (15.43) | 4.00(15.78) | 4.11 (17.12) | 4.19 (17.13) | 4.22 (17.70) | 4.27 (17.82) |
| S.Em± | | | 0.17 | 0.16 | 0.12 | 0.15 | 0.17 | 0.15 | 0.15 |
| C.D. at 5% | | | NS | 0.46 | 0.37 | 0.44 | 0.50 | 0.44 | 0.45 |
| C.V % | | | 7.65 | 7.93 | 7.98 | 7.36 | 9.12 | 10.47 | 8.10 |

* = $\sqrt{X+0.5}$ transformed values, figures in the parenthesis are retransformed values.

DAS: Day(s) after spray. NS: Not significant

**Statistical Analysis:** The data were analysis by square root transformation

**First spray**

All the insecticidal treatments were significantly superior over control after one, seven and fifteen days after application of respective insecticides.

The data presented in Table 1 showed that one day after spraying, flubendiamide 480 SC @ 0.14 percent registered the lowest larval population (8.06 larvae/tree) and it was statistically at par with chlorantraniliprole 18.5 SC @ 0.006 percent (8.49 larvae/tree) and spinosad 45 SC @ 0.014 percent (9.22 larvae/tree). The next effective treatment was indoxacarb 15.8 EC @ 0.007 percent (11.17 larvae/tree) and it

was at par with novaluron 10 EC @ 0.015 percent (11.48 larvae/tree), chlorpyriphos 50% + cypermethrin 5% @ 0.055 percent (11.61 larvae/tree), cypermethrin 5% + quinalphos 20% @ 0.023 percent (11.87 larvae/tree), and Profenophos 40% + cypermethrin 4% @ 0.04 percent (12.38 larvae/tree). The larval population was higher (14.73 larvae/tree) in tree treated with chlorpyriphos 20 EC @ 0.04 percent which indicated that this treatment is not effective against slug caterpillar. In untreated control plot the larval population was highest (15.43 larvae/tree). From the Table 1, it can be seen that seven days after spray application, all the treatments were significantly superior over control (15.78 larvae/tree). The lowest larval population (3.09 larva/tree) was observed in the tree treated with flubendiamide 480 SC @ 0.14 percent and was at par with chlorantraniliprole 18.5 SC @ 0.006 percent (3.21 larvae/tree) and spinosad 45 SC @ 0.014 percent (3.95 larvae/tree). The next effective treatment was indoxacarb 15.8 EC @ 0.007 percent (6.27 larvae/tree) and was statistically at par with novaluron 10 EC @ 0.015 percent (6.76 larvae/ tree), chlorpyriphos 50% + cypermethrin 5% @ 0.055 percent (7.05 larvae/tree), cypermethrin 5% + quinalphos 20% @ 0.023 percent (7.43 larvae/tree) and Profenophos 40% + cypermethrin 4% @ 0.044 percent (7.91 larvae/tree). The treatment chlorpyriphos 20 EC @ 0.04 percent (9.78 larvae/tree) was not found effective to control the slug caterpillar. The data presented in Table 1 showed that fifteen days after spraying, lowest larval population was noticed (9.56 larva/tree) in the treatment flubendiamide 480 SC @ 0.14 percent and was at par with chlorantraniliprole 18.5 SC @ 0.006 percent (9.61 larva/tree) and spinosad 45 SC @ 0.14 percent (9.69 larva/tree). The next effective treatment was indoxacarb 15.8 EC @ 0.007 percent (12.63larvae/tree) and was at par with novaluron 10 EC @ 0.015 percent (12.66 larvae/tree), chlorpyriphos 50% + cypermethrin 5% @ 0.055 percent (12.76 larvae/tree), cypermethrin 5% + quinalphos 20% @ 0.023 percent (12.92 larvae/tree) and Profenophos 40% + cypermethrin 4% @ 0.044 percent (13.09 larvae/tree). The treatment chlorpyriphos 20 EC @ 0.04 percent was not found effective against slug caterpillar registering higher larval population (16.16 larvae/tree).

**Second spray**

After second spray (Table 1), all the treatments were significantly superior over control after one, seven and fifteen days. From the Table 1, it can be seen that after one day the treatment of flubendiamide 480 SC @ 0.14 percent registered the lowest larval population (5.27 larvae/tree) and it was at par with chlorantraniliprole 18.5 SC @ 0.006 percent (5.85 larvae/tree) and spinosad 45 SC @ 0.014 percent (6.40 larvae/tree). The next effective treatment was indoxacarb 15.8 EC @ 0.007 percent (10.41 larvae/tree) and it was at par with novaluron 10 EC @ 0.015 percent (10.43 larvae/tree), chlorpyriphos 50% + cypermethrin 5% @ 0.055 percent (10.48 larvae/tree), cypermethrin 5% + quinalphos 20% @ 0.023 percent (10.57 larvae/tree) and Profenophos 40% + cypermethrin 4% @ 0.044 percent (10.89 larvae/tree). The higher (15.07 larvae/tree) number of larvae was observed in the treatment chlorpyriphos 20 EC @ 0.04 percent, which indicated that this treatment is not effective to control the slug caterpillar.

