

# Insect Pest Studies on Soybean Crop in Kamareddy District of Telangana State

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## ABSTRACT

*The present study was conducted during seasonal incidence of insect pests of soybean recorded from during Kharif 2013, 2014 and 2015. Soybean variety JS 335 is sown on third week of July every year. The experimentation was located out in Randomized Block Design (RBD) with six treatment and four replications. Defoliators are most damaging insect pest of soybean. In the evaluation of plant products against defoliators of soybean Neemoil 5% @ was effected against defoliators Spodoptera litura a(tobacco caterpillar) and Chrysodeixis. Acuta (Green semilooper) after first and second spray having 6.5 larval / mrl ,7.5laeval/mrl*

**Key words:** Botanical insecticides, Defoliator, Soybean.

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## INTRODUCTION

Soybean, Glycine max (L.) Merrill belonging to family Leguminaceae, subfamily Papilionaceae is one of the important oilseed cash crops of India. Soybean also known as Golden Bean is the largest oilseed crop in the world accounting for more than 50% of the world oilseeds production. Above 80% of global soybean output is crushed worldwide to obtain oil and meal. It is now the second largest oilseed in India after ground nut. It grows in varied agro climate conditions. It has emerged as an important commercial crop in many countries and international trade of soybean is spread globally. The processed soybean is the largest source of protein feed and second largest source of vegetable oil in the world. Soybean ranks first in the world for production of edible oil. India ranks third in world in respect of area and fifth in terms of production. It is an annual crop, fairly easy to grow, that produces more protein and oil per unit of land than almost any other crop.

Soybean is a unique crop with high nutritional value, thus it also known as “Miracle bean, Golden bean, and Crop of the planet “. It has provided 40% protein, well balanced in essential amino acids; 20% oil, rich in polyunsaturated fats specially. Omega 6 and Omega 5 fatty acids; 6-7% total minerals ;5-6% crude fiber and 17-19% carbohydrates (Chauhan and Joshi, 2005).

It is a versatile food plant that, used in its various forms, is capable of supplying most nutrients. It can substitute for meat and to some extent for milk. It is a crop capable of reducing protein malnutrition. In addition, soybeans are a source of high value animal feed.

Soybean has luxuriant crop growth, soft and succulent foliage, unlimited source of food, space and shelter there by it invites many insect-pests. During the introduction of soybean in India in the early seventies, only about a dozen minor insect pests were recorded while in 1997, this number has swelled to an alarming figure of 270, besides 1 mite, 2 millipedes, 10 vertebrate and 1 snail pest (Singh, 1999. Chaturvedi et al. (1998).

*The defoliators Spodoptera litura a(tobacco caterpillar) and Chrysodeixis. Acuta (Green semilooper), are most damaging pest on soybean. The full-grown caterpillars are most voracious feeders and cause extensive damage by defoliation. Because of excessive and indiscriminate use of pesticide several problems like development of resistance in targeted species, resurgence of secondary pest, elimination of natural enemies and wild life, contamination of soil, water and food chain and wholesome pollution of environment (Asoken et al., 2000).*

The defoliators, *Spodoptera litura (tobacco caterpillar) and Chrysodeixis. Acuta (Green semilooper)* are serious pest on soybean regulatory activities against pests of agricultural importance (Prakash and Rao, 1989, 2003). The current trends of modern society towards ‘green consumerism’ desiring fewer synthetic ingredients in food may favour plant-

based products which are generally recognized as safe in eco-friendly management of plant pests as botanical pesticides (Isman *et al.*, 2006).

Botanical pesticides are the important alternatives to minimize or replace the use of synthetic pesticides as they possess an array of properties including toxicity to the pest, repellency, anti-feedance, insect growth regulatory activities against pests of agricultural importance (Prakash and Rao, 1989, 2003).

