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# Bio-efficacy of various insecticides and Pyriproxifen 5%+ Diafenthiuron 25% SE against sucking pests of chilli

N.L. Dangi, Lekha*, Gaurang Chhangani, Anita Sharma and Tara Yadav

Department of Entomology, Agriculture University, Jodhpur

**Abstract**

The trials were conducted to evaluate the efficacy of various insecticides against sucking pests *viz.*, thrips, mite and whitefly of chilli at Rajasthan College of Agriculture, Udaipur during *Kharif* 2018 and 2019. The chilli variety VNR 102 was sown in a Randomized Block Design with seven treatments and three replications. The treatments were Pyriproxyfen 5% + Diafenthiuron 25% SE in comparison to the products *viz*., Diafenthiuron 50% WP, Pyriproxyfen 10% EC and Fenpropathrin 30% EC. All the treatments were found to be effective in reducing the pest population over control. The best treatment in reducing the pest population was Pyriproxyfen 5% + Diafenthiuron 25% SE@ 1000ml/ ha with per cent reduction of 63.03, 76.90, 73.47 and 75.25, 77.80, 74.48 at 5, 10 & 15 days after first and second spray, respectively. The next effective treatment was Pyriproxyfen 5% +Diafenthiuron 25% SE @ 750 ml/ ha followed by Diafenthurion 50% WP, Pyriproxyfen 5% +Diafenthiuron 25% SE @ 500 ml/ha,Pyriproxifen 10% EC and Fenpropathrin 30% EC.

**Keywords:** Sucking pests, chilli, Pyriproxifen 5%+ Diafenthiuron 25% SE, whiteflies, thrips and mites

***Correspondence**

Author: Lekha

Email: lekha.rca@gmail.com

## Introduction

Chilli (*Capsicum annuum* L.) is an important spice as well as vegetable crop grown all over India and essential ingredient of Indian curry, which is characterized by tempting colour and titillating pungency by Reddy and Puttaswamy (1988) [1]. Due to various utility, chilli crop has huge export as well domestic market potential. There are different factors involved in reducing the productivity of the chili yield. Among these, damage due to insect infestation is an important one. Insect-pests continuously change their trend and become a barrier to the growth and cultivation of chili. Over 35 species of arthropods attack chili plants and the most significant pests are mite, thrips, aphids and whitefly (Pradeep and Korat, 2018). Amongst these, aphids, *Myzus persicae* Sulzer., *Aphis gossypii* Glover., thrips, *Scirtothrips dorsalis* Hood., yellow mite, *Polyphagotarsonemus latus* Banks and fruit borer, *Helicoverpa armigera* Hubner are the most vital production constraints (Puttarudraiah, 1959 [2], Solanki and Rai, 2006 [3]).

For managing the sucking pests of chilli, different methods have been used; however, to keep the pest population below economic injury level (EIL) use of insecticides seems to be the only remedy. The present agricultural scenario in India indicates that it is very difficult to manage insect pests without use of chemical pesticides. Several workers have tested different chemicals against the fruit borer still the problem continues. It has become necessary to evaluate newer insecticides for maximum mortality of sucking insect pests with least or no ill-effects on the plant, consumer and environment. Keeping this in view, present study was carried out to screen out promising insecticides from newer groups for the effective management of sucking insect pest complex infesting chilli.

## Materials and Methods

The experiment was conducted to evaluate the bio-efficacy Pyriproxyfen 5% + Diafenthiuron 25% SE at different doses *i.e*. 500, 750, 1000 ml/ha in comparison to the products *viz*., Diafenthiuron 50% WP @ 600 gm/ha, Pyriproxyfen 10% EC WP @ 500 ml/haand Fenpropathrin 30% EC @ 340 ml/ha against thrips, mite and whitefly on Chilli crop during *Kharif* 2018 and 2019 in a Randomized Block Design with seven treatments including one untreated control, eachreplicated three times. Chilli variety VNR 102 was sown in plot size of 5 m X 4 m (20 sq m) at Experiment Research Farm, RCA, Udaipur. Two sprays were done at 15 days interval during both seasons at the initiation of the pests. The observation on population of whiteflies (*Bemisia tabaci)*, thrips (*Scirtothrips dorsalis*) and mites (*Polyphagotarsonemus latus*) were taken from five randomly selected plants. The populations of pests were

counted on three top young leaves in each plant before spray as well as 5, 10 & 15 days after each spray. Furthermore, these population counts were analyzed and per cent reduction over control was worked out.

