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Comparative efficacy of different recommended insecticides against yellow stem borer of paddy

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Abstract

The present investigation entitled “Comparative efficacy of different recommended insecticides against yellow stem borer of paddy” was conducted at the field of Anand Niketan College of Agriculture, Warora Dist. Chandrapur in Randomized Block Design with seven treatments and three replications. The insecticidal treatments viz., were, Carbosulfan 25% EC, Acephate 75% SP, Cartap hydrochloride 50% SP, Fipronil 5% SC, Thiamethoxam 25% WG, Bifenthrin 10% EC, including control were used during kharif 2021. Total three applications were applied at an interval of 15 days.

The application of Fipronil 5% SC proved effective in minimizing the stem borer (1.20% DH) and was at par with Carbosulfan 25 EC, Cartap hydrochloride 50 SP, Acephate 75 SP, Bifenthrin 10 EC and Thiamethoxam 25% WG recorded 1.27%, 1.33%, 1.39%, 1.47%, 1.53% yellow stem borer infestation respectively.

Keywords: Paddy, insecticide, yellow stem borer

Introduction

Rice (*Oryza sativa*) is a major field crop of India covering larger area in the country. In order to meet the growing demand of the ever increasing population. We need to produce more rice every year. But the rice production is less due to the cause of biotic and abiotic stresses, of which insect pests alone caused about 25 percent losses. India has the largest area of 43.13 million hectare with production of 104.80 MT which ranks second in production next to China and contributing 43 percent of total food grain production and 46 percent of total cereal production and continues to play a vital role in the national food grain supply (Anonymous 2017) [1]. In Maharashtra rice is grown in Vidarbha and Konkan region from which Chandrapur, Gadchiroli, Gondiya, Bhandara, Nagpur, Wardha, Ratnagiri, Sindhudurga, Raigad, Thane etc. are important rice producing districts. In India the yellow stem borer solely causes 2-20% damage and for increase in every percent of white ear heads there was 1.3% yield loss observed (Satpathi *et al.* 2012) [6]. In entire country, earlier rice leaf folder, *C. medinalis* was considered as minor pest. But now it has assumed major pest status (Nanda *et al.* 1990) [3]. Maximum leaf damage by this pest about of 60 to 70 percent at tillering and flowering stage which leads to 80 percent yield reduction. Usually second instar larvae of rice leaf folder stitches and glues to the longitudinal growing rice leaves for its shelter and starts feeding resucking green foliage leads to papery dry, stunting, curling or yellowing of (Yaspal *et al.* 2015) [7]. Yellow stem borer belongs to family Pyralidae (Lepidoptera) and causes great damage in rice crop. It is also widely distributed in Vidarbha region of Maharashtra. Attack by stem borers at vegetative stage or tillering stage, or this stage of plant produces symptoms called dead hearts and attack at the reproductive stage or earhead stage (at the time of panicle development) produces white ear heads (Pathak *et al.* 1971) [5].

Materials and Methods

The Present investigation on “Comparative efficacy of different recommended Insecticides against yellow stem borer of Paddy” was carried out at the field of Anand Niketan College of Agriculture, Warora, Dist. Chandrapur during kharif 2021. The experiment was laid out in randomized block design with seven treatment by using variety PKV-HMT. Each set of experiment was replicated three times. The size of gross plot - 5 x 4.5 m² and Net Plot -4.60 x 4.20 m², with spacing 20x15cm. Periodical application of the respective test insecticides was applied at ETL based infestation of the insect pests on different stages of the crop. Treatment details of the insecticides used is as under in the experiment.

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Result and Discussion

Effect of different treatments on percent infestation of stem borer on paddy after first spray

3 DAS

The data on percent infestation of stem borer presented in (Table 1) indicated that the minimum infestation of DH 4.91% was recorded in the treatment Fipronil 5 SC @ 2 ml/10L and was followed by Carbosulfan 25 EC @ 1.6 ml/10L, Cartap hydrochloride 50 SP @ 2 g/10L, Acephate 75 SP @ 2 g/10L, Thiamethoxam 25 WG @ 0.2 ml/10L, Bifenthrin 10 EC @ 1 ml/10L which recorded 4.99%, 5.06%, 5.16%, 5.25% and 5.21% DH respectively. Maximum percent infestation 5.90% was recorded in control.