The current trends of modern society towards ‘green consumerism’ desiring fewer synthetic ingredients in food may favour plant-based products which are generally recognized as safe in eco-friendly management of plant pests as botanical pesticides (Isman *et al.*, 2006).

## **MATERIALS AND METHODS**

The field experiment work was conducted in the field experiment was laid out in randomized block design with six treatments, Neem leaf extract (2%) (3%) (5%), Karanj oil @ (2%), (3%) (5%) Tobacco leaf extract @ (2%) (3%) (5%) Mahau oil @ (2%) (3%) (5%) Neem oil @ (2%), (3%) (5%) and including untreated control replicated two times. The crop was sown third week on July, 2013, 2014, and 2015. The experimental plot size of 5 m × 4 m. Defoliator pests Tobacco caterpillar and Green semilooper were observed as the major defoliator pests. The observations of these pests were recorded by counting the no. of larvae per meter row length. There were four replications and plots were selected following a Randomize complex Block Design. The recommended agronomic practices for raising the crop were maintained following the work of Mondal and Wahab (2001).

Observation on species of insect pests with their population per meter row length. plant was recorded from seedling to matured stage of the crop from randomly selected samples of the plants in meter row length each plot. The time of appearance of the pest were observed and recorded. The nature of the damage and feeding behavior of the insects were carefully observed and their photographs were taken in the crop fields. The recordings of data were included visual observation, hand nets, hand picking of insects from the standing crops during 7:00-10:00 a.m. and 4:00-6:00 p.m. at weekly intervals. Some insects were also collected by aspirators. Relative population of insect was counted as suggested by Biswas *et al.* (2001). The insects were preliminarily identified following Maxwell-Lefroy (1909), Borror *et al.* (1975), Fletcher (1985), Nair (1986), Singh (1990) and Biswas (2008). The insects were graded as foliage feeder, stem feeders on the basis of their feeding behavior. In this experiment, observations on the efficacy of treatments were recorded one day before the spray and after 3, 7, and 14 days of first and second spraying of plant products.

### **Defoliator pests**

Observations for defoliators were recorded by counting the number of larvae or caterpillars found in one meter row length by shaking the plants. Such observations were recorded at weekly interval at randomly selected 10 places (leaving border rows) and thereafter mean number of larvae per meter row was calculated. *Spodoptera litura* (tobacco caterpillar) and *Chrysodeixis. Acuta* (Green semilooper) were observed as the major defoliator pests. The observations of these pests were recorded by counting the no. of larvae per meter row length.

## **RESULTS AND DISCUSSION**

### **Overall mean population of *Spodoptera litura* (tobacco caterpillar) after first spray -2013**

Mean larval population during spray I indicated that botanical insecticide i. e. Neem oil @ 2% 10 lit/ha recorded the minimum population of 8.75 larvae per meter row length and among the different plant products, Karanj oil @ 2% 10lit /ha recorded minimum larval population of 9.5 larvae /mrl with 10 larval/mrl, followed by Mahau oil @2% 10lit /ha recorded Minimum larval Population of 10.5 larvae /mrl. Neem leaf extract @2% 10 lit /ha recorded minimum larval population 11 larvae /mrl and it was maximum in Tobacco leaf extract @2% 11.75 larval /mrl.

### **Over mean population of *Spodoptera litura* (tobacco caterpillar).**

Mean larval population during second spray indicated that plant products botanicals insecticide i.e., Neem oil @2% 10lit/ha record the minimum population of 8.75 larva per meter row length and among the different plant products, Karanj oil @2% 10 lit /ha recorded minimum larval population with 9.5 larvae /mrl, followed by Mahau oil @2% 10.5 larvae /mrl and maximum population in Neem leaf extract @2% 11 larvae /mrl. Tobacco leaf extracts @2% 11.75 larvae /mrl.