## Results and Discussion

The results on the bio-efficacy of various treatments against whitefly, thrips and mite showed that all the treatments were effective in reducing the pest population. The maximum reduction in pest population was observed from Pyriproxyfen 5% +Diafenthiuron 25% SE @ 1000 ml/ha treated plots followed by Pyriproxyfen 5% +Diafenthiuron 25% SE @ 750 ml/ha,Diafenthurion 50% WP, Pyriproxyfen 5% +Diafenthiuron 25% SE @ 500 ml/ha,Pyriproxifen 10% EC and Fenpropathrin 30% EC.

### *Effect on whitefly population*

All the treated plots with chemicals were significantly superior over untreated control plots. Pyriproxyfen 5% +Diafenthiuron 25% SE @750 and 1000 ml/ha gave best control against white fly during both cropping seasons. Percent reduction over control ranged from 73.01 to 74.48 during *Kharif* 2018 and 70.76 to 71.97 during *Kharif* 2019 in Pyriproxyfen 5% +Diafenthiuron 25% SE@ 750 and 1000 ml/ha, respectively. Minimum white fly population was recorded in Pyriproxyfen 5% +Diafenthiuron 25% SE @ 1000 ml/ha and which was statistically at par with Pyriproxyfen 5% +Diafenthiuron 25% SE @ 750 ml/ha during both cropping years. Pyriproxyfen 5% +Diafenthiuron 25% SE @ 750ml/ha and 1000ml/ha was significantly superior when compared to market samples of Diafenthiuron 50% WP, Pyriproxyfen 10% EC and Fenpropathrin 30 % EC in terms of controlling of White fly during both cropping seasons (**Tables 1** and **2**).

**Table 1** Bio-efficacy of various insecticides on whitefly in chilli crop during *Kharif*2018 (First Season)

| S. No. | Treatments | Dosage (ml/gm/ha) | No. of WF per leaf * | | | | | | | Per cent reduction of WF over control** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | I Spray | | | | II Spray | | | I Spray | | | II Spray | | |
| | | | 1 DBS | 5 DAS | 10 DAS | 15 DAS | 5 DAS | 10 DAS | 15 DAS | 5 DAS | 10 DAS | 15 DAS | 5 DAS | 10 DAS | 15 DAS |
| 1. | Pyriproxyfen5% +Diafenthiuron 25% SE | 500 | 6.92 (2.72) | 3.53 (2.01) | 3.00 (1.87) | 4.02 (2.13) | 4.23 (2.17) | 3.48 (1.99) | 4.14 (2.15) | 48.62 | 61.93 | 51.74 | 57.44 | 65.82 | 64.19 |
| 2. | Pyriproxyfen 5% +Diafenthiuron 25% SE | 750 | 6.78 (2.70) | 2.78 (1.81) | 2.09 (1.61) | 2.77 (1.81) | 3.17 (1.92) | 2.64 (1.77) | 3.12 (1.90) | 59.53 | 73.48 | 66.75 | 68.11 | 74.07 | 73.01 |
| 3. | Pyriproxyfen 5% +Diafenthiuron 25% SE | 1000 | 7.71 (2.87) | 2.54 (1.74) | 1.82 (1.52) | 2.21 (1.65) | 2.46 (1.72) | 2.26 (1.66) | 2.95 (1.86) | 63.03 | 76.90 | 73.47 | 75.25 | 77.80 | 74.48 |
| 4. | Diafenthurion 50% WP | 600 | 6.81 (2.70) | 3.03 (1.88) | 2.36 (1.69) | 3.10 (1.90) | 3.60 (2.02) | 3.07 (1.89) | 3.92 (2.10) | 55.90 | 70.05 | 62.79 | 63.78 | 69.84 | 66.09 |
| 5. | Pyriproxifen 10% EC | 500 | 6.67 (2.68) | 4.08 (2.14) | 3.30 (1.95) | 4.01 (2.12) | 4.53 (2.24) | 4.19 (2.17) | 4.20 (2.17) | 40.61 | 58.12 | 51.86 | 54.43 | 58.84 | 63.67 |
| 6. | Fenpropathrin 30% EC | 340 | 6.93 (2.73) | 4.87 (2.32) | 4.32 (2.20) | 5.11 (2.37) | 5.06 (2.36) | 4.67 (2.27) | 5.44 (2.44) | 29.11 | 45.18 | 38.66 | 49.09 | 54.13 | 52.94 |
| 7. | Untreated control | ---- | 6.17 (2.58) | 6.87 (2.71) | 7.88 (2.89) | 8.33 (2.97) | 9.94 (3.23) | 10.18 (3.27) | 11.56 (3.47) | -- | -- | -- | -- | -- | -- |
| S. Em ± | | | 0.09 | 0.10 | 0.09 | 0.09 | 0.23 | 0.06 | 0.06 | -- | -- | -- | -- | -- | -- |
| CD at 5% | | | NS | 0.31 | 0.27 | 0.28 | 0.72 | 0.19 | 0.17 | -- | -- | -- | -- | -- | -- |

