

Population dynamics of Red Spider Mites (*Oligonychus coffeae*) against synthetic pesticide, bio-pesticide and natural extracts in Terai region of West Bengal, India

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Abstract- The population dynamics of red spider mites against synthetic pesticide, bio-pesticide and neem extract in Terai region were studied. In two experimental locations the decreasing percentage of alive red spider mites against three pesticide treatments, the result is more or less same for particular pesticide. In contrast between three pesticides, Hexythiazox 5.45% EC was found to be effective. Apart from that bio-pesticide and Neem oil based E.C. Containing Azadirachtin 0.03% respectively reduced the population of mites.

Index Terms- Tea garden, red spider mite, pesticides.

spider mite attack accrue about 20% of total pest occurrence in Terai region of West Bengal (Sarkar and Kabir, 2016).

Systematic position of red spider mite:

Kingdom: Animalia

Phylum: Arthropoda

Class: Arachnida

Sub-class: Acari

Order: Trombidiformes

Family: Tetranychidae

Sub-family: Tetranychinae

Genus: *Oligonychus*

Species: *coffeae*





I. INTRODUCTION

Red spider mites sucks the juice of the tea leaf. Normally it attacks the upper surface of the mature tea leaves in case of severe attack it spreads to the undersurface and young leaves also. Reddish spots develops on the sucking sites which later on unite to form large brown patches. The leaves turn ruddy bronze, marking the affected fields distinct even from a distance. In case of severe attack leaves dries and falls off (Kabir and Das, 2015). Red spider mites lay eggs singly along midrib, veins and depressions of the leaves (Anonymous, 1994). The eggs are reddish, spherical and bears a small filament. Incubation period is 4-6 days and before hatching eggs become light orange coloured. It passes through three developmental stages before adult stages and each developmental stage is followed by a quiescent stage. They are six legged larva, protonymph and deutonymph. Total duration of larval and nymphal stages is 6-8 days. The life cycle from egg to adult is generally completed within 10-14 days. Both male and female are sexually mature after emergence and females can lay eggs after 24 hours of emergence (Muraleedharan, 1991). It was observed that red

II. MATERIALS AND METHODS

Location of the experiment: The experiment was conducted at East Section of Matigara Tea Estate and University of North Bengal tea plantation area at Section number A.

Experimental design and Layout: Two different locations were taken for two field trials. In both the tea fields, 24 plots were taken and each plot contained 24 bushes. Area of the each plot was 10 square meters. Each field trial contained one untreated control and three treatments. There were total 4 treatments and each treatment had 6 replications (Sarkar and Kabir, 2016).

Treatment 1 (T1): Untreated Control 
Treatment 2 (T2): Hexythiazox 5.45% EC (DIMITE) 
Treatment 3 (T3): Bio-pesticide (RISHAV) 
Treatment 4 (T4): Neem oil 0.03% (MULTINEEM) 

The experiments were laid out in Randomised Block Design (RBD).

Figure 1: Lay out (Matigara Tea Estate)