### **Reduction of *Spodoptera litura* (tobacco caterpillar) population over control**

Reduction was higher in Neem oil @ 2% 10lit/ha 8.75 larvae /mrl treated crop. Among the plant products, followed by Karanj oil @2 % 9.5 L/mrl Mahau oil@ 2 % 10.5 L/mrl, Neem leaf extract @2 % 11 L/mrl It was lowest in Neem leaf extract @2 % treated plots and recorded only 11 .75 L/mrl reduction insect population.

### Overall mean population of *Spodoptera litura* (tobacco caterpillar) after second spray -2013

Mean larval population during population during first indicated that botanical insecticide i. e. Neem oil @ 2% 10 lit/ha recorded the minimum population of 6.5 larvae per meter row length and among the different plant products, Karanj oil @ 2% 10lit /ha recorded minimum larval population of 7.5 with 10 larval/mrl, followed by Mahau oil @2% 10lit /ha recorded Minimum larval Population of 8.25 larvae /mrl. Neem leaf extract @2% 10 lit /ha recorded minimum larval population 10.5 and it was maximum in Tobacco leaf extract @2% 11 larval /mrl.

### Over mean population of *Spodoptera litura* (tobacco caterpillar)

Mean larval population during second spray indicated that plant products botanicals insecticide i.e., Neem oil @2% 10lit/ha record the minimum population of 6.5 larva per meter row length and among the different plant products, Karanj oil @2% 01 lit /ha recorded minimum larval population with 7.5 larvae /mrl, followed by Mahau oil @2% 8.25 larvae /mrl maximum population in Neem leaf extract @2% 10.5 larvae /mrl and Tobacco leaf extract @2% 11 larvae /mrl.

### Reduction of *Spodoptera litura* (tobacco caterpillar) population over control

Reduction was higher in Neem oil @ 3% 6.5 larvae /mrl treated crop. Among the plant products, followed by Karanj oil @3% 7.5 L/mrl Mahau oil@ 3% 8.25 L/mrl, Neem leaf extract @3% 10.5 L/mrl It was lowest in Neem leaf extract @3% treated plots and recorded only 11 L/mrl reduction insect population.

Tab. 1 Larval mortality rate after 2% spray

Efficacy of botanicals in the management of Tobacco caterpillar, <i>Spodoptera litura</i> -2013														
S.No	Treatments	Dose	No. of larvae meter row length during 1st Spray						No. of larvae meter row length during 2nd Spray					
			Day Before Spray	Days after spray-I					Day Before Spray	Days after spray-II				
				3 Day	7 Day	14 Day	Mean	SD		3 Day	7 Day	14 Day	Mean	SD
1	Control (Untreated)	–	14	14 (3.872)	16(4.297)	16(3.931)	15	1.15	13	16(3.990)	18(4.374)	20(4.507)	16.75	2.99
2	Neem leaf extract	2%	13	13(3.638)	10(3.686)	8(3.087)	11	2.45	12	11(3.704)	10(3.286)	9(3.179)	10.5	1.29
3	Karanj Oil	2%	10	10(3.516)	9(2.993)	9(3.072)	9.5	0.96	8	10(3.549)	6(2.653)	6(2.638)	7.5	1.91
4	Tobacco leaf Extract	2%	14	14 (3.526)	11(3.343)	8(3.114)	11.75	2.87	12	123.528)	11(3.367)	9(3.133)	11	1.41
5	Mahau Oil	2%	11	11(3.769)	10(3.888)	10(2.988)	10.5	0.5	10	8(3.526)	8(3.020)	7(2.976)	8.25	1.26
6	Neem Oil	2%	10	9(3.308)	8(3.199)	8(2.195)	8.75	0.96	8	7 (3.020)	6(2.662)	5(2.632)	6.5	1.29
C D				N/A	0.168	0.668				N/A	0.225	0.21		
SE(M)				0.147	0.237	0.22				0.347	0.074	0.069		
CV				8.181	9.413	14.337				13.811	4.593	4.341		