WF = Whitefly,*Mean of three replications, **Figures in parenthesis are transformed values, DAS – Days after spray

### *Effect on mite population*

The efficacy of different treatment schedules of Pyriproxyfen 5% +Diafenthiuron 25% SE against mite in chilli crop was presented in **Tables 3** and **4**. All the treated plots with chemicals were significantly superior over untreated control plotsPyriproxyfen 5% +Diafenthiuron 25% SE @ 750 and 1000 ml/hagave best control against mite during both cropping seasons. Percent reduction over control ranged from 76.07 to 80.49 during *Kharif* 2018 and 72.98 to 75.52 during *Kharif* 2019in Pyriproxyfen 5% +Diafenthiuron 25% SE @ 750 and 1000 ml/ha, respectively. Minimum mite population was recorded in Pyriproxyfen 5% +Diafenthiuron 25% SE @ 1000ml/ha and which was statistically

at par with Pyriproxyfen 5% +Diafenthiuron 25% SE @ 750 ml/ha during both years. Pyriproxyfen 5% +Diafenthiuron 25% SE at @ 750 and 1000 ml/ha were significantly superior when compared to market samples of Diafenthiuron 50% WP, Pyriproxyfen 10% EC and Fenpropathrin 30% EC in terms of controlling of mite during both cropping seasons.