From the data presented in Table 1, it can be seen that after seven days all the treatments were significantly superior over untreated control (17.70 larvae/tree). The lowest larval population was observed in the treatment of flubendiamide 480 SC @ 0.14 percent (1.33 larvae/tree) and was at par with chlorantraniliprole 18.5 SC @ 0.006 percent (1.67 larvae/tree) and spinosad 45 SC @ 0.014 percent (2.08 larvae/tree). The next effective treatment was indoxacarb 15.8 EC @ 0.007 percent (6.32 larvae/tree) and was at par with novaluron 10 EC @ 0.015 percent (6.66 larvae/tree), chlorpyriphos 50% + cypermethrin 5% @ 0.55 percent (6.96 larvae/tree), cypermethrin 5% + quinalphos 20% @ 0.023 percent (7.40 larvae/tree) and Profenophos 40% + cypermethrin 4% @ 0.044 percent (7.98 larvae/tree). The higher larval population (10.73 larvae/tree) was observed in the treatment of chlorpyriphos 20 EC @ 0.020 percent.

The data presented in Table 1, it can be seen that fifteen days after spraying, all the treatments were significantly superior over control (17.82 larvae/tree). The lowest larval population was observed in the treatment of flubendiamide 480 SC @ 0.14 percent (4.50 larva/tree) and was at par with chlorantraniliprole 18.5 SC @ 0.006 percent (5.04 larva/tree) and spinosad 45 SC @ 0.014 percent (5.49 larva/tree). The next effective treatment was indoxacarb 15.8 EC @ 0.007 percent (10.44 larvae/tree) and was at par with novaluron 10 EC @ 0.015 percent (11.25 larvae/tree), chlorpyriphos 50% + cypermethrin 5% @ 0.55 percent (11.89 larvae/tree), cypermethrin 5% + quinalphos 20% @ 0.023 percent (12.27 larvae/tree) and Profenophos 40% + cypermethrin 4% @ 0.044 percent (12.99 larvae/tree). The higher larval population (14.63 larvae/tree) was observed in the treatment of chlorpyriphos 20 EC @ 0.04 percent, which indicated that this treatment is not effective to control the slug caterpillar.

Thus, based on two spray applications it can be concluded that flubendiamide 480 SC @ 0.14 percent proved as the most effective treatment to control the slug caterpillar larvae under field conditions followed by chlorantraniliprole 18.5 SC @ 0.006 percent and spinosad 45 SC @ 0.014 percent. While, next effective treatments indoxacarb 15.8 EC @ 0.007 percent, novaluron 10 EC @ 0.015 percent, chlorpyriphos 50% + cypermethrin 5% @ 0.04 percent, cypermethrin 5% + quinalphos 20% @ 0.023 and Profenophos 40% + cypermethrin 4% @ 0.044 percent were rank second. The treatment of chlorpyriphos 20 EC @ 0.04 percent was least effective against slug caterpillar on mango. The order of effectiveness of various treatments based on larval population/tree was; flubendiamide 480 SC @ 0.14 percent, chlorantraniliprole 20 SC @ 0.006 percent, spinosad 45 SC @ 0.014 percent, indoxacarb 15.8 EC @ 0.007 percent, novaluron 10 EC @ 0.015 percent, chlorpyriphos 50% + cypermethrin 5% @ 0.055 percent, cypermethrin 5% + quinalphos 20% @ 0.023 percent, Profenophos 40% + cypermethrin 4% @ 0.044 percent, chlorpyriphos 20 EC @ 0.04 percent and control.

**Conclusion**

From the present results, it can be concluded that two spray application of flubendiamide 480 SC @ 0.14 percent or chlorantraniliprole 18.5 SC @ 0.006 percent or spinosad 45 SC @ 0.014 percent at 15 days interval during second fortnight of May was found most effective to control the larval population of slug caterpillar on mango.

In future the study will be carried out on the biology, life table, population ecology etc.

**Acknowledgement**

Authors are highly thankful to Professor and Head, Department of Agricultural Entomology, C. P. College of

Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar for providing necessary facilities and encouragement during course of present investigation.

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