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EVALUATION OF INSECTICIDAL SPRAY SCHEDULES AGAINST SUCKING PESTS OF CHILLI

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ABSTRACT

A field experiment on evaluation of insecticidal spray schedules against sucking pests of Chilli Capsicum annum LINNAEUS*, was taken during kharif season of 2014-15 at the Research farm, College of Agriculture, Indore (M.P) in randomised block design with eight treatments and three replication. The observations recorded for the insect pests viz., thrips (Scirtothrips dorsalis Hood) and whitefly (Bemesia tabaci Gennadius). The spray schedule-6 (comprising profenophos 0.04% + cypermethrin 0.004%, spiromesifen 0.03%, lambda-cyhalothrin 0.003%, thiamethoxam 0.004%, profenophos 0.04% + cypermethrin 0.004%, acetamiprid 0.008% sprayed at 8 days interval) registered the lowest population and higher mortality of thrips and whitefly and consequently, the lowest leaf curl index (LCI) in spray schedule-6. The highest dry chilli yield (21.86 q ha^{-1}) and net profit of Rs.108826.95 ha^{-1} were recorded in spray schedule-6 (S-6).*

Key words: Chilli, thrips, whitefly, leaf curl, insecticide

INTRODUCTION

Chilli (*Capsicum annuum*L.) is one of the important spice crop of India and also widely cultivated throughout warm temperate, tropical and subtropical countries. Chilli is famous for its pleasant aromatic flavour, pungency and high colouring substance. It is used very widely in culinary, pharmaceutical and beverage industries throughout the world. It is an important condiment used for imparting pungency an colour to the food being rich in vitamin C, A, B, oleoresin and red pigment. Its cultivation is mostly concentrated in the southern states *viz.*, Andhra Pradesh, Karnataka, Maharashtra and Tamil Nadu, occupying nearly 75 per cent of total area under chilli in India, which is the second largest exporter of chilli in the world. It is exported in the form of whole dried fruits, fresh chillies, chilli powder and oleoresins to south Asian countries, USA and Canada. In India, chilli is being grown on an area of 7.20 lakh hectares with production of 12.50 lakh tonnes (Anon., 2013). Chilli crop suffers from several foliage and sucking pests which are responsible for low yields. Among the sucking pests, white fly (*Bemisia tabaci* Genn.) and thrips (*Scirtothirps dorsalis* Hood) are serious production constraints (Berke and Sheih, 2000). Several pesticide spray schedules are recommended for the management of these pests in India. Keeping in view the, emphasis being given to the use of insecticide spray schedules suitably acceptable in pest management programmes, the present investigation was made to evolve spray schedules, using insecticides and combination products.

MATERIALS AND METHODS

A field experiment on evaluation of spray schedules against sucking pests of chilli was taken during *kharif*2014–2015 at Horticulture Research Farm, college of Agriculture, Indore in randomized block design with eight treatments and three replications using the variety Chilli seedlings of Pusa Jwala cultivar were raised in nursery beds and 40 days old seedlings were transplanted into main field with a spacing of 0.6 × 0.6 m. All the recommended agronomic practices were adopted. The spray schedule consisted S1- consisting of thiamethoxam 25 WG (0.004%), profenophos + cypermethrin, thiamethoxam (0.004%) (3 sprays) sprayed at 18 days interval. S2- thiamethoxam 25 WG (0.004%), profenophos + cypermethrin, lambda-cyhalothrin 5EC (0.003%), thiamethoxam (0.004%) (4 sprays) sprayed at 16 days interval. S3- thiamethoxam 25 WG (0.004%), lambda-cyhalothrin 5EC (0.003%), profenophos + cypermethrin, thiamethoxam (0.004%), acetamiprid 20 SP (0.008%) (5 sprays) sprayed at 14 days interval. S4- thiamethoxam 25 WG (0.004%), lambda- cyhalothrin 5EC (0.003%), profenophos + cypermethrin, thiamethoxam (0.004%), acetamiprid 20 SP (0.008%),

