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ORIGINAL ARTICLE

Macrotracheliella nigra, (Minute Pirate Bug) : A Anthocorid Predator on Rasping and Sucking thrips pests of chilli, *Capsicum annuum* in district Aligarh of Western Uttar Pradesh During the Year 2015-2016

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ABSTRACT

Predatory potential of Macrotrachelilla nigra was studied on thrips population of chilli pepper under net house controlled conditions at varied temperature. Results revealed that the natural population of Macrotracheliella nigra, feed on different stages of thrips. During the nymphal stage of a single individual several hundred thrips were consumed. In order to find out the biological parameters on thrips population, the released number of predators was 55, 60 and 64 in the first, second and third experimental microplots, simultaneously of the net house at regular time intervals. After examination at scheduled time and the percentage reduction in thrips popuation was at 32.4%, 41.8% and 61.49% after first, second and third releases in the net house. In the second microplot of the same net house the percentage reduction in the Scirtothrips dorsalis population was recorded at 35.6%, 40.4% and 78.09%. In the third microplot of the same net house after the first, second and third releases the reduction in Scirtothrips dorsalis population was recorded at 39.9%, 59.04% and 86.1%.

Key words: *Macrotracheliella nigra, Scirtothrips dorsalis, Capsicum annuum, Feeding potential.*

INTRODUCTION

Chilli, Capsicum annuum (Solanaceae) is considered as commercial vegetable-cum-spice crops. Different varieties of Chilli are *Capsicum annuum, Capsicum frutescens, Capsicum chinense, Capsicum baccatum* and *Capsicum pubescens* etc. They are cultivated for varied uses namely vegetables, pickles, spices and condiments. So, it is popularly called 'a wonder spice'. Chilli, *Capsicum annuum* crop is known to harbour more than 50 insects and 2 mite pests. *Scirtothrips dorsalis* (Thysanoptera: Thripidae) is the major constraints for higher productivity of chilli and its yields. These pests suck and attack the crop at seedling stage itself and continue till first harvest, causing severe losses upto 34%. Cosmetic damage largely affects the chilli fruits, which is directly proportional to yield loss. On the other hand, pests cause indirect damage in the form of several deformities on twigs, leaves, buds, flowers and affect the growth of the plant (Dev, 1964). High densities of pest's population cause an immediate loss in quality in a short period of time. In the studies of research it has been found that the crop of chilli has been extensively damaged by insects and pests. Apart from causing damage *Scirtothrips dorsalis* acts as vectors of "Chilli leaf curl, Peanut bud necrosis virus" respectively. Among the various strategies adopted to combat this pest population, biological control plays an important role. Biological control is an applied field of natural phenomenon (De Bach, 1964), the strategy of bringing natural agents to feed upon the damage causing pests and thus to reduce damage to tolerable levels. The impact of these natural agents ranges from a temporary or minor effect to the death of the host or prey.

Macrotracheliella nigra, Minute pirate bug (Hemiptera: Anthocoridae) is an important natural predator because of their potential to control a variety of different thrips species. The minute pirate bugs are widely recommended for biological control and insect pest management. They are recognized as beneficial predators (Dent, 2000). They have predatory nature and depend on insects and other arthropods, thrips for food. When the supplied food exhausted in one habitat, they sought other areas for food and shelter. The habitats of prey provided excellent hiding place for this predator. The nymphs of *Macrotracheliella nigra* are almost similar to the adults. *Macrotracheliella nigra* did not show metamorphosis during growth after hatching. They were only

driven by shedding or the process ecdysis. The main characteristic of this predator is *Fledging* in which they accompany the development of their structure. These predatory bugs are already being used for suppression of pests of cotton, brinjal, pepper, and other solanaceous crops. The *Macrotracheliella nigra* had been reported to be an important predator of the eggs of the corn earthworm, mites, aphids, leafminers and thrips. Considering its importance, the present study was carried out at the D.S. (P.G.), College, Zoology Research Laboratory, Aligarh (2015-2016) to study the predation habit on both immature and adults.

MATERIAL AND METHODS

The anthocorid predator, *Macrotracheliella nigra* was released on thrips population by the augmentation process. The evaluation through the process of rearing and mass production of *S. dorsalis* was performed continuously under research laboratory. In this manner, the adults of selected predators were collected. We also obtained some live species of natural enemies of thrips from the Department of Zoology, Aligarh Muslim University, Aligarh, Indian Agricultural Research Institute, and New Delhi and also from the National Bureau of Agriculturally important insects, Bangalore. In this manner, a stock of thrips natural predator was maintained for our experiments of biological control and its management against thrips population. The use of Glass vials with alcohol was used to preserve the different life stages of selected predator.