**Table 2** Bio-efficacy of various insecticides on white fly in chilli crop during *Kharif* 2019 (Second Season)

| S. No. | Treatments | Dosage (ml/ gm/ ha) | No. of WF per leaf * | | | | | | | Per cent reduction of WF over control** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | I Spray | | | | II Spray | | | I Spray | | | II Spray | | |
| | | | 1 DBS | 5 DAS | 10 DAS | 15 DAS | 5 DAS | 10 DAS | 15 DAS | 5 DAS | 10 DAS | 15 DAS | 5 DAS | 10 DAS | 15 DAS |
| 1. | Pyriproxyfen 5% +Diafenthiuron 25% SE | 500 | 4.01 (2.12) | 1.89 (1.55) | 1.66 (1.47) | 1.98 (1.57) | 2.41 (1.71) | 2.15 (1.63) | 2.29 (1.67) | 52.75 | 63.27 | 58.58 | 55.12 | 59.96 | 60.38 |
| 2. | Pyriproxyfen 5% +Diafenthiuron 25% SE | 750 | 3.92 (2.10) | 1.49 (1.41) | 1.19 (1.30) | 1.31 (1.35) | 1.69 (1.48) | 1.51 (1.42) | 1.69 (1.48) | 62.75 | 73.67 | 72.59 | 68.53 | 71.88 | 70.76 |
| 3. | Pyriproxyfen 5% +Diafenthiuron 25% SE | 1000 | 4.54 (2.24) | 1.39 (1.37) | 1.09 (1.26) | 1.18 (1.30) | 1.56 (1.44) | 1.41 (1.38) | 1.62 (1.46) | 65.25 | 75.88 | 75.31 | 70.95 | 73.74 | 71.97 |
| 4. | Diafenthurion 50% WP | 600 | 3.94 (2.11) | 1.64 (1.46) | 1.38 (1.37) | 1.59 (1.45) | 2.11 (1.62) | 1.90 (1.55) | 2.15 (1.63) | 59.00 | 69.47 | 66.74 | 60.71 | 64.62 | 62.80 |
| 5. | Pyriproxifen 10% EC | 500 | 3.85 (2.09) | 2.34 (1.69) | 2.01 (1.58) | 2.20 (1.64) | 2.73 (1.80) | 2.61 (1.76) | 2.28 (1.67) | 41.50 | 55.53 | 53.97 | 49.16 | 51.40 | 60.55 |
| 6. | Fenpropathrin 30% EC | 340 | 4.02 (2.13) | 2.86 (1.83) | 2.62 (1.77) | 2.81 (1.82) | 3.04 (1.88) | 2.84 (1.83) | 3.14 (1.91) | 28.50 | 42.04 | 41.21 | 43.39 | 47.11 | 45.67 |
| 7. | Untreated control | ---- | 3.51 (2.00) | 4.00 (2.12) | 4.52 (2.24) | 4.78 (2.30) | 5.37 (2.42) | 5.37 (2.42) | 5.78 (2.51) | -- | -- | -- | -- | -- | -- |
| S. Em ± | | | 0.06 | 0.04 | 0.03 | 0.05 | 0.04 | 0.03 | 0.02 | -- | -- | -- | -- | -- | -- |
| CD at 5% | | | NS | 0.12 | 0.10 | 0.15 | 0.14 | 0.09 | 0.07 | -- | -- | -- | -- | -- | -- |

WF = Whitefly,*Mean of three replications, **Figures in parenthesis are transformed values, DAS – Days after spray

**Table 3** Bio-efficacy of various insecticides on mite in chilli crop during *Kharif*2018 (First Season)

| S. No. | Treatments | Dosage (ml/ gm/ ha) | No. of Mite per leaf * | | | | | | | Per cent reduction of Mite over control** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | I Spray | | | | II Spray | | | I Spray | | | II Spray | | |
| | | | 1 DBS | 5 DAS | 10 DAS | 15 DAS | 5 DAS | 10 DAS | 15 DAS | 5 DAS | 10 DAS | 15 DAS | 5 DAS | 10 DAS | 15 DAS |
| 1 | Pyriproxyfen 5% +Diafenthiuron 25% SE | 500 | 4.57 (2.25) | 2.40 (1.70) | 2.10 (1.61) | 2.33 (1.68) | 2.80 (1.82) | 2.65 (1.77) | 2.64 (1.77) | 55.64 | 65.06 | 62.96 | 56.86 | 59.10 | 59.76 |
| 2 | Pyriproxyfen 5% +Diafenthiuron 25% SE | 750 | 4.43 (2.22) | 1.96 (1.57) | 1.63 (1.46) | 1.69 (1.48) | 1.90 (1.55) | 1.74 (1.50) | 1.57 (1.44) | 63.77 | 72.88 | 73.13 | 70.72 | 73.15 | 76.07 |
| 3 | Pyriproxyfen 5% +Diafenthiuron 25% SE | 1000 | 4.36 (2.20) | 1.91 (1.55) | 1.32 (1.35) | 1.33 (1.35) | 1.63 (1.46) | 1.37 (1.37) | 1.28 (1.33) | 64.70 | 78.04 | 79.01 | 74.88 | 78.86 | 80.49 |
| 4 | Diafenthurion 50% WP | 600 | 3.82 (2.08) | 2.15 (1.63) | 1.88 (1.54) | 2.11 (1.62) | 2.35 (1.69) | 2.23 (1.65) | 2.32 (1.68) | 60.26 | 68.72 | 66.45 | 63.79 | 65.59 | 64.63 |
| 5 | Pyriproxifen 10% EC | 500 | 4.58 (2.25) | 3.49 (2.00) | 3.54 (2.01) | 3.63 (2.03) | 3.81 (2.08) | 3.67 (2.04) | 3.98 (2.12) | 35.49 | 41.10 | 42.29 | 41.29 | 43.36 | 39.33 |
| 6 | Fenpropathrin 30% EC | 340 | 4.32 (2.20) | 2.63 (1.77) | 2.28 (1.67) | 2.40 (1.70) | 2.71 (1.79) | 2.58 (1.75) | 2.22 (1.65) | 51.39 | 62.06 | 61.84 | 58.24 | 60.19 | 66.16 |
| 7 | Untreated control | ---- | 4.47 (2.23) | 5.41 (2.43) | 6.01 (2.55) | 6.29 (2.61) | 6.49 (2.64) | 6.48 (2.64) | 6.56 (2.66) | -- | -- | -- | -- | -- | -- |
| S. Em ± | | | 0.07 | 0.02 | 0.11 | 0.12 | 0.10 | 0.13 | 0.10 | -- | -- | -- | -- | -- | -- |
| CD at 5% | | | NS | 0.07 | 0.33 | 0.36 | 0.29 | 0.38 | 0.30 | -- | -- | -- | -- | -- | -- |