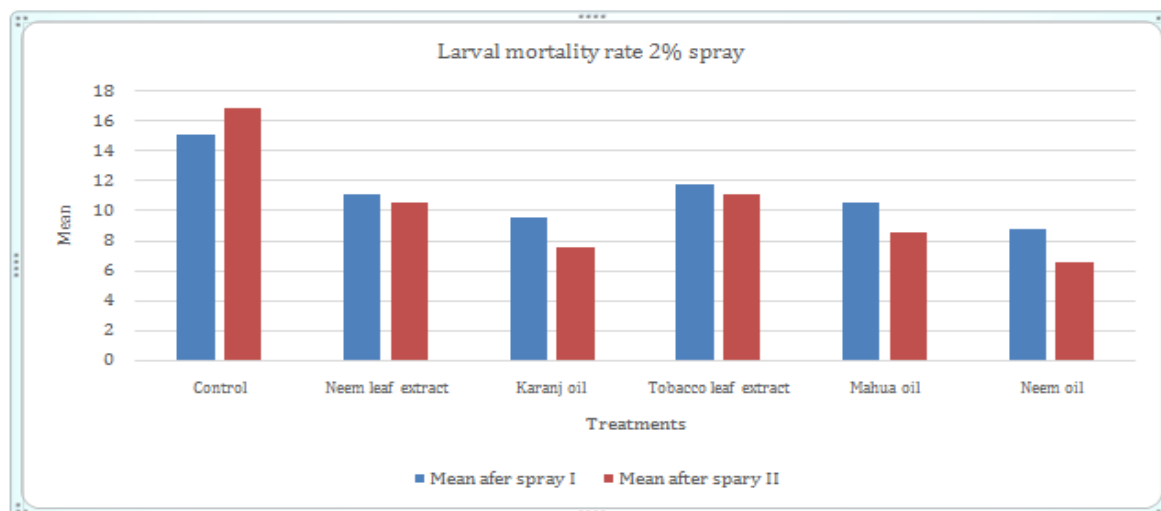


Fig 1: Larval mortality rate after 2% spray

### Overall mean population of *Spodoptera litura* (tobacco caterpillar) after first spray-2014

Mean larval population during population during first indicated that botanical insecticide i. e. Neem oil @ 3% 10 lit/ha recorded the minimum population of 6.25 larvae per meter row length and among the different plant products, Karanj oil @ 3% 10lit /ha recorded minimum larval population of 7.5 with 10 larval/mrl, followed by Mahau oil @3% 10lit /ha recorded Minimum larval Population of 8.25 larvae /mrl. Neem leaf extract @3% 10 lit /ha recorded minimum larval population 10.25 larvae /mrl and it was maximum in Tobacco leaf extract @3% 11 larval /mrl.

### Over mean population of *Spodoptera litura* (tobacco caterpillar)

Mean larval population during second spray indicated that plant products botanicals insecticide i.e., Neem oil @3% 10lit/ha record the minimum population of 6 .25 larva per meter row length and among the different plant products, Karanj oil @3% 10 lit /ha recorded minimum larval population with 7.5 larvae /mrl, followed by Mahau oil @3% 8.25 larvae /mrl maximum population in Neem leaf extract @3% 10.25 larvae /mrl and Tobacco leaf extract @3% 11 larvae /mrl.

### Reduction of *Spodoptera litura* (tobacco caterpillar) population over mean control

Reduction was higher in Neem oil @ 3% 10lit/ha 6.25 larvae /mrl treated crop. Among the plant products, followed by Karanj oil @3% (82.18%), Mahau oil@ 3% 8.25 larvae /mrl, Neem leaf extract @3% 10.25 larvae /mrl. It was lowest in and Tobacco leaf extract @3% treated plots and recorded only 11 larvae /mrl reduction insect population.