Before the cultivation of sampled chilli plants we prepared the soil with natural minerals and without any use of pesticides so that the growth of all chilli seedlings picked up from different areas could be seen in healthy environment. The Net House was naturally ventilated and climatically controlled. It was made free from weeds and grass at regular intervals so that the necessary minerals for the growth of chilli plants might not be wasted. In this manner, temperature, humidity, light and intensity of soil media with proper irrigation were kept suitable for the growth of the chilli plants. Each nethouse was in size of 3x2 m with 4.5 ft height of the net. Chilli plants (*Capsicum annuum*) were transplanted on first week of January 2015 and first week of July in all micro-plots of the net house respectively. However, the cultivation of sampled plants has been arranged in a systematic linear fashion. Each plant was separated from the other at the distance of about 40-50 centimetres. The distance was maintained from row-to-row and plant-to-plant. The feeding potential was studied by providing known number of prey insects/thrips. Each experiment was performed till the population of thrips reached at Economic Threshold Level (ETL). In this manner, we calculated the mortality in the experimental units. The number of preys consumed was observed at weekly intervals with prey being added until population, and worked out for each stage of their life cycle. The data was significantly tested with the help of statistical analysis 'T-test'.

RESULTS AND DISCUSSION

The predatory potential of an anthocorid predator, *Macrotracheliella nigra* evaluated on Chilli thrips, *Scirtothrips dorsalis* population, predation effciency in the experimental net house of the first microplot, the initial number of *Scirtothrips dorsalis* was 55. In order to find out the biological parameters on thrips population, the release number of predators was 55. A day after examination the average number of alive *Scirtothrips dorsalis* was 37.17 and, thus, the reduction percentage was recorded at 32.4%. The second release of predators was done after one week at the rate of 55. At that time, the remaining number of *Scirtothrips dorsalis* was 73.3. After one day, it was further examined and on examination it was found that the average number of alive *Scirtothrips dorsalis* was 42.63 and the rate of reduction was recorded at 41.8%. In the same microplot the third release was done after two weeks of the first release and 55 predators were again released to control over the thrips population. At that time the remaining number of *Scirtothrips dorsalis* was 39.73. After examination at scheduled time, the average number of alive *Scirtothrips dorsalis* was recorded 15.30 and the percentage reduction was 61.49%.

In the second microplot of the experimental net house the initial number of *Scirtothrips dorsalis* was same as of *Scirtothrips dorsalis* as in the first microplot i.e. 55. But, the rate of the release predators was increased. It was made 60 in number, in order to see the effectiveness in a better way. A day after of the release of the predators it was recorded that the average number of alive

Scirtothrips dorsalis was 35.40. The reduction rate was recorded at 35.6%. The second release of the predators was done after one week as it was done in the first release of second microplot. The rate of release again the same and it was made 60 in number. On examination the remaining number of *Scirtothrips dorsalis* was 65.6. When the effect was examined it was found that the number of *Scirtothrips dorsalis* after one day was reduced by 40.4% as the average number of alive *Scirtothrips dorsalis* was found 33.16. In the third release the remaining number of *Scirtothrips dorsalis* was found 34.06 after observation. For this the release rate of the selected predators was 60. In the search results the average number of alive *Scirtothrips dorsalis* after one day was recorded 7.46. Thus, the rate of reduction was recorded at 78.09%.

OBSERVATION

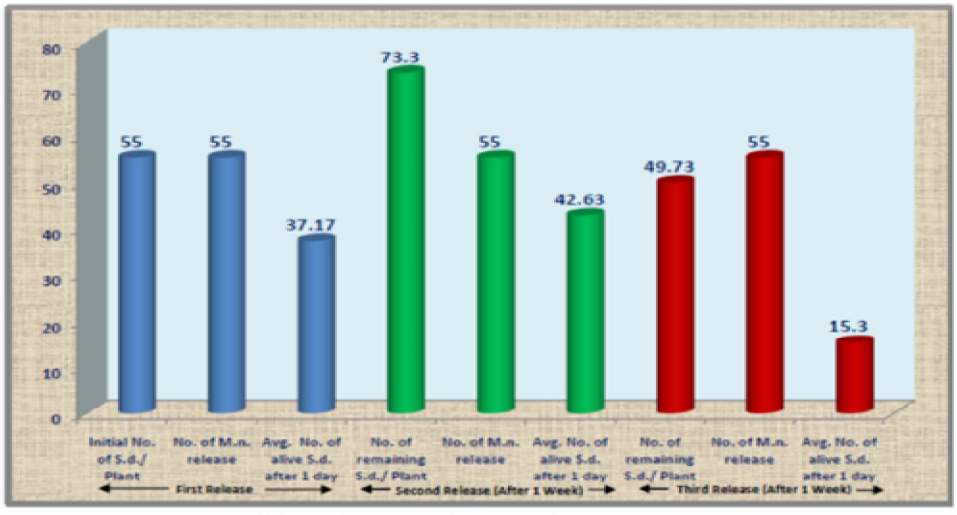
Table 1: Effect of Predator; *Macrotracheliella nigra* on the population of *Scirtothrips dorsalis* in The Chilli Field Net House during the year 2015-2016