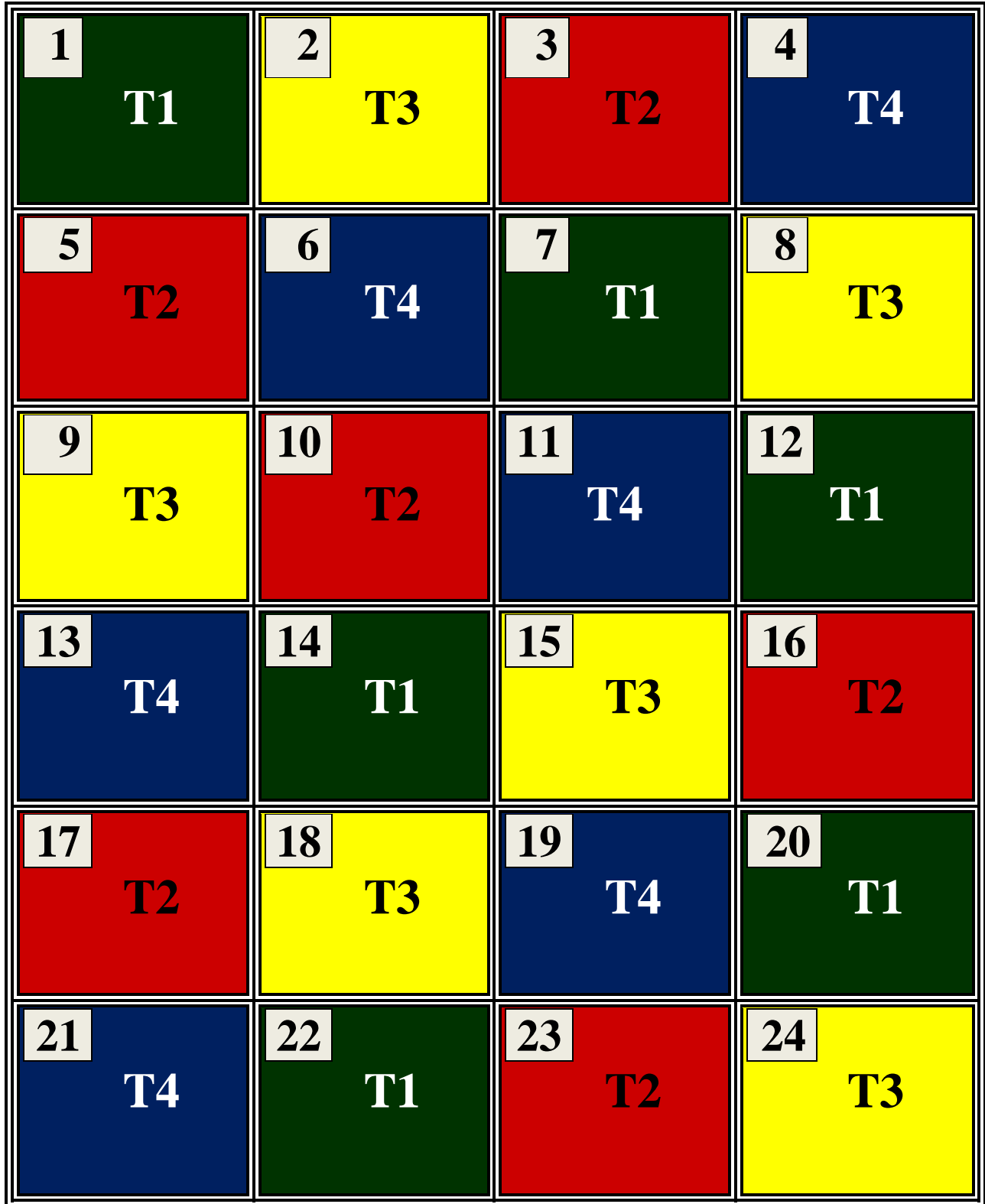
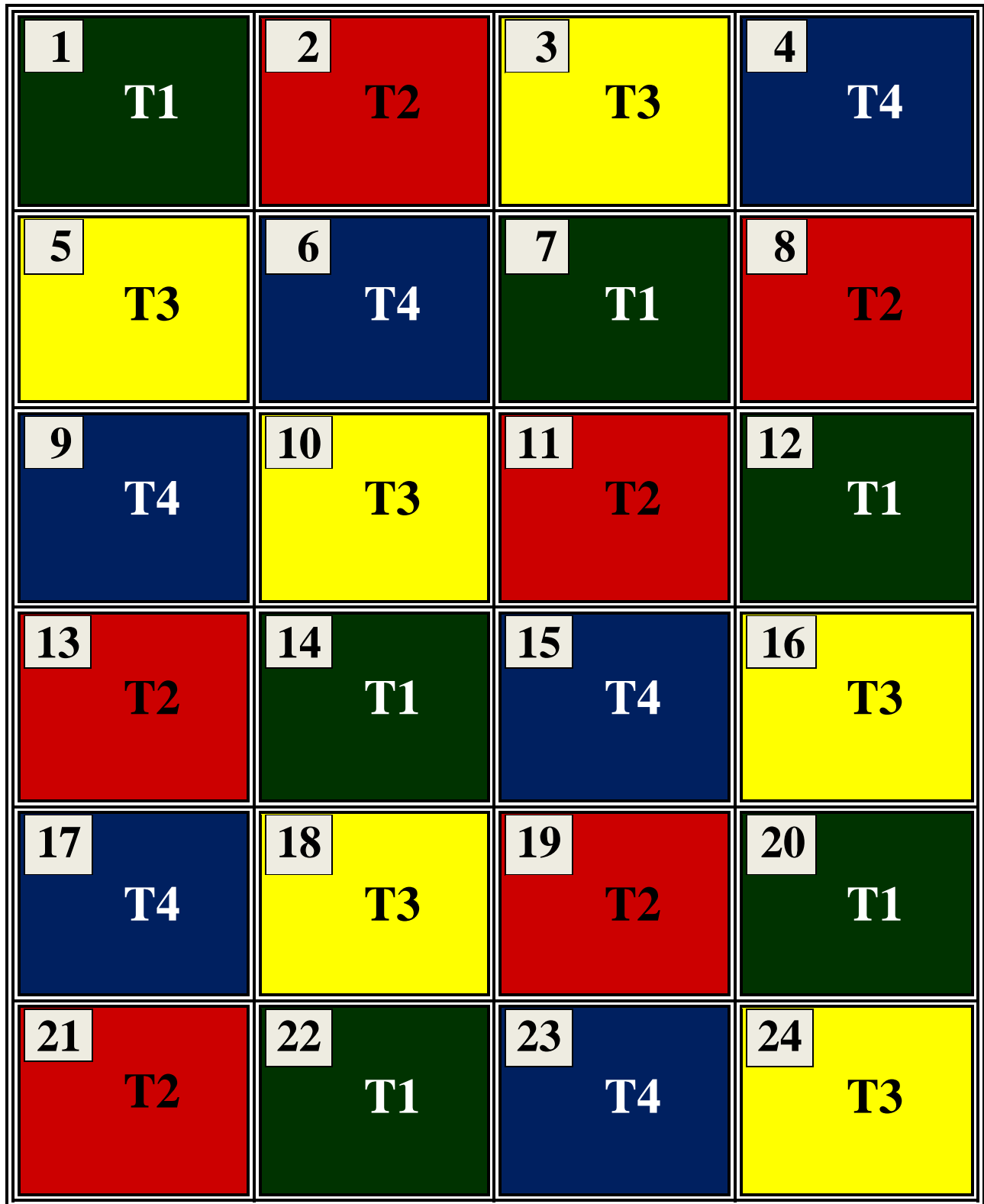