### Overall mean population of *Spodoptera litura* (tobacco caterpillar) after second spray -2014

Mean larval population during population during first indicated that botanical insecticide i. e. Neem oil @ 3% 10 lit/ha recorded the minimum population of 6 larvae per meter row length and among the different plant products Karanj oil @ 3% 10lit /ha recorded minimum larval population with 7.75 larval/mrl, followed by Mahau oil @3% 10lit /ha recorded with 8 larval/mrl Neem leaf extract @3% 10 lit /ha 9.75 and it was maximum in Tobacco leaf extract @3% 10 larval /mrl.

### Reduction of *Spodoptera litura* (tobacco caterpillar) population over control

Reduction of *S. litura* population was higher in Neem oil @3% 10 lit/ha 6 treated crop. Which was followed by Karanj oil @3 %,7.75 larvae /mrl Mahau oil @3% 8 larvae /mrl, Neem leaf extract @3% 9.75 larvae /mrl and lowest in Neem leaf extract @ 3% Treated crop was recorded only 10 larvae /mrl reductions in insect population.

### Over mean population of *Spodoptera litura* (tobacco caterpillar).

Mean larval population during second spray indicated that plant products botanicals insecticide i.e., Neem oil @3% 10lit/ha record the minimum population of 6 larva per meter row length and among the different plant products, Karanj oil @3% 10 lit /ha recorded minimum larval population with 7.75 larvae /mrl, followed by Mahau oil @3% 8 larvae /mrl and maximum population Neem leaf extract @3% 9.75 larvae /mrl and Tobacco leaf extract @3% 10 larvae /mrl.

### Reduction of *Spodoptera litura* (tobacco caterpillar) population over control

Reduction was higher in Neem oil @ 3% 10lit/ha 6 treated crop. Among the plant products, followed by Karanj oil @3% 7.75, Mahau oil@ 3% 8, larvae /mrl Neem leaf extract @3% 9.75 larvae /mrl. It was lowest in Tobacco leaf extract @3% treated plots and recorded only 10 larvae /mrl reduction insect population.

Tab. 2: Larval mortality rate after 3% spray

Efficacy of botanicals in the management of Tobacco caterpillar, Spodoptera litura -2014														
S.No	Treatments	Dose	No. of larvae meter row length during 1st Spray						No. of larvae meter row length during 2nd Spray					
			Day Before Spray	Days after spray					Day Before Spray	Days after spray				
				3 Day	7 Day	14 Day	Mean	SD		3 Day	7 Day	14 Day	Mean	SD
1	Control (Untreated)	–	10	12(3.570)	14(3.828)	16(4.105)	13	2.58	13	14(3.918)	16(4.070)	18(4.280)	15.25	2.22
2	Neem leaf extract	3%	12	11(3.449)	10(3.310)	8(3.063)	10.3	1.71	12	10(3.241)	8(2.951)	9(3.142)	9.75	1.71
3	Karanj Oil	3%	10	8(3.040)	7(2.818)	5(2.444)	7.5	2.08	9	8(2.951)	7(2.897)	7(2.800)	7.75	0.96
4	Tobacco leaf Extract	3%	13	12(3.549)	10(3.347)	9(3.142)	11	1.83	12	11(3.433)	9(3.004)	8(2.966)	10	1.83
5	Mahau Oil	3%	10	8(2.951)	8(2.916)	7(2.800)	8.25	1.26	10	8(2.939)	7(2.877)	7(2.827)	8	1.41
6	Neem Oil	3%	10	6(2.586)	5(2.853)	4(2.66)	6.25	2.63	11	7(2.804)	7(2.862)	6(2.571)	6	1.78
C.D				0.325	0.535	0.283				0.357	0.307	0.4		
SEM				0.107	0.176	0.093				0.117	0.101	0.131		
C.V				6.697	11.072	6.259				7.299	6.481	8.484		

