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EVALUATION OF DIFFERENT INSECTICIDES AGAINST AMERICAN SERPENTINE LEAF MINER, *LIRIOMYZA TRIFOLII* (BURGESS) (DIPTERA : AGROMYZIDAE) IN TOMATO CROP

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Abstract

Leaf miner, *Liriomyza trifolii* (Burgess) was observed as an important pest of tomato crop. This insect has attained a pest of economic importance in the recent past. Control of leaf miner with insecticides is usually difficult because of its biology *i.e.* short life cycle, smaller in size and high mobility of adults, relatively long pupal stage in soil, higher productive capability *i.e.* fecundity and concealed larval stages. In addition, mines created by larvae remain on the leaf as long as the leaf survives. The conventional insecticides recommended against this pest gave low to moderate control and hence there is a need to test newer insecticides and with this the present study was undertaken. Seven insecticides tested for their efficacy against *L. trifolii* on variety Naveen-2000 plus of tomato, Profenophos 40% + Cypermethrin 4% was found to be the most effective over control, while other insecticides were also showed significant result on the leaf miner infestation.

Key words : Tomato, Serpentine leaf miner, *Liriomyza trifolii* (Burgess).

Introduction

Tomato *Lycopersicon esculentum* (Mill.) is one of the important vegetable crops covering an area of 0.485 m ha. in India, which has increased considerably in recent years with the introduction of new hybrid varieties. These varieties have excellent transportable quality and a long post-harvest shelf life.

Tomato crop is affected by several biotic and physicochemical factors. Among the major biotic factor the insects which damage the tomato crop substantially is the American Serpentine leaf miner (*Liriomyza trifolii*). The serpentine leaf miner, *Liriomyza trifolii* (Burgess) (Diptera : Agromyzidae), an invasive pest was accidentally introduced into India from American sub continent along with chrysanthemum cuttings (Anonymous, 1991). In India, it was initially recorded on 55 plant species (Viraktamath *et al*., 1993) and later on about 79 species (Srinivasan *et al*., 1995) that included pulses, oil seeds, vegetables, green manures, fodder and fibre crops. Galande *et al*. (2004) recorded this pest on 16 new crops and 16 weed species. American serpentine leaf minor, *L. trifolii* is one of the recently introduced pests of tomatoes, in India, whose infestation is increasing every year at an alarming rate. Other than serpentine leaf miner (L. *trifolii*), tomato fruit borer *Helicoverpa armigera* (Hb.) is the most destructive pest of tomato in India. The infestation by fruit borer occurs in autumn-winter and spring summer crops.

Insecticides applications have commonly been responsible for outbreak of *Liriomyza* because insecticides used are often toxic to the large parasite complex than to the leaf miners themselves (Oatman and Knnedy, 1976). Indiscriminate and continuous use of same chemical pesticides had lead to development of resistance, destruction of beneficial insects leading to pest resurgence and pesticide residues, destruction in feeds, foods and environment. To avoid these desperate situations, it is necessary to focus the judicious use of selective pesticides at the time of pest incidence at a certain time interval. Chemical insecticides being the main tool of IPM especially in emergency need to be used. Therefore, continuing services of pesticides with new made of action and subject to new pathway of detoxification could be tested and developed to replace old ones showing

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resistance. Different conventional insecticides were tried for the control of serpentine leafminer (Nadagouda *et al*., 2010). To test the relative efficacy of different insecticides used against serpentine leaf miner *L. trifolii.*

Materials and Methods

Experiment was conducted in *Rabi* season year 2014-15 at farmers field of Lucknow district of Uttar Pradesh, India. Efficacy of eight insecticides *i.e.* Azadirachtin (1500ppm), Profenophos 50EC, Dimethoate 50EC, Profenophos 40% + Cypermethrin 4%, Cypermethrin 25, Imidachloprid 600FS and Thiamethoxam 20SG were tested against *L. trifolii* at different rates. Two sprays were given, 1st at flowering stage on 70 DAT and 2nd at fruiting stage on 82 DAT. Pre and Post treatment observations were recorded. The data regarding the efficacy of insecticides was recorded for upper as well as lower leaves and for the whole plants. The crop has been transplanted in Randomized block design with four replications. The recommended agronomic practices have been adopted during the entire course of experiment. In case of serpentine leaf miner, observation have been randomly taken from 15 plants from each of the replication and number of miner infestation counted on a single compound leaf of the upper as well as the lower portion of plant.