Experimental Microplot	First Release				Second Release (After 1 Week)				Third Release (After 1 Week)			
	Initial No. of S.d.*/ Plant	No. of M.n. release**	Avg. No. of alive S.d. after 1 day	% reduction	No. of remain-ing S.d.*/ Plant	No. of M.n. release	Avg. No. of alive S.d. after 1 day	% reduction	No. of remain-ing S.d.*/ Plant	No. of M.n. release	Avg. No. of alive S.d. after 1 day	% reduction
I	55	55	37.17	32.4	73.3	55	42.63	41.8	39.73	55	15.30	61.49
II	55	60	35.40	35.6	65.6	60	33.16	49.4	34.06	60	7.46	78.09
III	55	65	33.04	39.9	56.5	65	23.14	59.04	29.16	65	4.03	86.1

* Mean Value, ** All the number of predators were releases in each micro-plot

S.d. = *Scirtothrips dorsalis*, M.n = *Macrotracheliella nigra*

Graph 1: Effect of Predator; *Macrotracheliella nigra* on the population of *Scirtothrips dorsalis* in Chilli Field Net House during the year 2015-2016 (First Micro-Plot)

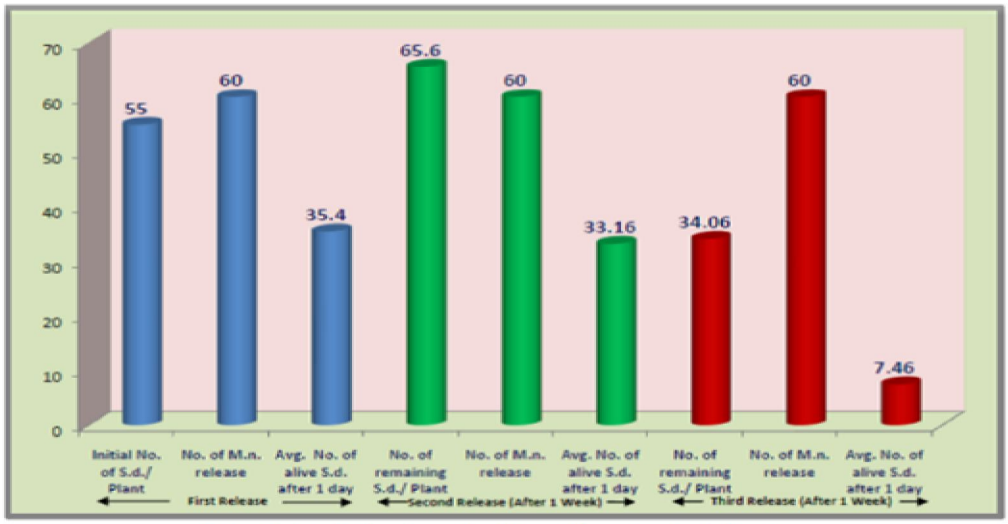


S.d. = *Scirtothrips dorsalis*, M.n = *Macrotracheliella nigra*

In the third experimental microplot the initial number of *Scirtothrips dorsalis* was again 55. But the increased number of released predators was 65. In the search results after one day, the average number of alive *Scirtothrips dorsalis* was 33.04 and the reduction percentage of thrips population at 39.9%. After a week the second release of the predators in equal number (65) was done. At that