7 DAS

The data tabulated in (Table 1) revealed that all the treatments were significantly superior over untreated control and recording minimum percent infestation at seven days after spray among different treatments Fipronil 5 SC @ 2 ml/10L recorded minimum DH infestation of stem borer 2.23% and was found statistically at par with Carbosulfan 25 EC @ 1.6 ml/10L 2.23%, Acephate 75 SP @ 2 g/10L 3.16%, Cartap hydrochloride 50 SP @ 2 g/10L 3.07% and Bifenthrin 10 EC @ 1 ml/10L recorded 3.37% respectively. Next effective treatment is Thiamethoxam 25 WG @ 0.2 ml/10L recorded 3.98% DH. Maximum percent infestation of yellow stem borer was recorded in control (7.00%).

14 DAS

From the data presented in Table 1 revealed that percent infestation of stem borer at fourteen days after first spray was found statistically significant. Among all the treatments, Fipronil 5 SC @ 2 ml/10L recorded minimum percent infestation i.e. 1.17%. However, this treatment was found at par with Carbosulfan 25 EC @ 1.6 ml/10L, Cartap hydrochloride 50 SP @ 2 g/10L, Acephate 75 SP @ 2 g/10L with percent infestation of 1.77%, 1.90% and 2.37% respectively. The next best treatments were Bifenthrin 10 EC @ 1 ml/10L recorded 2.53% and Thiamethoxam 25 WG @ 1 ml/10L recorded 2.99% where maximum percent infestation of stem borer was recorded control (7.83%).

Mean percent Dead heart infestation of yellow stem borer after first spray

From the data presented in Table 1 revealed that, there were no significant differences was observed in all the treatments. However, in overall lowest percent infestation of Stem borer 2.77% was noticed in Fipronil 5 SC @ 2 ml/10L and was found at par with Carbosulfan 25 EC @ 1.6 ml/10L 2.99%, Cartap hydrochloride 50 SP @ 2 g/10L 3.34%, Acephate 75 SP @ 2 g/10L 3.56%, Bifenthrin 10 EC @ 1 ml/10L 3.70% and Thiamethoxam 25 WG @ 0.2 g/10L 4.07% respectively. Maximum percent infestation of yellow stem borer control 6.91% respectively.

Table 1: Comparative efficacy effect of different treatments on percent infestation of stem borer on paddy after first spray

| Tr. No. | Treatments | % Dose Concentration | Percent DH infestation of YSB after 1st spray | | | |
|---------|----------------|----------------------|---|--------|--------|--------|
| | | | 3 DAS | 7DAS | 14 DAS | Mean |
| T1 | Carbosulfan | 1.6 ml/l | 4.99 | 2.23 | 1.77 | 2.99 |
| | 25% EC | | (2.23) | (1.52) | (1.33) | (1.72) |
| T2 | Acephate 75% | 2 g/l | 5.16 | 3.16 | 2.37 | 3.56 |
| | SP | | (2.27) | (1.77) | (1.53) | (1.88) |
| T3 | Cartap | 2 g/l | 5.06 | 3.07 | 1.90 | 3.34 |
| | hydrochloride | | (2.24) | (1.75) | (1.37) | (1.82) |
| | 50% SP | | | | | |
| T4 | Fipronil 5% SC | 2 ml/l | 4.91 | 2.23 | 1.17 | 2.77 |
| | | | (2.21) | (1.49) | (1.08) | (1.66) |
| T5 | Thiamethoxam | 0.2 g/l | 5.25 | 3.98 | 2.99 | 4.07 |
| | 25% WG | | (2.29) | (1.99) | (1.72) | (2.01) |
| T6 | Bifenthrin 10% | 1 ml/l | 5.21 | 3.37 | 2.53 | 3.70 |
| | EC | | (2.29) | (1.83) | (1.59) | (1.92) |
| T7 | Control | | 5.90 | 7.00 | 7.83 | 6.91 |
| | (water spray) | | (2.42) | (2.64) | (2.79) | (2.62) |
| | F Test | | Sig | Sig | Sig | Sig |
| | SE(m)± | | 0.12 | 0.11 | 0.13 | 0.12 |
| | CD at 5% | | 0.39 | 0.36 | 0.40 | 0.38 |
| | CV (%) | | 12.53 | 12.31 | 12.44 | 12.42 |