Results and Discussion

Eight insecticides were tested for their efficacy against the American Serpentine leaf miner *L. trifolii* on variety Naveen-2000 plus. The data regarding the efficacy of different insecticides on the upper leaves of tomato crop and yield is appended in table 1. Mean number of leaf mines per 15 leaves on upper leaves of the tomato plant differ significantly in different treatments. All the insecticides showed significant differences over control. However, non-significant difference was recorded amongst the treatment. Profenophos50EC, Imidachloprid 600FS, Thiamethoxan20 SG and Azadirachtin (1500ppm) were most effective to reduce the incidence of leaf miner on tomato crop when compared with the control.

There was no-significant difference in between the yield and mean number of leaf mines per 15 leaves, but the yields obtained in the entire treated plot was higher than the control. Among the treatments, yield was highest in Profenophos 40% + Cypermethrin 4%. Application of Profenophos40% + Cypermethrin 4%, Diamethoate 50EC and Imidachloprid600 FS, significantly reduced the infestation over control.

There was significant correlation between mean number of leaf mines on lower leaves and yield of the tomato crop. The yield was more in Profenophos 40% + Cypermethrin 4% (573.1q/ha) followed by Diamethoate 50EC (571.1q/ha), Imidachloprid600 FS (568.2q/ha), Profenophos 50EC (564.2q/ha), Cypermethrin 25 EC (539.0q/ha) Thiamethoxan 20 SG (535.9q/ha), Azadirachtin (1500 ppm) (480.8q/ha) over control (419.4q/ha).

Insecticides like Profenophos 50 EC was found most effective against leaf miner infestation on upper leaves and followed by Thiamethoxan 20 SG, Imidachloprid 600 FS, Azadirachtin (1500 ppm), Profenophos 40% + Cypermethrin 4%, Diamethoate 50EC and Cypermethrin 25EC over control. While application of Profenophos 40% + Cypermethrin 4% was most effective on lower leaves to reduce leaf miner incidence. Other insecticides like Endosulfan 35EC, Imidachloprid 600 FS, Diamethoate 50EC, Profenophos 50EC, Thiamethoxan 20 SG, Cypermethrin 25EC and Azadirachtin (1500 ppm) were also effective. These results are in conformity of the findings of Pawar and Patil (2013). While Dimetry *et al*. (1995) evaluated two neem seed kernel extracts against *Liriomyza trifolii* (Burgess) (Diptera : Agromyzidae). Laboratory evaluation of Neem Azal-S and Margosan-O was carried out against the adults and larvae of *Liriomyza trifolii*. The feeding deterrent activity of both compounds was significant against the adults particularly at high concentration and lasted for 5 days after treatment. Both formulations also deterred the females from laying eggs and the percentage or oviposition deterrent index (ODI) reached 80.7 and 52.6 for Neem Azal-S and Margosan-O (2%), respectively. The sex ratio between the resulting adults was virtually unaffected with the exception of individuals whose larvae were treated with *2*% Neem Azal-S, where all the resulting progeny were female. Walunj *et al*. (2002) conducted a field experiment furing rabi 1999/2000 in Maharashtra, India to evaluate the efficiency of the new insecticides, abamectin (Vertimec 1.8 EC), at 5.0, 7.0 and 10.0 g a.i./ha, against serpentine leaf miner *L. trifolii* on tomato (Namdhari Hybrid-815). The following treatments were used for comparison: Fluvalinate 25 EC [Cypernethrin+profenfos] at 440 g a.i./ha Bacillus thuringiensis 50wp at 500 g a.i./ha. All insecticide treatments were significantly superior to the untreated control in minimizing the incidences of the leaf miner. Abemectin was superior over the rest of the treatments. Abemectin at 10 g a.i./ha recorded the lowest percentage of affected leaflets (17.78%), followed by abemectin at 10 g a.i./ha (21.11%) and reduced at 14 days after treatment in each treatment. The highest yield (150.00 q/ha) was recorded in the plot treated. The highest yield (150.00 q/ha) was recorded in the plot treated with