*Mean of three replications, **Figures in parenthesis are transformed values, DAS – Days after spray

**Table 4** Bio-efficacy of various insecticides on mite in chilli crop during *Kharif* 2019 (Second Season)

| S. No. | Treatments | Dosage (ml/ gm/ ha) | No. of Mite per leaf * | | | | | | | Per cent reduction of Mite over control** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | I Spray | | | | II Spray | | | I Spray | | | II Spray | | |
| | | | 1 DBS | 5 DAS | 10 DAS | 15 DAS | 5 DAS | 10 DAS | 15 DAS | 5 DAS | 10 DAS | 15 DAS | 5 DAS | 10 DAS | 15 DAS |
| 1. | Pyriproxyfen 5% +Diafenthiuron 25% SE | 500 | 3.23 (1.93) | 1.51 (1.42) | 1.36 (1.36) | 1.41 (1.38) | 1.93 (1.56) | 1.87 (1.54) | 1.79 (1.51) | 57.10 | 65.13 | 65.61 | 54.27 | 54.83 | 58.66 |
| 2. | Pyriproxyfen 5% +Diafenthiuron 25% SE | 750 | 3.14 (1.91) | 1.22 (1.31) | 1.04 (1.24) | 1.05 (1.24) | 1.42 (1.39) | 1.31 (1.35) | 1.17 (1.29) | 65.34 | 73.33 | 74.39 | 66.35 | 68.36 | 72.98 |
| 3. | Pyriproxyfen 5% +Diafenthiuron 25% SE | 1000 | 3.09 (1.89) | 1.18 (1.30) | 0.92 (1.19) | 0.88 (1.17) | 1.29 (1.34) | 1.12 (1.27) | 1.06 (1.25) | 66.48 | 76.41 | 78.54 | 69.43 | 72.95 | 75.52 |
| 4. | Diafenthurion 50% WP | 600 | 2.73 (1.80) | 1.34 (1.36) | 1.22 (1.31) | 1.26 (1.33) | 1.69 (1.48) | 1.62 (1.46) | 1.61 (1.45) | 61.93 | 68.72 | 69.27 | 59.95 | 60.87 | 62.82 |
| 5. | Pyriproxifen 10% EC | 500 | 3.24 (1.93) | 2.40 (1.70) | 2.36 (1.69) | 2.32 (1.68) | 2.63 (1.77) | 2.51 (1.73) | 2.66 (1.78) | 31.82 | 39.49 | 43.41 | 37.68 | 39.37 | 38.57 |
| 6. | Fenpropathrin 30% EC | 340 | 3.06 (1.89) | 1.85 (1.53) | 1.67 (1.47) | 1.66 (1.47) | 2.13 (1.62) | 2.07 (1.60) | 1.62 (1.46) | 47.44 | 57.18 | 59.51 | 49.53 | 50.00 | 62.59 |
| 7. | Untreated control | ---- | 3.16 (1.91) | 3.52 (2.00) | 3.90 (2.10) | 4.10 (2.14) | 4.22 (2.17) | 4.14 (2.15) | 4.33 (2.20) | -- | -- | -- | -- | -- | -- |
| S. Em ± | | | 0.05 | 0.02 | 0.04 | 0.06 | 0.04 | 0.07 | 0.04 | -- | -- | -- | -- | -- | -- |
| CD at 5% | | | NS | 0.06 | 0.13 | 0.18 | 0.12 | 0.20 | 0.12 | -- | -- | -- | -- | -- | -- |

