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Assessment of Impact of Chlorfenapyr 240 SC on Fruit Borer of Tomato

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Abstract: ***A research experiment entitled "Assessment of impact of Chlorfenapyr 240 SC Against fruit borer of Tomato" was carried out in randomized block design (RBD) during Rabi season at experimental site, College of Agriculture, Indore (MP). To assess the impact of insecticides against fruit borer.The population counted on 5 plants at 1, 3, 5, 7 and 10 day after each spray. The maximum reduction in larval number of fruit borer was noted in T_5-Chlorfenapyr 240 SC @ 480ml/ha (95.46%) followed by T_4- Chlorfenapyr 240 SC @ 288 ga.i./ha (94.28%), T_3-Chlorfenapyr 240 SC @ 240 g a.i.ha^{-1}(92.70%), T_2-Chlorfenapyr 240 SC @ 192 g a.i./ha (90.76%), T_6-Cynantraniliprole 10.26% OD 100mlha^{-1} (89.56%), T_7-Dimethoate 30% EC @ 150 gmha^{-1} (87.66%). The minimum percent reduction of fruit borer was found in T_1-Chlorfenapyr 240 SC @ 144 g a.i.ha^{-1} (85.34%)compared to untreated control. The higher fruit yield also recorded in T_5-Chlorfenapyr 240 SC @ 480ml/ha (32 t/ha) followed by T_4- Chlorfenapyr 240 SC @ 288 ga.i./ha (27 t/ha).***

Keywords: Chlorfenapyr, fruit borer, Tomato, cyntraniliprole

1. Introduction

Tomato (*Lycopersiconesculentum* Miller) belongs to the Solanaceae family. Tomato is one of the most important "protective food" because of its special nutritive value. It is one of the most versatile vegetable with wide usage in Indian culinary tradition. Tomatoes are used for soup, salad, pickles, ketchup, puree, sauces and in many other ways. It is also used as a salad vegetable. It is a rich source of vitamin 'C' and many minerals like calcium, potassium, magnesium and phosphorus. It is also called as 'Poor Man's Orange'. Tomato has very few competitors in the value addition chain of processing.

Present world production of tomato is about 100 million tones. Fresh fruits produced on 3.7 M ha area. India ranks third in the area and second in production of tomato, after China. In India, it is grown in 0.76 M ha area with 18.39 MT production and 16.1 MTha^{-1} productivity. The major tomato producing states are Karnataka, Bihar, Uttar Pradesh, Maharashtra, Madhya Pradesh and West Bengal. (Anonymous, 2016).Madhya Pradesh is endowed with favorable climatic and soil conditions for cultivation of tomato with an area of 0.07 m ha, approximate production of 1.94 m MT and productivity of 29.5 MT^{-1}, Production of tomato has been concentrated in Ratlam, Indore, Khargone, Jhabua, Ujjain, Sagar, Raisen, Bhopal, Shahjapur, Jabalpur, Chhindwara, Satna, Vidisha and Bhopal district during 2016 (Anonymous, 2016).

Tomato crop is mainly infested by insect pests like fruit borer, leaf miner, white fly and mites. Fruit borer (*Helicoverpaarmigera* Hubner) is widely distributed and regarded as key pest of tomato which mainly attacks buds, flowers and fruits of tomato. In tomato it is the most destructive pest causing qualitative and quantitative loss to the crop in all seasons. It is estimated about 70% loss in marketable yield due to attack of fruit borer on tomato (Abbas*et al*. 2015).

2. Objectives

1) To assess the bio efficacy of Chlorfenapyr with different doses against tomato fruit borer.
2) To obtain the fruit yield for economic assessment.

3. Material and Methods

The studies entitled **"**Assessment of impact of Chlorfenapyr 240 SC Against fruit borer of Tomato" carried out in *Rabi* season of 2016-17 at experimental site of Horticulture field no 5, College of Agriculture, Indore (M.P.).The present experiments were carried out on medium black cotton soil of the College of Agriculture, Indore having a uniform topography. Tomato Hybrid Pahuja 508 was transplanted on 8th November, 2016 with 60 x 45 cm spacing. Insecticidal spray was started at the ETL of insects @ 500 liter water per hectare with knapsack sprayer fitted with a flood jet nozzle. The eight treatments consist of Five doses of chlorfenapyr 240 sc @ 144, 192, 240, 288 and 480 g.a.i.ha-1, Cyantraniliprole 10.26% OD @ 90 g.a.i. ha-1 and Dimethoate 30% EC @ 200g.a.i. ha-1 including untreated control were sprayed thrice at 10 days interval. Fruit Borer population was counted one day before and 1st, 3rd, 5th, 7th and 10th days after each spray from five randomly selected plants of each plot and population was counted on per plant. Per cent population reduction was calculated for each spray, averaged for three sprays and finally overall population reduction was calculated. Thus, data obtained from the observations for each character were tabulated and analyzed statistically.