Figures in parentheses are square root transformation DAS - day after spray

Effect of different treatments on percent infestation of stem borer on paddy after second spray

3 DAS

Data presented in (Table 2) pertaining to percent infestation of stem borer at three days after second spray revealed that, the lowest (1.03%) infestation was recorded in plot treated with Fipronil 5 SC @ 2 ml/10L and was at par with Cartap hydrochloride 50 SP @ 2 g/10L, Carbosulfan 25 EC @ 1.6 ml/10L recorded 1.88% and 1.76% DH. The next effective group of treatment were Acephate 75 SP @ 2 g/10L, Thiamethoxam 25 WG @ 0.2 g/10L and Bifenthrin 10 EC @ 1 ml/10L recorded 2.35% DH, 2.43% DH, 2.50% DH

infestation respectively. The maximum percent infestation 7.83% DH was recorded in control.

7 DAS

The data on comparative effect of different treatments against stem borer at seven days after second spray (Table 2) revealed that application of Fipronil 5 SC @ 2 ml/10L recorded significantly lowest percent infestation of YSB i.e. 1.00% DH and it was found at par with Carbosulfan 25 EC @ 1.6 ml/10L 1.10%, Cartap hydrochloride 50 SP @ 2 g/10L 1.20%, Acephate 75 SP @ 2 g/10L 1.43%, Thiamethoxam 25 WG @ 0.2 g/10L 2.01% DH infestation of YSB respectively. These

treatments were followed by Bifenthrin 10 EC @ 1 ml/10L reached 2.05% DH of YSB. The maximum percent infestation

8.89% was recorded in control.

Table 2: Comparative efficacy effect of different treatments on percent infestation of stem borer on paddy after second spray

| Tr. No. | Treatments | % Dose Concentration | Percent DH infestation of YSB after 2nd spray | | | |
|---------|----------------|----------------------|---|--------|--------|--------|
| | | | 3 DAS | 7DAS | 14 DAS | Mean |
| T1 | Carbosulfan | 1.6 ml/l | 1.76 | 1.10 | 1.01 | 1.29 |
| | 25% EC | | (1.32) | (1.04) | (1.00) | (1.13) |
| T2 | Acephate 75% | 2 g/l | 2.35 | 1.43 | 1.05 | 1.61 |
| | SP | | (1.53) | (1.19) | (1.02) | (1.26) |
| T3 | Cartap | 2 g/l | 1.88 | 1.20 | 1.02 | 1.36 |
| | hydrochloride | | (1.27) | (1.09) | (1.00) | (1.16) |
| T4 | Fipronil 5% SC | 2 ml/l | 1.03 | 1.00 | 1.00 | 1.01 |
| | | | (1.01) | (1.00) | (1.00) | (1.00) |
| T5 | Thiamethoxam | 0.2 g/l | 2.43 | 2.01 | 1.50 | 1.98 |
| | 25% WG | | (1.55) | (1.41) | (1.22) | (1.40) |
| T6 | Bifenthrin 10% | 1 ml/l | 2.50 | 2.05 | 1.23 | 1.92 |
| | EC | | (1.58) | (1.43) | (1.10) | (1.38) |
| T7 | Control | (water spray) | 7.83 | 8.89 | 9.13 | 8.61 |
| | | | (2.79) | (2.98) | (3.02) | (2.93) |
| | F Test | | Sig | Sig | Sig | Sig |
| | S.E(m)± | | 0.11 | 0.15 | 0.14 | 0.13 |
| | CD at 5% | | 0.33 | 0.46 | 0.44 | 0.41 |
| | CV (%) | | 10.16 | 14.82 | 12.82 | 12.6 |

Figures in parentheses are square root transformation DAS - day after spray

14 DAS

The data revealed on percent infestation of stem borer at fourteen days after second spray presented in (Table 2) was statistically significant. Among all the treatments Fipronil 5 SC @ 2 ml/10L recorded lowest percent infestation of YSB i.e. 1.00% DH and it was at par with Carbosulfan 25 EC @ 1.6 ml/10L, Cartap hydrochloride 50 SP @ 2 g/10L, Acephate 75 SP @ 2 g/10L, Bifenthrin 10 EC @ 1 ml/10L and Thiamethoxam 25 WG @ 0.2 g/10L which recorded 1.01%, 1.02%, 1.05%, 1.23% and 1.50% of DH infestation respectively. The maximum percent infestation 9.13% was recorded in control.