Figure 2: Lay out (University of North Bengal tea plantation area)



Collection of pre-treatment Red spider effected leaves:
Hundred leaves were collected from each plot including all bushes.

including all bushes. After 14 days of treatment, second observation was taken using the same method.

Doses of the pesticides:

Hexythiazox 5.45% EC (DIMITE) @ 0.8ml/litre
Bio-pesticide (RISHAV) @ 1.5ml/litre
Neem oil 0.03 % (MULTINEEM) @ 1ml/litre

III. RESULTS AND DISCUSSION

Collection of post-treatment Red spider effected leaves:
After 7 days of treatment, first observation was taken. In first observation hundred leaves were collected from each plot

Before spray (pre-treatment), total number of alive red spider mites were counted with the help of magnifying glass from hundred number of leaves which were collected from each plot. After treating with pesticides (post-treatment), same procedure was followed. Then number of alive red spider mites of pre-treatment and post-treatment were compared.

Table-1: Comparison of pre-treatment and post-treatment alive red spider mites at Matigara Tea Estate (1st Observation)

Treatment	Name of the treatment	Total number of alive red spider mites in six replications (600 leaves) in case of pre-treatment	Total number of alive red spider mites in six replications (600 leaves) in case of post-treatment	Difference of alive red spider mites in six replications (600 leaves) in case of pre-treatment and post-treatment	Percentage (%) of increase or decrease
T1	Untreated Control	4653	5392	-739	-15.88
T2	Hexythiazox 5.45% EC	5486	4426	1060	19.32
T3	Bio-pesticide	5841	4932	909	15.56
T4	Neem oil 0.03%	5654	5016	638	11.28

Table-2: Comparison of pre-treatment and post-treatment alive red spider mites at Matigara Tea Estate (2nd Observation)

Treatment	Name of the treatment	Total number of alive red spider mites in six replications (600 leaves) in case of pre-treatment	Total number of alive red spider mites in six replications (600 leaves) in case of post-treatment	Difference of alive red spider mites in six replications (600 leaves) in case of pre-treatment and post-treatment	Percentage (%) of increase or decrease
T1	Untreated Control	4653	5810	-1157	-24.87
T2	Hexythiazox 5.45% EC	5486	3824	1662	30.29
T3	Bio-pesticide	5841	4512	1329	22.75
T4	Neem oil 0.03%	5654	4591	1063	18.80

Table-3: Comparison of pre-treatment and post-treatment alive red spider mites at University of North Bengal tea plantation area (1st Observation)