Table 1 : Relative efficacy of different insecticides against serpentine leaf miner, *Liriomyza trifolii* (Burgess) on tomato crop and effect on yield.

S. no.	Treatment Insecticides/doses	Mean number of leaf miner per 15 leaves ex-portions of the tomato plant				Whole plant (82 DATE)	Yield (q/ha)
		Upper leaves		Lower leaves			
		Pretreatment (70 DAT*)	Post treatment (82 DAT)	Pretreatment (70 DAT)	Post treatment (82DAT)**		
1.	Azadirachtin (1500 ppm) (4ml/lit. water)	2.905	11.3	7.16	24.04	16	480.8
2.	Dimethoate 50EC (1.5ml/lit. water)	2.9325	12	6.9925	21.32	17.2	571.1
3.	Profenophos50EC (1.0ml /lit. water)	2.9375	10.5	6.8475	21.71	12.8	564.2
4.	Cypermethrin25EC (0.3ml/lit. water)	2.98	12	6.985	23.91	15.1	539
5.	Imedachoprid 600 FS(0.6gm/lit. water)	3.01	11.5	6.88	19.58	18.3	568.2
6.	Profenophos -40% + Cypermethrin 4% (0.6ml/lit. water)	2.8925	11.8	6.9425	19.18	12.6	573.1
7.	Thiamethoxan 20SG (0.0.6 gm/lit. water)	3.0225	11.1	7.105	22.89	17.5	535.9
Control		3.0425	13.1	8.8925	24.35	20.1	419.4
CD (5%)		0.0661	0.198	0.0595	0.157	0.17	0.918

* DAT- Days after transplanting, **DAT- Population also represented the leaf miner population one day before the second spray.

abemectin at 10 g a.i./ha, which was at par with abemectin at 7.0 g a.i./ha and polytrin at 440 g a.i./ha with yields of 138.78 and 137.0 q/ha, respectively. The study of cumulative number of leaf mines on whole plants one day before the second spray revealed that all insecticides were effective to reduce the leaf miner infestation, in which Profenophos 40% + Cypermethrin 4% and Profenophos 50EC were most effective over control. The data of yield also showed that all insecticides were effective over control, in which yield obtained in the treatment of Profenophos 40% + Cypermethrin 4% (573.1q/ha.) was highest. The enhancement in yield in different treatment, despite low level of leaf miner infestation may be attributed to other biotic stresses of the plant.

Conclusion

Farmers of Lucknow district mainly grow tomato in *Rabi* season, where serpentine leaf minor population increasing very rapidly and becoming alarming situation, so, management of this insect is urgently required. Hence, there are some insecticides tested for their efficacy against *L. trifolii* on variety Naveen-2000plus of tomato. Where, Profenophos 40% + Cypermethrin 4% was found to be the most effective over control, while other insecticides were also showed significant result on the leaf miner infestation.

Future study

Now, Serpentine leaf minor (*L. trifolii*) infestation increasing very rapidly in tomato as well as in other different vegetables like vegetable pea, spong gourd, bottel gourd etc. This insect seen in alarming condition. So,

- Newer insecticides should be evaluated for their effective management.
- Effective Integrated Pest Management (IPM) strategy should be evaluated against *L. trifolii,* which should be economically and ecologically viable.
- Screenings of different varieties of vegetable crop are also an important field for study.

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