Mean percent Dead heart infestation of Yellow stem borer after second spray

From the data presented in Table 2 revealed that, all the treatments were significantly superior over control. However, in overall, lowest percent infestation of Stem borer 1.01% was noticed in Fipronil 5 SC @ 2 ml/10L and was at par with Carbosulfan 25 EC @ 1.6 ml/10L 1.29%, Cartap hydrochloride 50 SP @ 2 g/10L 1.36%, Acephate 75 SP @ 2 g/10L 1.61%, Bifenthrin 10 EC @ 1 ml/10L 1.92% and Thiamethoxam 25 WG @ 0.2 g/10L 1.98% respectively. Highest percent dead hearts was recorded in control 8.61%.

Table 3: Comparative efficacy effect of different treatments on percent infestation of stem borer on paddy after third spray

| Tr. No. | Treatments | % Dose Concentration | Percent DH infestation of YSB after 3rd spray | | | |
|---------|----------------|----------------------|---|--------|--------|--------|
| | | | 3 DAS | 7DAS | 14 DAS | Mean |
| T1 | Carbosulfan | 1.6 ml/l | 1.00 | 0.52 | 0.28 | 0.6 |
| | 25% EC | | (1.00) | (0.72) | (0.52) | (0.77) |
| T2 | Acephate 75% | 2 g/l | 1.02 | 0.63 | 0.36 | 0.67 |
| | SP | | (1.00) | (0.79) | (0.6) | (0.81) |
| T3 | Cartap | 2 g/l | 1.01 | 0.61 | 0.23 | 0.61 |
| | hydrochloride | | (1.00) | (0.78) | (0.47) | (0.78) |
| T4 | Fipronil 5% SC | 2 ml/l | 1.00 | 0.50 | 0.21 | 0.57 |
| | | | (1.00) | (0.70) | (0.45) | (0.75) |
| T5 | Thiamethoxam | 0.2 g/l | 1.48 | 1.02 | 0.73 | 1.07 |
| | 25% WG | | (1.21) | (1.00) | (0.85) | (1.03) |
| T6 | Bifenthrin 10% | 1 ml/l | 1.20 | 1.00 | 0.46 | 0.88 |
| | EC | | (1.09) | (1.00) | (0.67) | (0.93) |
| T7 | Control | (water spray) | 9.15 | 9.21 | 9.29 | 9.33 |
| | | | (3.02) | (3.03) | (3.04) | (3.05) |
| | F Test | | Sig | Sig | Sig | Sig |
| | S.E(m)± | | 0.13 | 0.10 | 0.11 | 0.11 |
| | CD at 5% | | 0.40 | 0.33 | 0.35 | 0.36 |
| | CV (%) | | 11.80 | 11.71 | 10.28 | 11.26 |

Figures in parentheses are square root transformation DAS - day after spray

3 DAS

Data presented in (Table 3) pertaining to percent infestation of stem borer at three days after third spray revealed that all the treatments were significantly superior over control. The lowest i.e. 1.00% DH infestation of YSB recorded in Fipronil 5 SC @ 2 ml/10L and it was found at par with Carbosulfan 25 EC @ 1.6 ml/10L recorded 1.00%, Cartap hydrochloride 50 SP @ 2 g/10L recorded 1.01%, Acephate 75 SP @ 2 g/10L recorded 1.02%, Bifenthrin 10 EC @ 1 ml/10L recorded 1.20% and Thiamethoxam 25 WG @ 0.2 g/10L recorded 1.48% DH infestation of YSB respectively. The maximum percent infestation i.e. 9.15% was recorded in control.