Treatment	Name of the treatment	Total number of alive red spider mites in six replications (600 leaves) in case of pre-treatment	Total number of alive red spider mites in six replications (600 leaves) in case of post-treatment	Difference of alive red spider mites in six replications (600 leaves) in case of pre-treatment and post-treatment	Percentage (%) of increase or decrease
T1	Untreated Control	6829	7924	-1095	-16.03
T2	Hexythiazox 5.45% EC	7014	5749	1265	18.03
T3	Bio-pesticide	7165	6141	1024	14.29
T4	Neem oil 0.03%	6978	6139	839	12.02

Table-4: Comparison of pre-treatment and post-treatment alive red spider mites at University of North Bengal tea plantation area (2nd Observation)

Treatment	Name of the treatment	Total number of alive red spider mites in six replications (600 leaves) in case of pre-treatment	Total number of alive red spider mites in six replications (600 leaves) in case of post-treatment	Difference of alive red spider mites in six replications (600 leaves) in case of pre-treatment and post-treatment	Percentage (%) of increase or decrease
T1	Untreated Control	6829	8605	-1776	-26.01
T2	Hexythiazox 5.45% EC	7014	4927	2087	29.75
T3	Bio-pesticide	7165	5587	1578	22.02
T4	Neem oil 0.03%	6978	5592	1386	19.86

Figure 3: Comparison of pre-treatment and post-treatment alive red spider mites at Matigara Tea Estate (1st Observation)

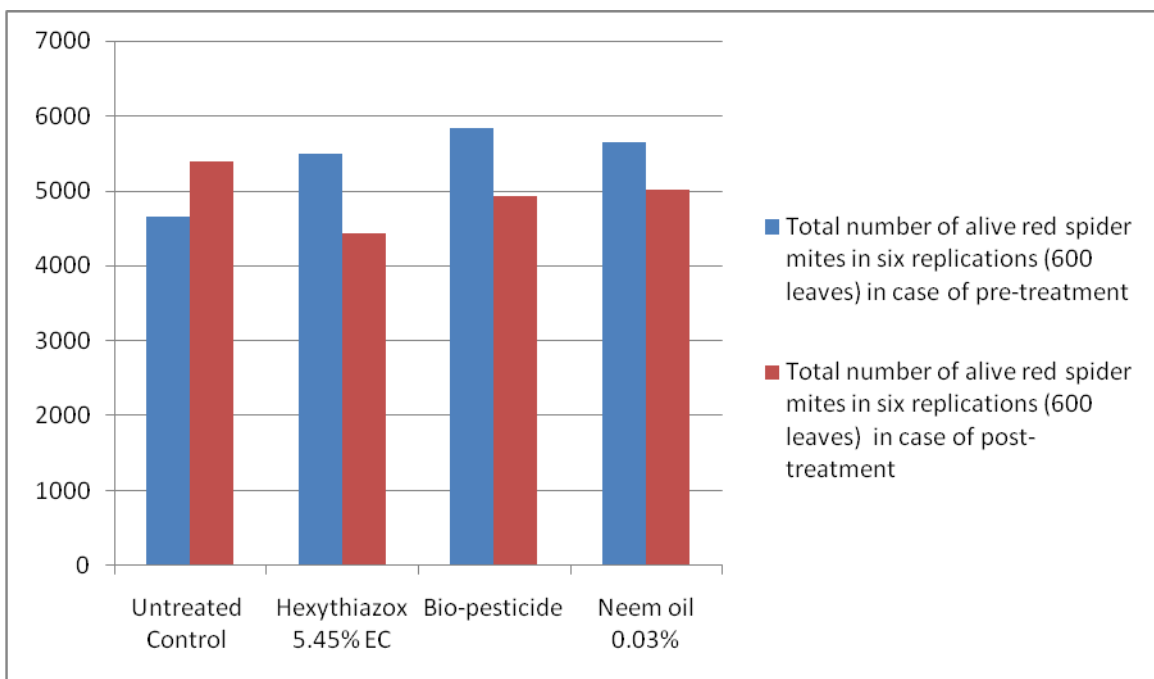


Figure 4: Comparison of pre-treatment and post-treatment alive red spider mites at Matigara Tea Estate (2nd Observation)