4. Result and Discussion

The data revealed that the larval population ranged from 3.45 to 3.90 and showed no significant difference before the application of treatments. After first spray per cent reduction in fruit borer population was calculated from last observation of first spray over pre-treatment count. It was revealed that the maximum reduction in population was recorded inT_5-Chlorfenapyr 240 SC @ 480 g *a.i.*/ha (67.20%) followed by T_4-Chlorfenapyr 240SC @ 288 g*a.i.*/ha (61.42%), T_3-Chlorfenapyr 240 SC @ 240 g*a.i.*/ha (60.81%), T_2-Chlorfenapyr 240 SC @ 192 g*a.i.*/ha (60.00%), T_6-Cyantraniliprole 10.26% OD @ 99 g*a.i.*/ha (53.62%) ,T_7-Dimethoate 30% EC @ 200 g*a.i.*/ha (52.75%) and T_1-Chlorfenapyr 240 SC @144 g *a.i.*/ha (49.10%). The similar trend was also recorded after second spray repeatedly in the

highest dose of T_5-Chlorfenapyr 240 SC @ 480 ml/ha (68.29%) followed by T_4-Chlorfenapyr 240 SC @ 288 g*a.i.*/ha (66.66%), T_3-Chlorfenapyr 240 SC @ 240 g*a.i.*/ha (58.62%), T_2-Chlorfenapyr 240 SC @ 192 g *a.i.*/ha (42.70%), T_6-Cynantraniliprole 10.26%OD 100 ml/ha (56.25%), T_7-Dimethoate 30% EC @ 150gm/ha (47.22%) and T_1-Chlorfenapyr 240 SC @ 144 g*a.i.*/ha (46.96%). After third spray the maximum reduction in fruit damage was calculated in T_5-Chlorfenapyr 240 SC @ 480ml/ha (94.19%) followed by T_4-Chlorfenapyr 240 SC @ 288 g*a.i.*/ha (92.19%), T_3-Chlorfenapyr 240 SC @ 240 g*a.i.*/ha (90.35%), T6-Cynantraniliprole 10.26% OD 100ml/ha (88.59%), T_7-Dimethoate 30% EC @ 150 gm/ha (87.63%), T_2-Chlorfenapyr 240 SC @ 192 g *a.i.*/ha (84.08%) %) and T_1-Chlorfenapyr 240 SC @ 144 g*a.i.*/ha (88.60%).Various researchers reported that the present findings are in accordance with the findings reported by Chatterjee and Mondal (2008) where they showed that chlorfenapyr with other insecticides with various concentrations were highly effective in reducing the damage caused by fruit borer on tomato. Babar *et al.* (2016) revealed that the chemical insecticide chlorofenapyr 36% SC against *Helicoverpaarmigera* was best fitted in the IPM programe for control of the tomato pests. Vivan*et al.* (2017) evaluated chlorfenapyr with 16 other insecticides with various concentrations against fruit borer on tomato which caused 100% mortality of larvae. Aslam *et al.* (2004) reported that chlorfenapyr 360 SC was most effective for American bollworm in cotton. Further, Laishana *et al.* (2013) showed that among the six biorational insecticides, Spinetoram recorded the overall best control (6.39%) followed by emamectin benzoate (7.41%), *Bacillus thuriniensis* (10.43%), Neem (10.56%), *Beauveriabassiana* (11.01%), chlorfenapyr (11.30%) and *Verticilliumlecanii* (11.41%), respectively providing highest fruit protection over control. Patra*et al.* (2015) reported that chlorfenapyr at higher doses was effective against *H. armigera*in reducing the tomato fruit damage. Mahmoud *et al.* (2014) indicated results of LC_{50} values that chlorfenapyr was less effective (LC_{50}) 1.054 and (3.165%). Generally, the tested insecticides and their mixtures achieved a considerable reduction in *T. absoluta* and *H. armigera* population. Abbas *et al.* (2015) indicated that chlorfenapyr were less effective in reducing damage by *H. armigera* on tomato.

Further, various workers reported the effectiveness of cynantraniliprole against fruit damage by tomato fruit borer (*Helicoverpaarmigera*). Mandal (2012) founded cyantraniliprole 10% OD @ 90 and 105 g *a.i.*/ha highly effective in controlling the fruit borer, *H. armigera*, of tomato. Patel *et al.* (2012) reported the bioefficacy of two higher doses of cyantraniliprole 10 OD@ (60 and 70 g *a.i.*/ha) in chilli found most effective in reducing fruit damage by fruit borer. Misra (2015) revealed that cyantraniliprole showed significantly lowest larval population of *H. armigera* per 5 plants at 7 days after spraying on tomato. Hema*et al.* (2016) showed an effectiveness of cyantraniliprole on lepidopteran larvae and on sucking pests in cotton. Kodamkaram*et al.* (2015) revealed that cyantraniliprole 10OD was more toxic against a serious shoot and fruit borer pest of brinjal, when applied as fruit dip, and recorded highest per cent mortality.

