STUDIES ON COMPARITIVE WORTH OF DIFFERENT BOTANICALS AND SELECTED SYNTHETICS INSECTICIDES AGAINST CHILLI THRIPS

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ABSTRACT

The present research work was conducted at Agricultural Research Institute Tarnab, Peshawar during 2020. The study aimed to evaluate the comparative worth of different botanicals and selected synthetic insecticides against chilli thrips in vivo condition, as well as the CB ratio of botanicals and synthetic insecticides against chilli thrips regulation. Highest efficacy has been shown by imidacloroprid after 1st and 2nd application at 3 DAS (21.65, 16.66 thrips plant^{-1}) followed by 5 DAS (6.65 and 5.66 thrips plant^{-1}) while at 7 DAS (13.65, 12.00 thrips plant^{-1}). Whereas among botanicals, *Momordica charantia* (Bitter gourd) showed maximum control at 3 DAS (28.32, 26.32 thrips plant^{-1}) and 5 DAS (23.32, 21.32 thrips plant^{-1}) while at 7 DAS (29.32, 27.32 thrips plant^{-1}) the population of *Scirtothrips dorsalis* was exceeded. Similarly, the lowest pest reduction has been shown by *Ocimum basilicum* (basil) extracts at 3 DAS (32.32, 31.32 thrips plant^{-1}) and 5 DAS (29.32, 27.65 thrips plant^{-1}) while at 7 DAS (33.32, 31.65 thrips plant^{-1}). Similarly, the cost and benefit analysis showed that maximum return was obtained from imidacloropid treated plot instead of botanicals. On the other hand, among botanicals, bitter melon showed maximum return cost and benefit analysis as compared to the rest of botanical treatments. Among all the botanicals, basil was significantly best recorded due to minimum treatment cost.

Keywords: *Scirtothrips dorsalis*, *Momordica charantia*, *Ocimum basilicum*, Imidacloprid, Acetamiprid

INTRODUCTION

Chili is an essential cash crop of Pakistan. Approximately, farmers cultivate 0.2 million tones chili per year. Sindh is considered as top chili producing area which approximately gives 82% of the output. Pakistan was considered as 5th largest chili producing country worldwide (PARC, 2007).

The production of chili is decreasing day by day mainly due to insect pest and pathogens attack in the early stages. During growth, chili is affected by different insect pests via aphids, thrips, leaf hoppers, ear wigs, crickets, mites, root grubs, pod borers, cutworms, and flea beetles causing destruction of the crop. Thrips may injure crop during flowering, branching and seedling stages (Butani, 2019).

The major insect pest that effects the chili and reduce its yield are mites, thrips and aphids. Thrips in its extreme infestation alone reduce yield losses up to 50% (Seal *et al.*, 2006). Thus, proper assessment of chemicals is needed in controlling the insect pests leaving residues below MRL (Maximum residues limit). Now a days, most of the pesticides are systemic, go head in the system of plants with high degree of toxicity, causing significant health problems. They also adversely effect the population of useful insects like pollinators, natural enemies and microbial activities. Both of these aspects combined to add new dimensions in research for eco-friendly management of insect-pest. Efforts were made to examine the efficacy of 12 locally obtained plant extracts were checked against thrips in garlic (Sujay *et al.*, 2015).

Due to consistent use of pesticides, in pest management programs, pesticides are failed to minimize pest problems (Anhurs *et al.*, 2009). The pest also develop resistance to various insecticides due to over dose of pesticide which results in causing havoc and pest escape. Beside pest management, it is necessary to sustain the survival of useful insects like pollinators and natural enemies. Due to the above reasons, the present research was aimed to minimize thrips problems.

MATERIALS AND METHODS

Study area

The research work was conducted at new developmental farm of the University of Agriculture Peshawar during year 2020.

Experimental design

The local chili variety was transplanted in open plot. Plot size was 4.8x2.8 W. There were five treatments each was replicated 3 times.

Treatments

The treatments used in this experiment were *viz.,* bitter gourd (*Momordica charantia),* Ginger *(Zingiber officinale),* Basil *(Ocimum basilicum),* Thiamethoxam and Imidacloprid.

Methodology

Pre data was recorded to know the population of thrips per plant. By jurking the plant, we were able to know the population of thrips per plant. After pre data we used plant extracts and insecticides to control the population of thrips and to know about the effect of these plant extracts and chemical insecticides. We used three plant extracts and two insecticides. Plant extracts were bitter gourd, ginger and basil. Insecticides were imidacloprod and acetamiprid. We used spray pump for spraying these insecticides. In plant extracts bitter gourd were used 100ml/4liter. Basil was used 200ml/4lit. Ginger was used 300ml/4lit. and in insecticides imidacloprid was used 4ml/4lit. and acetamiprid was used 5ml/4lit. Spray was done two times. After each spray data was recorded after 3, 5 and 7 days interval.