*Mean of three replications, **Figures in parenthesis are transformed values, DAS – Days after spray

**Table 5** Bio-efficacy of various insecticides on Thrips in Chilli crop during *Kharif* 2018 (First Season)

| S. No. | Treatments | Dosage (ml/ gm/ ha) | No. of Thrips per leaf * | | | | | | | Per cent reduction of Thrips over control** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | I Spray | | | | II Spray | | | I Spray | | | II Spray | | |
| | | | 1 DBS | 5 DAS | 10 DAS | 15 DAS | 5 DAS | 10 DAS | 15 DAS | 5 DAS | 10 DAS | 15 DAS | 5 DAS | 10 DAS | 15 DAS |
| 1. | Pyriproxyfen 5% +Diafenthiuron 25% SE | 500 | 4.65 (2.27) | 2.45 (1.72) | 2.42 (1.71) | 2.18 (1.64) | 2.25 (1.66) | 2.10 (1.61) | 2.02 (1.59) | 47.08 | 47.62 | 53.12 | 52.83 | 55.79 | 58.09 |
| 2. | Pyriproxyfen 5% +Diafenthiuron 25% SE | 750 | 4.40 (2.21) | 2.01 (1.58) | 1.98 (1.57) | 1.64 (1.46) | 1.68 (1.48) | 1.54 (1.43) | 1.47 (1.40) | 56.59 | 57.14 | 64.73 | 64.78 | 67.58 | 69.50 |
| 3. | Pyriproxyfen 5% +Diafenthiuron 25% SE | 1000 | 4.49 (2.23) | 1.92 (1.56) | 1.79 (1.51) | 1.61 (1.45) | 1.59 (1.45) | 1.39 (1.37) | 1.28 (1.33) | 58.53 | 61.26 | 65.38 | 66.67 | 70.74 | 73.44 |
| 4. | Diafenthurion 50% WP | 600 | 4.45 (2.22) | 2.92 (1.85) | 2.89 (1.84) | 2.12 (1.62) | 2.55 (1.75) | 2.46 (1.72) | 2.19 (1.64) | 36.93 | 37.45 | 54.41 | 46.54 | 48.21 | 54.56 |
| 5. | Pyriproxifen 10% EC | 500 | 4.34 (2.20) | 3.20 (1.92) | 3.05 (1.88) | 3.06 (1.89) | 2.82 (1.82) | 2.61 (1.76) | 2.70 (1.79) | 30.89 | 33.98 | 34.19 | 40.88 | 45.05 | 43.98 |
| 6. | Fenpropathrin 30% EC | 340 | 4.26 (2.18) | 2.26 (1.66) | 2.29 (1.67) | 2.14 (1.62) | 2.24 (1.66) | 2.02 (1.59) | 1.79 (1.51) | 51.19 | 50.43 | 53.98 | 53.04 | 57.47 | 62.86 |
| 7. | Untreated control | ---- | 4.60 (2.26) | 4.63 (2.27) | 4.62 (2.26) | 4.65 (2.27) | 4.77 (2.30) | 4.75 (2.29) | 4.82 (2.31) | -- | -- | -- | -- | -- | -- |
| S. Em ± | | | 0.07 | 0.03 | 0.07 | 0.02 | 0.04 | 0.06 | 0.07 | -- | -- | -- | -- | -- | -- |
| CD at 5% | | | NS | 0.11 | 0.20 | 0.05 | 0.11 | 0.20 | 0.21 | -- | -- | -- | -- | -- | -- |

*Mean of three replications, **Figures in parenthesis are transformed values, DAS – Days after spray