Furthermore, effectiveness of dimethoate on fruit damage bytomato fruit borer (*Helicoverpaarmigera*) on tomatowas reported by various workers. Ahmed *et al.* (2015) revealed that the plots of tomato fruits sprayed with dimethoate had the least number of holed and damaged fruit. Nishantha*et al.* (2009) showed that dimethoate @ 170 g *a.i.*/ ha recorded significantly lower pod and grain damage (20.79% and 9.79%) by *H. armigera*in pigeonpea.. Carneir o*et al.* (2014) reported that, dimethoate gave good responses to control of *H. armigera*in laboratory test.Hossain (2007) reported that dimethoate (7.92%) was less effective in reducing damage by *H. armigera*. Roopa and kumar (2014) indicated the results that the maximum larvae/plant (capsicum) (1.03) was recorded in the treatments dimethoate, imidacloprid and quinalphos and stood on par with each other. The above findings are in the line of agreement with the present investigation. Chlorfenapyr and cynantraniliprole are the products of novel group of insecticides and comparatively new to dimethoate hence their effectiveness is justified.

Table 1: Effect of insecticidal treatments on *Helicoverpaarmigera*

Treatments	Dose g *a.i.* /ha	Pre-treatment count	Larval population/plant					Population reduction (%)	% Over all reduction
			1 DAS	3 DAS	5 DAS	7 DAS	10 DAS		
T_1-Chlorfenapyr 240 SC	144	1.05 (1.24)	0.43 (0.96)	0.43 (0.96)	0.54 (1.01)	0.52 (1.00)	0.57 (1.03)	45.71	85.34
T_2-Chlorfenapyr 240 SC	192	0.65 (1.07)	0.20 (0.84)	0.22 (0.85)	0.27 (0.88)	0.31 (0.90)	0.36 (0.93)	44.61	90.76
T_3-Chlorfenapyr 240 SC	240	0.60 (1.05)	0.16 (0.81)	0.16 (0.81)	0.20 (0.84)	0.24 (0.86)	0.27 (0.88)	55.00	92.70
T_4-Chlorfenapyr 240 SC	288	0.45 (0.97)	0.11 (0.78)	0.11 (0.78)	0.13 (0.79)	0.17 (0.82)	0.20 (0.84)	55.55	94.28
T_5-Chlorfenapyr 240 SC	480	0.39 (0.94)	0.06 (0.75)	0.07 (0.75)	0.11 (0.78)	0.13 (0.79)	0.17 (0.82)	56.41	95.46
T_6-Cyantraniliprole 10.26% OD	99	0.70 (1.10)	0.23 (0.86)	0.23 (0.86)	0.28 (0.89)	0.31 (0.90)	0.36 (0.93)	48.57	89.56
T_7-Dimethoate 30% EC	200	0.95 (1.20)	0.34 (0.92)	0.35 (0.92)	0.40 (0.95)	0.44 (0.97)	0.47 (0.98)	50.52	87.66
T_8-Untreated control		4.19 (2.17)	4.21 (2.17)	4.24 (2.17)	4.29 (2.19)	4.33 (2.20)	4.39 (2.21)		
S Em±		-	0.03	0.03	0.03	0.03	0.03		
CD at 5 % (p=0.05)		NS	0.09	0.09	0.09	0.09	0.10		
CV %		-	5.20	5.09	5.16	5.08	0.36		

Yield and Economics

Findings revealed that obtained marketable fruit yield was noted highest inT_5-Chlorfenapyr 240 SC @ 480 ml/ha (32.00 t/ha) followed by T_4-Chlorfenapyr 240SC @ 288 g *a.i*/ha (27.00 t/ha), T_3-Chlorfenapyr 240 SC @ 240 g *a.i*/ha (25.33 t/ha), T_6-Cyantraniliprole 10.26% OD @ 99 g *a.i*/ha (24.67 t/ha), T_2-Chlorfenapyr 240 SC @192 g *a.i*/ha (24.24 t/ha), T_1-Chlorfenapyr 240 SC @144 g *a.i*/ha (23.84 t/ha) T_7-Dimethoate 30% EC @ 200 g *a.i*/ha (20.00 t/ha) and T8-untreated check (14.10 t/ha).

Table 2: Effect of newer insecticides molecules on marketable Fruit yield of tomato

Treatments	Dose g *a.i.*/ha	Dose gm or ml/ha	t/ha
T_1-Chlorfenapyr 240 SC	144	600	23.84
T_2-Chlorfenapyr 240 SC	192	800	24.24
T_3-Chlorfenapyr 240 SC	240	1000	25.33
T_4-Chlorfenapyr 240 SC	288	1200	27.00
T_5-Chlorfenapyr 240 SC	480	2000	32.00
T_6-Cyantraniliprole 10.26% OD	90	900	24.67
T_7-Dimethoate 30% EC	200	600	20.00
T_8-Untreated control			14.10
S Em±			0.09
CD at 5 % (p=0.05)			0.27

5. Conclusion

The present study concluded that maximum reduction in population was observed in treatment Chlorfenapyr240 SC @ 480 ml/ha. Under untreated control minimum population reduction was found. The marketable Okra fruit yield was recorded higher in higher dose of Chlorfenapyr 240 SC @ 480 ml/ha followed byT_4-Chlorfenapyr 240SC @ 288 g *a.i*/haandT_3-Chlorfenapyr 240 SC @ 240 g *a.i*/ha as compared to untreated control.

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