For yield estimation

The red-ripe matured chili fruits were collected plot by plot in two or three pickings and individually weighed using a manual weighing equipment. The weight reported was converted to kg/ha or t/ha. The percent increase in yields above the control in each treatment was computed using the method.

$$\% \text{ Increase in yield} = \frac{\text{Yield in treatment-yield in control}}{\text{Yield in control}} \times 100$$

Cost benefit ratio

The overall cost of plant protection included the cost of treatment, sprayer rental, and spray labour expenses. During the study period, two sprays were applied, and total plant protection costs were computed. Total income was calculated by multiplying total yield per hectare by the current market price, while net benefit was calculated by subtracting total revenue from total income. The

advantage over the control was determined for each sprayed treatment by subtracting the revenue of the controlled treatment from the sprayed treatment. The CBR was calculated by formula-

$$\text{Cost benefit ratio} = \frac{\text{Net benefit over control}}{\text{Total cost of protection}}$$

Statistical analysis

The data were subjected to ANOVA by using Statistix 8.1 software.

RESULTS AND DISCUSSION

Table 1: Efficacy of different botanicals and synthetic insecticides against thrips after 1st application during 2020.

Treatments	Mean number of thrips plant^{-1}			
	Before spraying	3DAS	5DAS	7DAS
Bitter gourd	35.32d	28.32d	23.32d	29.32d
Ginger	35.32d	30.32c	26.32c	31.32c
Basil	37.32c	32.32b	29.32b	33.32b
Thiamethoxam	38.65b	24.65e	12.65e	18.65e
Imidacloprid	38.65b	21.65f	6.65f	13.65f
Control	40.32a	37.65a	35.65a	38.00a

Mean in columns followed by the same letters are non-significant at 5% level of probability

DAS: Days After spray

Thrips infestation after 1st application

The results on number of thrips per plant before and after application of five different treatments i.e., bitter gourd, ginger, basil, thiamethoxam and imidacloprid recorded at different time intervals are presented in Table 1. Before spray showed significant differences between all treatments. After 3 day of spray, maximum mean number of thrips were recorded in control treatment (37.65) while minimum number of thrips was recorded in imidacloprid (21.65) followed

by thiamethoxam (24.65). Among botanical treatments, bitter gourd recorded (28.32) followed by (30.32) and (32.32) which were significant with each other, respectively.

Similarly, after 5 days of spray, maximum number of thrips were recorded in control plot (35.65) while minimum number of thrips were recorded in imidacloprid (6.65) followed by thiamethoxam (12.65). Among botanical treatments, bitter gourd recorded (23.32) followed by (26.32) and (29.32) which were significant with each other, respectively.

After 7 days of spray steadily increased was recorded, maximum number of thrips were recorded in control plot (38.00) while minimum number of thrips were recorded in imidacloprid (13.65) followed by thiamethoxam (18.65). Among botanical treatments, bitter gourd recorded (29.32) followed by (31.32) and (33.32) which were significant with each other, respectively.

Table 2: Efficacy of different botanicals and synthetic insecticides against thrips after 2nd application during 2020.

Treatments	Mean number of thrips plant^{-1}			
	Before spraying	3 DAS	5 DAS	7 DAS
Bitter gourd	33.32bc	26.32c	21.32d	27.32c
Ginger	34.65abc	29.00bc	23.65c	28.00c
Basil	36.36ab	31.32b	27.65b	31.65b
Acetamiprid	30.32bc	19.00d	9.65e	14.32d
Imidacloprid	29.00c	16.66d	5.66f	12.00d
Control	40.32a	37.32a	34.65a	37.65a

Mean in columns followed by the same letters are non-significant at 5% level of probability

DAS: Days After spray

Thrips infestation after 2nd application

Table 2 showed that before spray recorded significant differences between all treatments. After 3 day of spray, maximum mean number of thrips were recorded in control treatment (37.32) while minimum number of thrips was recorded in imidacloprid (16.66) followed by thiamethoxam

(19.00). Among botanical treatments, bitter gourd recorded (26.32) followed by (29.00) and (31.32) which were significant with each other, respectively.

Similarly, after 5 days of spray, maximum number of thrips were recorded in control plot (34.65) while minimum number of thrips were recorded in imidacloprid (5.65) followed by thiamethoxam (9.65). Among botanical treatments, bitter gourd recorded (21.32) followed by (23.65) and (27.65) which were significant with each other, respectively.

After 7 days of spray steadily increased was recorded, maximum number of thrips were recorded in control plot (37.65) while minimum number of thrips were recorded in imidacloprid (12.00) followed by thiamethoxam (14.32). Among botanical treatments, bitter gourd recorded (27.32) followed by (28.00) and (31.65) which were significant with each other, respectively.

Table 3: Cost benefit ratio response of different botanicals and synthetic insecticides application during 2020.