***Effect on thrips population***

The perusal of **Tables 5** and **6** indicates that significantly lower population of thrips was recorded under all the treatments when compared with untreated control at 5, 10 & 15 days after I and II spray during both seasons. Per cent reduction over control ranged from 69.50 to 73.44 during *Kharif* 2018 and 70.21 to 72.30 during *Kharif* 2019 in

Pyriproxyfen 5% +Diafenthiuron 25% SE @ 750 and 1000 ml/ha, respectively. Pyriproxyfen 5% +Diafenthiuron 25% SE @ 1000ml/ha recorded maximum per cent reduction and which was statistically at par with Pyriproxyfen 5% +Diafenthiuron 25% SE @ 750 ml/ha during both cropping seasons. Pyriproxyfen 5% +Diafenthiuron 25% SE @ 750ml/ha and 1000ml/ha was significantly superior when compared to market samples of Diafenthiuron 50% WP, Pyriproxyfen 10% EC and Fenpropathrin 30% EC in terms of controlling of thrips during both years. Maximum per cent reduction was recorded in Pyriproxyfen 5% +Diafenthiuron 25% SE @ 750ml/ha and 1000ml/ha during first season. Same trend was found in second season. The present findings are in agreement with Swami *et al* (2018) [4], evaluated Pyriproxyfen 10% EC 75 g a.iat different doses i.e. 750, 1000, 1250 ml for the management of thrips and jassids infesting chilli crop along with Imidacloprid 17.8 SL and Fenpropathrin 30% EC and recorded Pyriproxyfen 10% EC @ 1250ml/ha most effective against chilli thrips and jassids followed by Imidacloprid 17.8 SL @ 250ml/ha.

**Table 6** Bio-efficacy of various insecticides on Thrips in Chilli crop during *Kharif* 2019 (Second Season)

| S. No. | Treatments | Dosage (ml/ gm/ ha) | No. of Thrips per leaf * | | | | | | | Per cent reduction of Thrips over control** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | I Spray | | | | II Spray | | | I Spray | | | II Spray | | |
| | | | 1 DBS | 5 DAS | 10 DAS | 15 DAS | 5 DAS | 10 DAS | 15 DAS | 5 DAS | 10 DAS | 15 DAS | 5 DAS | 10 DAS | 15 DAS |
| 1. | Pyriproxyfen 5% +Diafenthiuron 25% SE | 500 | 5.54 (2.46) | 2.79 (1.81) | 2.75 (1.80) | 2.51 (1.73) | 2.63 (1.77) | 2.53 (1.74) | 2.38 (1.70) | 47.75 | 49.07 | 54.11 | 52.01 | 54.33 | 58.54 |
| 2. | Pyriproxyfen 5% +Diafenthiuron 25% SE | 750 | 5.22 (2.39) | 2.24 (1.66) | 2.13 (1.62) | 1.83 (1.53) | 2.02 (1.59) | 1.87 (1.54) | 1.71 (1.49) | 58.05 | 60.56 | 66.54 | 63.14 | 66.25 | 70.21 |
| 3. | Pyriproxyfen 5% +Diafenthiuron 25% SE | 1000 | 5.34 (2.42) | 2.12 (1.62) | 1.93 (1.56) | 1.80 (1.52) | 1.91 (1.55) | 1.69 (1.48) | 1.59 (1.45) | 60.30 | 64.26 | 67.09 | 65.15 | 69.49 | 72.30 |
| 4. | Diafenthurion 50% WP | 600 | 5.19 (2.39) | 3.04 (1.88) | 3.04 (1.88) | 2.44 (1.71) | 2.96 (1.86) | 2.83 (1.82) | 2.36 (1.69) | 43.07 | 43.70 | 55.39 | 45.99 | 48.92 | 58.89 |
| 5. | Pyriproxifen 10% EC | 500 | 5.15 (2.38) | 3.72 (2.05) | 3.54 (2.01) | 3.61 (2.03) | 3.45 (1.99) | 3.24 (1.93) | 3.35 (1.96) | 30.34 | 34.44 | 34.00 | 37.04 | 41.52 | 41.64 |
| 6. | Fenpropathrin 30% EC | 340 | 5.15 (2.38) | 2.88 (1.84) | 2.82 (1.82) | 2.37 (1.69) | 2.64 (1.77) | 2.55 (1.75) | 2.21 (1.65) | 46.07 | 47.78 | 56.67 | 51.82 | 53.97 | 61.50 |
| 7. | Untreated control | ---- | 5.30 (2.41) | 5.34 (2.42) | 5.40 (2.43) | 5.47 (2.44) | 5.48 (2.45) | 5.54 (2.46) | 5.74 (2.50) | -- | -- | -- | -- | -- | -- |
| S. Em ± | | | 0.09 | 0.04 | 0.07 | 0.02 | 0.04 | 0.06 | 0.04 | -- | -- | -- | -- | -- | -- |
| CD at 5% | | | NS | 0.13 | 0.21 | 0.05 | 0.12 | 0.18 | 0.13 | -- | -- | -- | -- | -- | -- |