7 DAS

The data on comparative effect of different treatments against stem borer at seven days after third spray (Table 3) revealed that the similar treatments of efficiency of insecticides at 3 DAS was also noticed at 7 DAS. Application of Fipronil 5 SC @ 2 ml/10L recorded the lowest percent infestation i.e. 0.50% DH. This treatment was found at par with Carbosulfan 25 EC @ 1.6 ml/10L recorded 0.52%, Cartap hydrochloride 50 SP @ 2 g/10L 0.61%, Acephate 75 SP @ 2 g/10L 0.63%, Bifenthrin 10 EC @ 1 ml/10L 1.00% and Thiamethoxam 25 WG @ 0.2 g/10L 1.02% DH infestation recorded respectively. The maximum percent infestation 9.21% DH infestation was recorded in control.

14 DAS

The data revealed on percent infestation of stem borer at fourteen days after third spray presented in (Table 3) was statistically significant. Among the different treatments comparatively Fipronil 5 SC @ 2 ml/10L recorded the lowest percent infestation i.e. 0.21% DH. This treatment was at par with Cartap hydrochloride 50 SP @ 2 g/10L, Carbosulfan 25 EC @ 1.6 ml/10L, Acephate 75 SP @ 2 g/10L and Bifenthrin 10 EC @ 1 ml/10L which recorded 0.23%, 0.28%, 0.36% and 0.46% DH respectively. Thiamethoxam 25 WG @ 0.2 g/10L was least effective than above which exhibited higher percent infestation i.e. 0.73% DH. The maximum percent infestation 9.29% was recorded in control.

Mean percent Dead heart infestation of yellow stem borer after third spray

From the data presented in (Table 3) revealed that, all the treatments were significantly superior over control. However, in overall lowest percent infestation of Stem borer 0.57% was noticed in Fipronil 5 SC @ 2 ml/10L and was at par with Carbosulfan 25 EC @ 1.6 ml/10L 0.6%, Cartap hydrochloride 50 SP @ 2 g/10L 0.61%, Acephate 75 SP @ 2 g/10L 0.67%, Bifenthrin 10 EC @ 1 ml/10L 0.88% and Thiamethoxam 25 WG @ 0.2 g/10L 1.07% respectively. Highest percent (9.33% DH) was observed in control.

Cumulative effect of different treatments on percent infestation of stem borer on paddy**3 DAS**

The data on percent infestation of stem borer is presented in (Table 4) exhibited that all the treatments were significantly superior over untreated control. The minimum infestation of 2.31% was recorded in the treatment Fipronil 5 SC @ 2 ml/10L which was at par with Carbosulfan 25 EC @ 1.6 ml/10L recorded 2.58%, Cartap hydrochloride 50 SP @ 2 g/10L recorded 2.65%, Acephate 75 SP @ 2 g/10L recorded 2.84%, Bifenthrin 10 EC @ 1 ml/10L recorded 2.97%, Thiamethoxam 25 WG @ 0.2 g/10L recorded 3.05% DH infestation respectively. The maximum percent infestation of YSB at vegetative stage (7.63%) was recorded in control.

7 DAS

The data on cumulative effect of different treatments against stem borer at seven days after spray was significant (Table 4) the application of Fipronil 5 SC @ 2 ml/10L recorded minimum infestation of 1.24%. This treatment was at par with Carbosulfan 25 EC @ 1.6 ml/10L recorded 1.28%, Cartap hydrochloride 50 SP @ 2 g/10L recorded 1.63%, Acephate 75 SP @ 2 g/10L recorded 1.74%, Bifenthrin 10 EC @ 1 ml/10L recorded 2.14%, Thiamethoxam 25 WG @ 0.2 g/10L recorded 2.34% respectively. The maximum percent infestation (8.37%) was recorded in control.

Table 4: Cumulative effect of three applications of different treatments on percent infestation of Stem borer