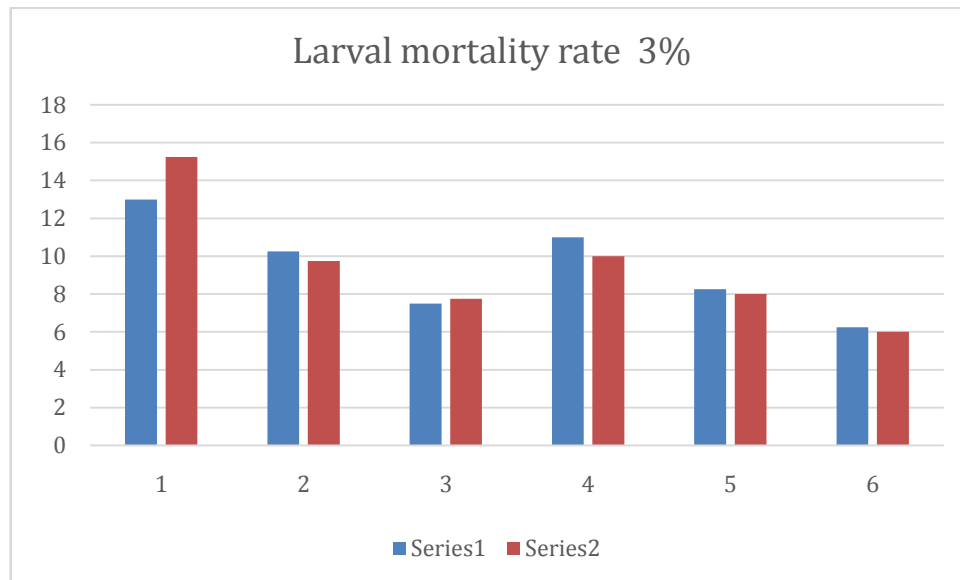


Fig 2: Larval mortality rate after 3 % spray

#### Overall mean population of *Spodoptera litura* (tobacco caterpillar) after first spray-2015

Mean larval population during population during first indicated that botanical insecticide i. e. Neem oil @ 5% 10 lit/ha recorded the minimum population of 7 larvae per meter row length and among the different plant products, Karanj oil @ 5% 10lit /ha recorded minimum larval population with 8 larval/mrl, followed by Mahau oil @5% 10lit /ha recorded minimum Neem leaf extract @5% 10 lit /ha 10.25 larvae /mrl and it was maximum in Neem leaf extract @5% 11.5 larval /mrl.

#### Reduction of *Spodoptera litura* (tobacco caterpillar) population over control

Reduction of *S. litura* population was higher in Neem oil @5%10 lit/ha 7 larvae /mrl treated crop. which was followed by Karanj oil @5 % larvae /mrl 8, Mahau oil @5 9.25, larvae /mrl Neem leaf extract @5% 10.25 larvae /mrl and lowest in Tobacco leaf extract @ 5 % Treated crop was recorded only 11.5 larvae /mrl reduction in insect population.

#### Over mean population of *Spodoptera litura* (tobacco caterpillar).

Mean larval population during second spray indicated that plant products botanicals insecticide i.e., Neem oil @5% 10lit/ha record the minimum population of 7 larva per meter row length and among the different plant products, Karanj oil @ 5 % 10 lit /ha recorded minimum larval population with 8 larvae /mrl, followed by Mahau oil @5% 9.25 larvae /mrl Neem leaf extract @5% 10.25 larvae /mrl and maximum population in Tobacco leaf extract @5% 11.5 larvae /mrl.

#### Reduction of *Spodoptera litura* (tobacco caterpillar) population over control

Reduction was higher in Neem oil @ 5% 10lit/ha 7 larvae /mrl treated crop. Among the plant products, followed by Karanj oil @5% 8, larvae /mrl Mahau oil@ 5% 9.25 larvae /mrl, Neem leaf extract @5% 10.25. It was lowest in Tobacco leaf extract @5% treated plots and recorded only 11.5 larvae /mrl reduction insect populations.