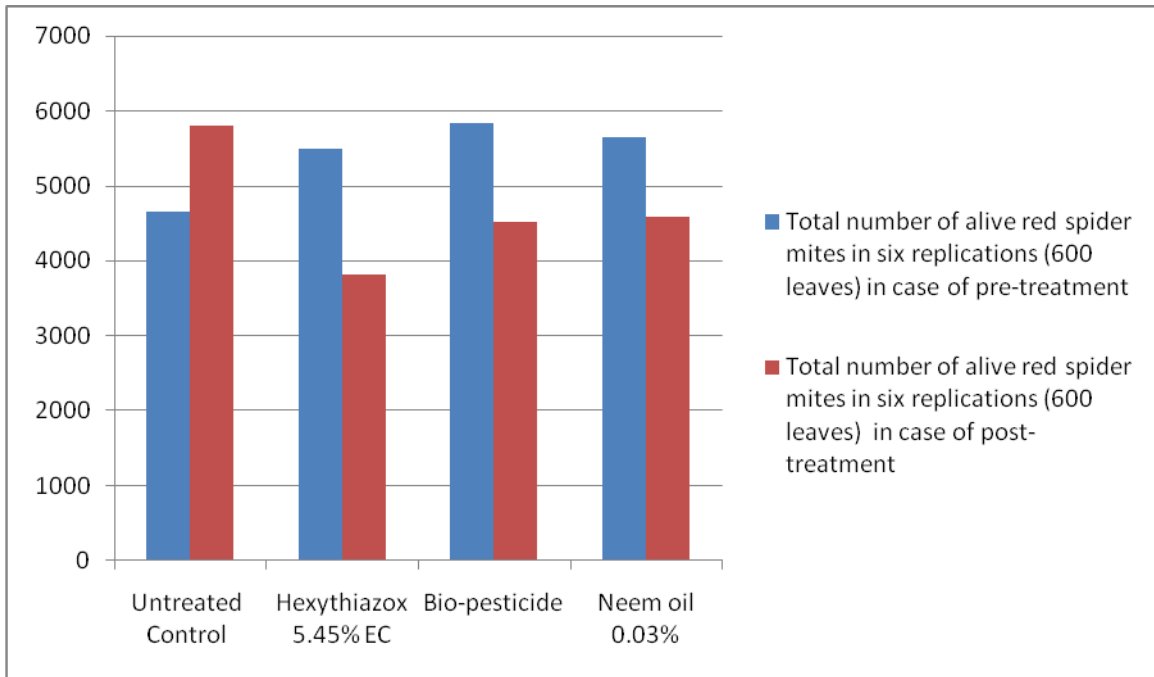


Figure 5: Comparison of pre-treatment and post-treatment alive red spider mites at University of North Bengal tea plantation area (1st Observation)