| Tr. No. | Treatments | % Dose Concentration | Cumulative% infestation | | | |
|---------|----------------|----------------------|-------------------------|--------|--------|--------|
| | | | 3 DAS | 7DAS | 14 DAS | Mean |
| T1 | Carbosulfan | 1.6 ml/l | 2.58 | 1.28 | 1.02 | 1.62 |
| | 25% EC | | (1.52) | (1.09) | (0.95) | (1.27) |
| T2 | Acephate 75% | 2 g/l | 2.84 | 1.74 | 1.26 | 1.94 |
| | SP | | (1.60) | (1.26) | (1.05) | (1.39) |
| T3 | Cartap | 2 g/l | 2.65 | 1.63 | 1.05 | 1.77 |
| | hydrochloride | | (1.54) | (1.21) | (0.96) | (1.33) |
| | 50% SP | | | | | |
| T4 | Fipronil 5% SC | 2 ml/l | 2.31 | 1.24 | 0.79 | 1.44 |
| | | | (1.41) | (1.07) | (0.85) | (1.2) |
| T5 | Thiamethoxam | 0.2 g/l | 3.05 | 2.34 | 1.74 | 2.37 |
| | 25% WG | | (1.69) | (1.47) | (1.27) | (1.53) |
| T6 | Bifenthrin 10% | 1 ml/l | 2.97 | 2.14 | 1.41 | 2.17 |
| | EC | | (1.65) | (1.42) | (1.13) | (1.47) |
| T7 | Control | | 7.63 | 8.37 | 8.75 | 8.25 |
| | (water spray) | | (2.75) | (2.89) | (2.96) | (2.87) |
| | F Test | | Sig | Sig | Sig | Sig |
| | S.E(m)± | | 0.20 | 0.14 | 0.12 | 0.15 |
| | CD at 5% | | 0.64 | 0.45 | 0.39 | 0.49 |
| | CV (%) | | 15.80 | 14.01 | 15.91 | 15.57 |

Figures in parentheses are square root transformation DAS - day after spray

14 DAS

All the insecticidal treatments were significantly superior over control. Cumulative minimum percent infestation of three applications at 14 DAS was recorded in the plots treated with Fipronil 5 SC @ 2 ml/10L 0.79%. This treatment was at par with Carbosulfan 25 EC @ 1.6 ml/10L recorded 1.02%, Cartap hydrochloride 50 SP @ 2 g/10L recorded 1.05%, Acephate 75 SP @ 2 g/10L recorded 1.26% and Bifenthrin 10 EC @ 1 ml/10L recorded 1.41% Yellow stem borer respectively. These treatments were followed by Thiamethoxam 25 WG @ 0.2 g/10L 1.74% Yellow stem borer infestation. The maximum percent infestation 8.75% was recorded in control.

Mean

It is evident from the cumulative mean data presented in (Table 4) and illustrated under fig that the treatment with Fipronil 5 SC @ 2 ml/10L proved significantly effective and showed minimum percent infestation of stem borer 1.44% DH and found at par with Carbosulfan 25 EC @ 1.6 ml/10L recorded 1.62% DH, Cartap hydrochloride 50 SP @ 2 g/10L recorded 1.77% DH, Acephate 75 SP @ 2 g/10L recorded 1.94% DH, Bifenthrin 10 EC @ 1 ml/10L recorded 2.17% DH and Thiamethoxam 25 WG @ 0.2 g/10L recorded 2.37% DH infestation respectively. The maximum percent infestation 8.25% was recorded in control.

Present investigation of the research work is collaborate with the earlier findings of Niranjana *et al.* (2018) ^[4], who reported after application of Fipronil 0.3 G recorded minimum percent infestation of stem borer at 10 & 20 Kg/ha and recorded 1.84% DH and 2.13% DH and it was followed by Cartap Hydrochloride 4 G at 25 & 50 kg/ha.

Mishra *et al.* (2012) ^[2] also reported the lowest percent infestation of yellow stem borer and highest grain yield in the treated plots with Fipronil 5 SC 50 g ai/ha and was followed by Cartap hydrochloride 50 SP 300 g ai/ha. Thus these results are comparable to the findings of present investigation and gave support to the data.

Conclusion

The cumulative mean percent infestations of stem borer after three applications in all the treatments were significantly superior over control. The application of Fipronil 5 SC @ 2 ml/10L recorded minimum infestation (1.2% DH). This treatment was at par with Carbosulfan 25 EC@ 1.6ml/10L recorded (1.27% DH), Cartap hydrochloride 50 SP @ 2g/10L recorded (1.33% DH), Acephate 75 SP @ 2g/10L recorded (1.39% DH), Bifenthrin 10 EC @ 1ml/10L recorded (1.47% DH), Thiamethoxam 25WG @ 0.2g/10L recorded (1.53% DH) respectively. The maximum percent infestation (2.87% DH) was recorded in control.

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