*Mean of three replications, **Figures in parenthesis are transformed values, DAS – Days after spray

**Table 7** Yield of green chili after application of different treatments during *Kharif* 2018 and *Kharif* 2019

| S. No. | Treatments details | Dosage (ml or g/ha) | Ist Season (*Kharif* 2018) | | IInd Season (*Kharif* 2019) | |
|---|---|---|---|---|---|---|
| | | | Yield (q/ha) | Per cent increase | Yield (q/ha) | Per cent increase |
| $T_1$ | Pyriproxyfen 5% +Diafenthiuron 25% SE | 500 | 148.67 | 42.49 | 147.67 | 36.31 |
| $T_2$ | Pyriproxyfen 5% +Diafenthiuron 25% SE | 750 | 156.67 | 50.16 | 157.33 | 45.23 |
| $T_3$ | Pyriproxyfen 5% +Diafenthiuron 25% SE | 1000 | 161.33 | 54.63 | 162.67 | 50.15 |
| $T_4$ | Diafenthiuron 50% WP | 600 | 137.67 | 31.95 | 139.00 | 28.31 |
| $T_5$ | Pyriproxifen10%EC | 500 | 127.33 | 22.04 | 128.67 | 18.77 |
| $T_6$ | Fenpropathrin 30%EC | 340 | 124.33 | 19.17 | 125.67 | 16.00 |
| $T_7$ | Untreated Control | -- | 104.33 | --- | 108.33 | --- |
| | S.Em. ± | | 2.20 | | 4.13 | |
| | CD at 5% | | 6.79 | | 12.72 | |

***Yield***

The difference in the yield level between treated and untreated plots were very much significant.The green chilli yield data computed on q/ha revealed that, the highest yield 161.33 q/ha during *Kharif* 2018 and 162.67 q/ha during *Kharif* 2019 were obtained in Pyriproxyfen 5% +Diafenthiuron 25% SE @ 1000 ml/ha which was at par with dose of 750ml/ha yield 156.67.33 q/ha during *Kharif* 2018 and 157.33 q/ha during *Kharif* 2019seasons. The lowest yield was

recorded in the untreated plot yield 104.33 q/ha and 108.33 q/ha during *Kharif* 2018 &*Kharif* 2019, respectively (**Table 7**).

The present findings are in line with the earlier work done by Singh and Singh (2013) [5], Kumawat *et al*(2015) [6], Latha and Hunumanthraya (2018) [7],Swami *et al* (2018) [8]and Pradeep and Korat (2018) [9], who have also observed significant reduction in pest population due to application of various chemical and formulation as compared to untreated control.

## Conclusion

The use of various chemical belong to newer group helps in reducing the pest population and among various chemicals used in the study maximum reduction in pest population was observed from Pyriproxyfen 5% + Diafenthiuron 25% SE @ 1000 ml/ha treated plots followed by Pyriproxyfen 5% + Diafenthiuron 25% SE @ 750 ml/ha,Diafenthurion 50% WP, Pyriproxyfen 5% + Diafenthiuron 25% SE @ 500 ml/ha,Pyriproxifen 10% EC and Fenpropathrin 30% EC.

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