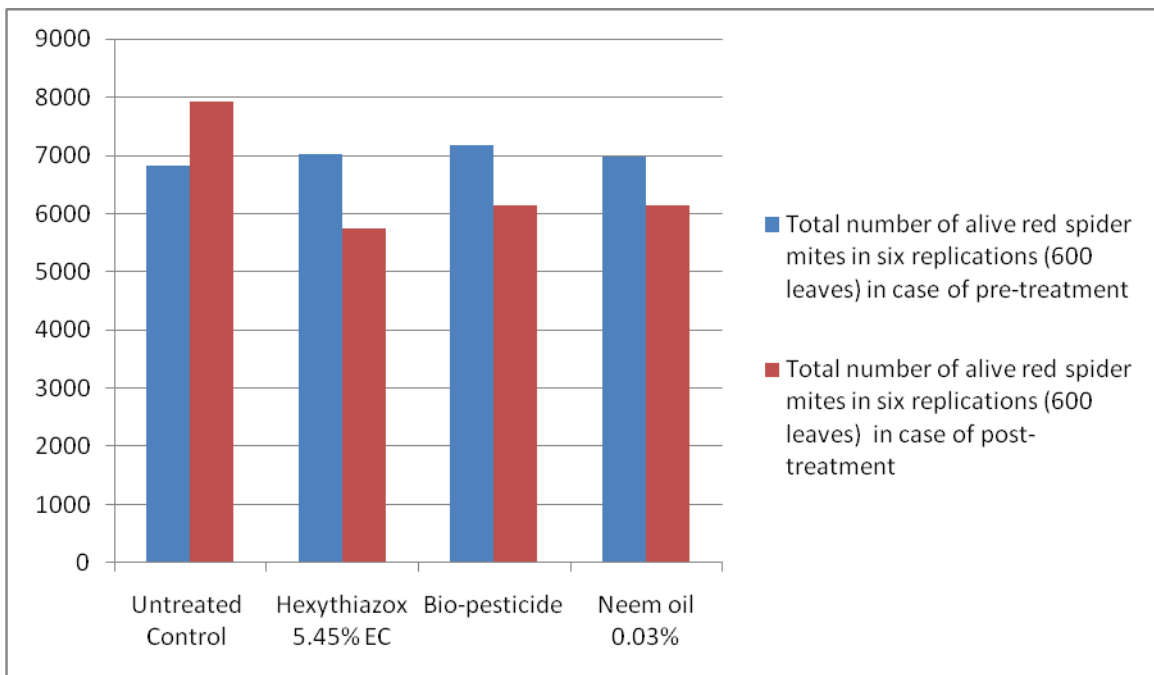
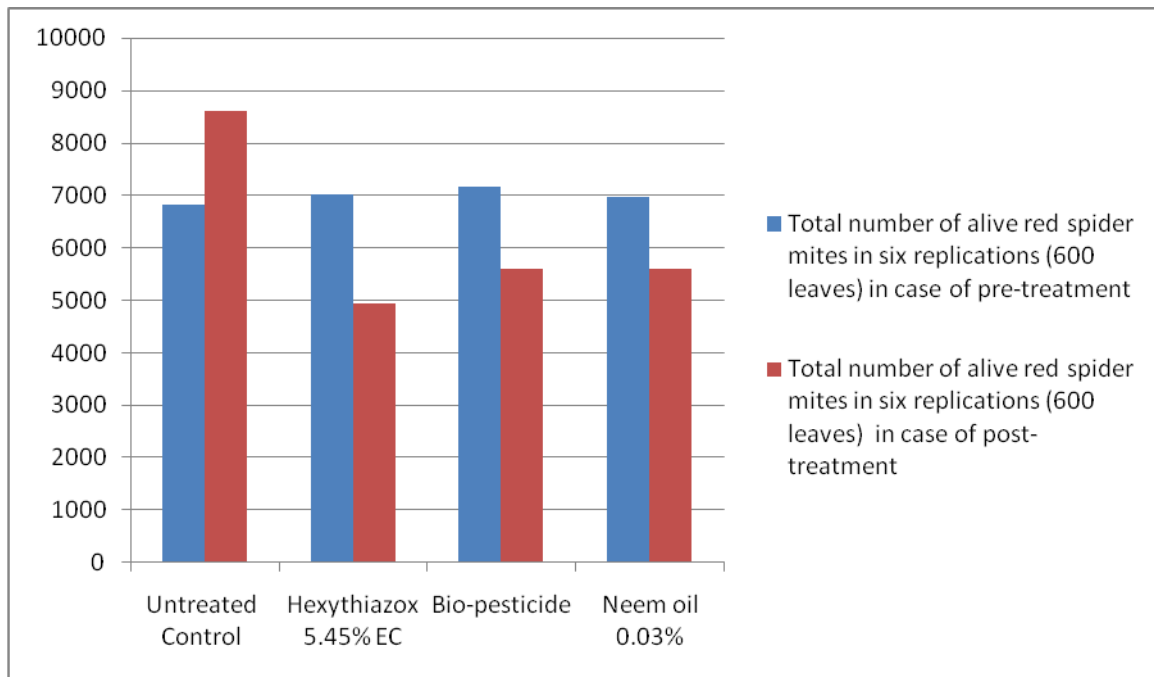


Figure 6: Comparison of pre-treatment and post-treatment alive red spider mites at University of North Bengal tea plantation area (2nd Observation)



IV. CONCLUSION

In two experimental locations the population of alive red spider mites against three pesticide treatments was more or less same. Among three treatments, Hexythiazox 5.45% EC was found to be most effective. Bio-pesticide and Neem oil were also effective to some extent.

The increase in population of red spider mites was continuous which was observed in the first and second observations at both the locations in untreated controls. Against Hexythiazox, the decreasing percentage of red spider mites population was 19.32% and 18.03% (1st observation) at Matigara Tea Estate and University of North Bengal tea plantation area. During 2nd observation at both the locations, it was 30.29% and 29.75% which is most effective rather than other treatments. It was also observed that the population dynamics of red spider mites against bio-pesticide treatment decreased 15.56% and 14.29% (1st observation) respectively at Matigara Tea Estate and University of North Bengal tea plantation area. In case of 2nd observation the percentage of decreasing population was 22.75% and 22.02% respectively at both locations. It was found that Neem oil based E.C Containing Azadirachtin 0.03% decrease 11.28% and 12.02% (1st observation) population of alive spider mite at both location. 2nd observation shows that 18.80% and 19.86% of alive red spider mites population was decreased at both locations.

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