profenophos + cypermethrin (6 sprays) sprayed at 12 days interval. S5- profenophos + cypermethrin (0.04%+0.004%), lambda-cyhalothrin 5EC (0.003%), profenophos 50 EC (0.05%), thiamethoxam 25 WG (0.004%), profenophos + cypermethrin (0.04%+0.004%), lambda- cyhalothrin 5EC (0.003%), profenophos 50 EC (0.05%) (7 sprays) sprayed at 10 days interval. S6- profenophos + cypermethrin (0.04%+0.004%), spiromesifen 22.9 SC (0.03%), lambda- cyhalothrin 5 EC (0.003%), thiamethoxam 25 WG (0.004%), profenophos + cypermethrin (0.04%+0.004%), acetamiprid 20 SP (0.008%) (6 sprays) sprayed at 10 days interval. S7- diafenthiuron 50 WP (0.05%), thiamethoxam 25 WG (0.004%), lambda-cyhalothrin 5 EC (0.003%) (3 sprays) sprayed at 15 days interval S8- Control. Foliar application of respective insecticides was given as per schedule using a manually operated knapsack sprayer and the first spray was taken up as soon as the pest reached the economic threshold level. Five plants were selected randomly from each plot and the population of thrips and whitefly were counted from six leaves each two from top, middle and bottom canopy of plant with the help of magnifying lens at one day prior to each spray and after 3,7 and 14 days of spraying and converted into per plant and per cent insect mortality were also recorded at every 3, 7 and 14 days after spraying. The observation of these insects were averaged and finally, the mean population of thrips and whitefly per leaf was worked out and the data were converted to $\sqrt{x}+0.5$ transformations values and later subjected to one way analysis of variance. Corrected per cent mortality of each sucking pest in each treatment was calculated by using the formula given by Abbott (1925) and modified by Henderson and Tilton (1955) and the data on corrected per cent mortality were subjected to angular transformation before statistical analysis. Ten plants were selected randomly in each plot and scored for leaf curling visually following the standard scoring procedure as described by Niles (1980) at one week, two week, three week and four weeks after spraying.

RESULTS AND DISCUSSION

The population of thrips significantly varied from 0.36 to 6.69 per leaf in pooled mean of different spray schedules at 14 days after last spray with minimum (0.36 thrips/leaf) under spray schedule–6, which was at par with the spray schedule–5 (0.4 thrips/ leaf) and maximum (6.69/ leaf) in control (Table 1).

Table 1: Mean population and per cent mortality of chilli thrips and whitefly and leaf curl index (LCI) in different spray schedules at different intervals

Treatment	Mean population/leaf		Mean per cent mortality		Leaf Curl Index (LCI)		
	Thrips	Whitefly	Thrips	Whitefly	2WAS	3WAS	4WAS
S_1	1.87 (1.54)*	1.37 (1.37)	70.37 (63.35)**	70.70 (63.58)	1.60	1.53	1.67
S_2	1.07 (1.25)	0.89 (1.18)	84.12 (73.90)	81.07 (71.34)	1.47	1.47	1.53
S_3	0.87 (1.17)	0.73 (1.11)	87.61 (77.10)	82.91 (72.86)	1.47	1.40	1.47
S_4	0.86 (1.17)	0.59 (1.04)	88.62 (78.09)	85.21 (74.86)	1.33	1.40	1.40
S_5	0.40 (0.95)	0.54 (1.02)	95.27 (86.04)	90.57 (80.12)	1.00	1.13	1.13
S_6	0.36 (0.92)	0.25 (0.86)	94.34 (84.70)	95.00 (85.64)	1.00	1.07	1.00
S_7	1.74 (1.50)	1.38 (1.37)	71.33 (64.02)	72.05 (64.53)	1.53	1.53	1.60
S_8 (Control)	6.69 (2.68)	5.17 (2.38)	-	-	2.53	2.93	3.51
S Em ±	0.06	0.05	2.19	1.73	0.12	0.11	0.09
CD (p=0.05)	0.18	0.15	6.64	5.26	0.37	0.33	0.28
CV %	7.27	6.54	5.74	4.67			