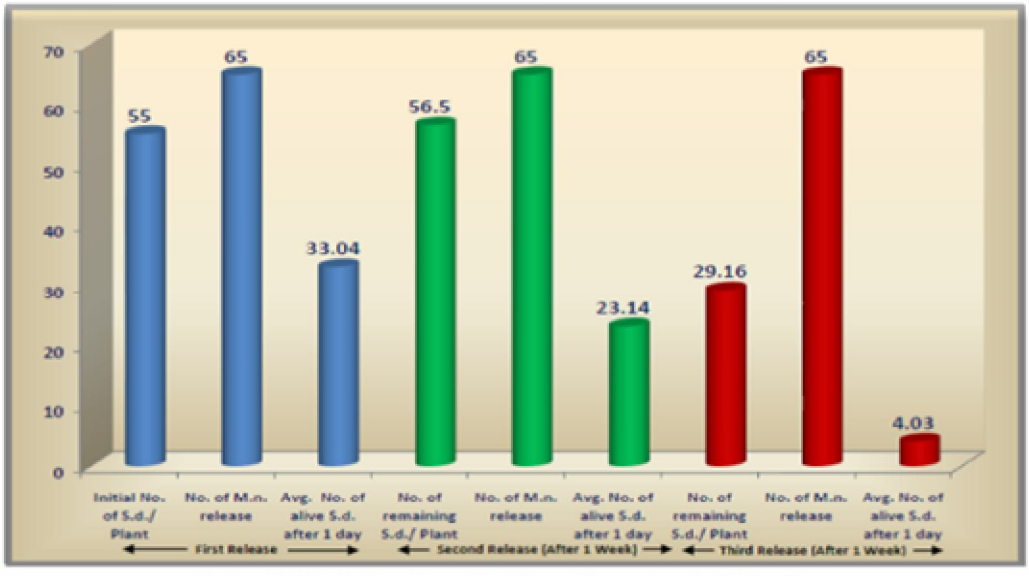
time the remaining number of *Scirtothrips dorsalis* was 56.5. A day after it was found that the average number of alive *Scirtothrips dorsalis* was 23.14 and the reduction rate was 59.04%. The third release of the predators in equal number was done again i.e. 65. At the calculated time the number of remaining *Scirtothrips dorsalis* was 29.16. When observation was done after one day of release, it was found that the average number of alive *Scirtothrips dorsalis* was 4.03. And, thus the gain in the percentage reduction was at 86.1%.

Graph 2: Effect of Predator; *Macrotracheliella nigra* on the population of *Scirtothrips dorsalis* in The Chilli Field Net House during the year 2015-2016 (Second Micro-Plot)



S.d. = *Scirtothrips dorsalis*, M.n = *Macrotracheliella nigra*

Graph 3: Effect of Predator; *Macrotracheliella nigra* on the population of *Scirtothrips dorsalis* in The Chilli Field Net House during the year 2015-2016 (Third Micro-Plot)



S.d. = *Scirtothrips dorsalis*, M.n = *Macrotracheliella nigra*

Here are in accordance on the basis of observation that the predatory potential was high in the all stages of thrips population. The population of thrips started reducing instantly, but after some time the infestation of thrips began to increase as the predators as selected in number could not consume the increasing number of thrips with as much speed as the population of thrips multiplied. So, a week after the equal number of predators was again released and then the

population of thrips began to decrease rapidly. At the third release of the predators, the reduction in the population of thrips accelerated fast, and, thus, viable results were obtaine.

On the basis of the predation habit, it can be inferred that *Macrotracheliella nigra* is a potential predator in the chilli ecosystem and for the population of thrips, *Scirtothrips dorsalis.* During the nymphal stage of a single individual several hundred thrips were consumed. It seemed that at least one meal was needed between two molts, and the most hearty meal preceded for the phenomenon of ecdysis. Predatory habits of most Anthocorids are well recognized during our research examination.

Sample 1:

Gain in percentage reduction of alive number of *Scirtothrips dorsalis* during first release and second release.

x_i = 9.4, 13.8, 19.14

Sample 2:

Gain in percentage reduction of alive number of *Scirtothrips dorsalis* during second release and third release.

y_i = 19.69, 28.69, 27.06

$\bar{X}$**(Mean of 1st Sample)** = 14.11

$\bar{Y}$**(Mean of 2nd Sample)** = 25.14

The Sum of Square Deviation

$\sum (x_i - \bar{X})^2$ = 47.69

$\sum (y_i - \bar{Y})^2$ = 45.98

S = Standard Deviation

S = 4.84

d.f = 4

Null Hypothesis (H_0):

Assume that difference between gain in percentage reduction of alive *Scirtothrips dorsalis* during two successive releases is not significantly different.

$|t|$ = 2.82

CONCLUSION

On the basis of null hypothesis Assume that difference between gains in percentage reduction of alive *Scirtothrips dorsalis* during two successive releases is not significantly different.

But tabulated $|t|_{0.05}$ for Degree of Freedom 4 is 2.78 which is smaller than the calculated value 2.82. Hence, Null Hypothesis (H_0) is accepted at 5% level of significance.

∴ The gain in % reduction of the two samples is not significantly different and it is accepted at 5% level.

We conclude statistically that the percentage gain in *Scirtothrips dorsalis* reduction is affected by the release of predators; *Macrotracheliella nigra*, during two successive releases.

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