Treatment	Yield Kg/ha	Marketable out put	Cost of preparation	Cost of application	Total cost	Return over control (D)	CBR C/D
Bitter gourd	1900	57000	3500	2400	5900	33000	1:5.59
Ginger	1600	48000	4500	2400	6900	24000	1:3.47
Basil	1200	36000	0	2400	2400	12000	1:5.00
Acetamiprid	2800	84000	900	2400	3300	60000	1:18.18
Imidacloroprid	3300	99000	750	2400	3150	75000	1:23.80
Control	800	24000	-	-	-	-	-

Average price per kg= 30

Economic analysis of different treatments

Similarly, as from the result, it is obvious that all the treatments significantly maximum net return was recorded as compared to control treatments. The imidacloprid treated plot was given maximum return. In case of botanicals (Bitter melon) was recorded best treatment against the chili thrips. Furthermore, the cost benefit ratio of the treatments showed that imidacloprid is more economical because maximum ratio cost/benefit was recorded (23.80). Among plant extracts, bitter gourd showed highest cost benefit ratio (5.59) followed by basil (5.00) and ginger (3.47) as compared to check plot with cost benefit ratio 1.

DISCUSSIONS

Garlic thrips was initially recorded in the 3rd week of November by Sontakke and Mohapatra (2014), and continued active around the season. The population steadily increased, reaching to top in the 2nd week of December. The population of insect was intensely correlated with relative humidity of morning, but not with afternoon relative humidity.

Khattak *et al.* (2006) reported that neem oil 2% and neem seed water extract 3% was significantly decreased the number of thrips, white flies and jassids on cotton till seven days after application. Almeida (2013) evaluated different botanical formulations for the managment of chili thrips and recorded that azadiracitin (0.00075%) and neem seed kernel suspension (5%) water was effectively controlled *S. dorsalis* by more than 40 per cent. According to Prabhu *et al.* 2015, neem oil 2% was mostly effective in decreasing the number of thrips, jassids, and whiteflies in Bt cotton, however garlic bulb and eucalyptus leaves extract were also effective recorded. The above-mentioned studies, which were collected by a number of researchers, backed up the current results.

Gomez and Gomez (1984) and Sarkar *et al.* (2015) showed further investigation and observed that a different botanical was effective towards sucking pests (thrips, aphids, and whitefly) (*Momordica charantia*).

According to Tehri *et al.,* (2017), the population of adult thrips on onion continued lowest (less than 5 thrips/plant) until the start of February, when the 1st peak of 13 adults per plant

occurred, after which the population began to increase to a 1st peak of 32 thrips/plant, followed by a 2nd peak of 72 thrips/plant in March, at which point onion thrips stopped to exist.

Ngbede *et al.,* (2019) revealed that thrips seemed after the 10th week after plantion (52nd standard meteorological week) and persisted upto the 22nd week after sowing in Rabi, 2011-12. (12th standard meteorological week). The number of thrips per plant reached from 1.96 to 12.20. The lowest number of thrips was recognized in the 1st week of January (1.96 thrips per plant) when the maximum temperature was 21.1°C and the minimum was 3.1°C, the highest relative humidity was 78% and the least was 30%, rainfall was o mm, and the speed of wind was 3.3 km per h. Through the vegetative growth period, the number of thrips gradually increased, peaking in the 2nd week of March (12.20 thrips per plant) when temperatures touched a highest of 28.9°C and a lowest of 11.7°C, relative humidity touched a highest of 56% and a low of 17%, precipitation was o mm, and speed of wind was 5.2 km per h.

CB ratio of botanicals and synthetic insecticides chilli cultivar

As can be seen from the findings of the chilli cultivar, the maximum net return was recorded of every treatment when compared to the other treatments. After imidaclorpid, the (*Momordica charantia*) treatment had the higher profit in botanicals. Moreover, the CB ratio of the revealed that Imidacloprid is additional cost-effective, as the highest CB ratio was seen (23.80). Among botanicals, bitter melon (5.59) had the highest cost benefit ratio, followed by basil (5.00) and ginger (3.47).

CONCLUSIONS AND RECOMENDATION

Conclusion

Results concluded that highest effectiveness was recorded by imidacloroprid. However, in botanicals, bitter gourd recorded highest control after 3 and 5 days while 7 days after spray the thrips population were exceeded. Though, the CB ratio recorded that highest return was recorded from imidacloropid treatment besides botanicals. But amongst all the tested botanicals basil was most significant treatment recorded due to lowest treatment cost.

Recommendations

1. Amongst all tested insecticides, imidacloroprid was showed effectiveness but in accord to treatment cost (Rs. 2400) basil recorded sustaining results (1:5.00).
2. Among botanicals, bitter gourd recorded highest mortality towards thrips but due to its highest cost it is not suggested.
3. Future prospective would focus on study of basil extracts to decrease highest treatment cost.

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