***Figures in the parentheses are $\sqrt{x}+1$ transformed values. ****Figures in the parentheses are angular transformed values. WAS-Week after Spraying*

The per cent mortality of thrips was significantly maximum in spray schedule-5 (95.27 per cent), which was at par with the spray schedule-6 (94.34 per cent). Similar results were recorded by Ulaganathan and Gupta (2004) and Shitole (2014). It is evident that minimum population of whitefly was recorded in spray schedule-6 (0.25 whitefly/leaf) is pooled mean at 14 days after last spray and the percent mortality was also found significantly superior in spray schedule-6 (95.00 percent) which was at par with the spray schedule- 5 (90.57 percent). Afzal *et*. *al*. (2001) and Ulaganathan and Gupta (2004) reported similar findings. The leaf curling symptom due to the feeding of thrips and whitefly was lowest in spray schedule-6 (1 LCI/leaf) (1.07 LCI/leaf) and (1 LCI/leaf) at two, three and four weeks after insecticidal spraying respectively. The data on yield and economics revealed that spray schedule-6 recorded highest yield of 21.86q ha^{-1}, which being at par with spray schedule-5 (21.44q ha^{-1}) proved significantly superior over other treatments. The minimum yield (8.04q ha^{-1}) was recorded with Untreated control (Table 2). Further, it was also observed that spray schedule-6was found most economic insecticidal treatment with cost benefit ratio of 1:5.21, followed by spray schedule-5, spray schedule-4, spray schedule 3, spray schedule-2 and spray schedule 7 which resulted in cost benefit ratio of 1:5.07, 1:4.00, 1:3.43, 1:3.33 and 1:2.96 respectively. The minimum cost benefit ratio of 1:2.81 was found in spray schedule-1 (Table 2).

Table 2: Yield and economics of different treatments

Treatment	Yield (q ha^{-1})	Cost of treatment (Rs.ha^{-1})	Net gain (Rs.ha^{-1})	CBR
S_1	14	32165.6	58857.15	2.81
S_2	15.69	32381.6	69646.3	3.33
S_3	16.08	32765.6	71784.3	3.43
S_4	17.95	33185.6	83516.05	4.00
S_5	21.44	33516.8	105883.5	5.07
S_6	21.86	33324.8	108826.95	5.21
S_7	14.74	33888.8	61968.65	2.96
S_8 (Control)	8.04	31400	20874.95	

**Market value of dry chilli=□6500/k, *Thiamethoxam 25 WG=□ 1800/kg, Profenophos 40 EC+ Cypermethrin 4 EC =□ 700/lit, Lambda-cyhalothrin 5 EC=□ 600/lit, Acetamiprid 20 SP = □ 1600/kg, Profenophos 50 EC=□ 700/lit, Spiromesifen 22.9 SC=□ 4000/lit, Diafenthiuron 50 WP=□ 3500/kg*

Among different spray schedules, the spray schedule-6 having six spray application at eight day interval with insecticides profenophos 0.04% + cypermethrin 0.004%, spiromesifen 0.03%, lambda - cyhalothrin 0.003%, thiamethoxam 0.004%, profenophos 0.04% + cypermethrin 0.004% and acetamiprid 0.008% recorded highest yield (21.86 q ha^{-1}), with net profit of Rs.108826.95 ha^{-1} and lowest leaf curl damage (1 LCI/leaf) with least number of thrips and whitefly per leaf. From the results, it may be concluded that the thrips and white fly recongnized as a major pest of chilli crop and cause leaf curl disease. These pests can be controlled by the spray schedule S-6 comprising profenophos 0.04% + cypermethrin 0.004%, spiromesifen 0.03%,lambda cyhalothrin 0.003%, thiamethoxam 0.004%, profenophos 0.04%+ cypermethrin 0.004% ,acetamiprid 0.008% sprayed at 8 days interval and thus registered the lowest population and higher mortality of thrips and white fly and consequently, the lowest leaf curl index. . The highest dry chilli yield and net profit of was obtained with spray schedule-6.

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