#### Overall mean population of *Spodoptera litura* (tobacco caterpillar) after second spray-2015

Mean larval population during population during first indicated that botanical insecticide i. e. Neem oil @ 5% 10 lit/ha recorded the minimum population of 6 larvae per meter row length and among the different plant products, Karanj oil @ 5% 10lit /ha recorded minimum larval population with 7.5 larval/mrl, followed by Mahau oil @5% 10lit /ha 8.25 larvae /mrl Neem leaf extract @5% 10 lit /ha 9.75 larvae /mrl and it was maximum in Tobacco leaf extract @5% 10 larval /mrl.

#### Reduction of *Spodoptera litura* (tobacco caterpillar) population over control

Reduction of *S. litura* population was higher in Neem oil @5%10 lit/ha 6 larvae /mrl treated crop. Which was followed by Karanj oil @ 5 % 7.5 larvae /mrl, Mahau oil @5% 8.25, larvae /mrl Neem leaf extract @5% 9.75 larvae /mrl and lowest in Tobacco leaf extract @ 5 % Treated crop was recorded only 10 larvae /mrl reductions in insect population.

#### Over mean population of *Spodoptera litura* (tobacco caterpillar).

Mean larval population during second spray indicated that plant products botanicals insecticide i.e., Neem oil @5% 10lit/ha record the minimum population of 6 larva per meter row length and among the different plant products, Karanj



oil @5% 10 lit /ha recorded minimum larval population with 7.5 larvae /mrl, followed by Mahau oil @5% 8.25 larvae /mrl maximum population in Neem leaf extract @5% 9.75 larvae /mrl and Tobacco leaf extract @ 5% 10. larvae /mrl.

#### Reduction of *Spodoptera litura* (tobacco caterpillar) population over control

Reduction was higher in Neem oil @ 5% 10lit/ha 6 larvae /mrl treated crop. Among the plant products, followed by Karanj oil @5 % 7.5 larvae /mrl, Mahau oil@ 5% 8.25 larvae /mrl, Neemleaf extract @5% 9.75 larvae /mrl. It was lowest in Tobacco leaf extract @5% treated plots and recorded only 10 larvae /mrl reduction insect population.

Tab. 3: Larval mortality rate after 5% spray

Efficacy of botanicals in the management of Tobacco caterpillar, <i>Spodoptera litura</i> 2015														
S. No	Treatments	Dose	No. of larvae meter row length during 1st Spray						No. of larvae meter row length during 2nd Spray					
			Day Before Spray	Days after spray-I					Day Before Spray	Days after spray-II				
				3 Day	7 Day	14 Day	Mean	SD		3 Day	7 Day	14 Day	Mean	SD
1	Control (Untreated)	–	10	10 (3.12)	12(3.570)	13(3.702)	12	2.83	12	14(3.826)	16(4.387)	18(4.328)	15	2.58
2	Neem leaf extract	5%	11	11(3.468)	10(3.291)	9(3.130)	10.25	0.96	11	11(3.454)	9(3.018)	8(2.988)	9.75	1.5
3	Karanj Oil	5%	9	9(3.144)	8 (2.971)	6(2.672)	8	1.41	8	10(3.329)	6(2.653)	6(3.061)	7.5	1.91
4	Tobacco leaf Extract	5%	12	12(3.589)	11(3.406)	11(3.423)	11.5	0.58	12	11(3.417)	9(3.090)	8(3.001)	10	1.83
5	Mahua Oil	5%	10	10(3.294)	9(3.142)	8(2.971)	9.25	0.96	10	8(3.014)	8(3.020)	7(2.840)	8.25	1.26
6	Neem Oil	5%	10	8(3.103)	6(2.662)	4(2.212)	7	2.58	8	7(2.677)	5(2.403)	4(2.252)	6	1.83
C D				0.204	0.203	0.217				0.293	0.375	0.304		
SE(M)				0.067	0.067	0.071				0.096	0.125	0.1		
CV				4.043	4.206	4.725				5.855	7.967	6.496		

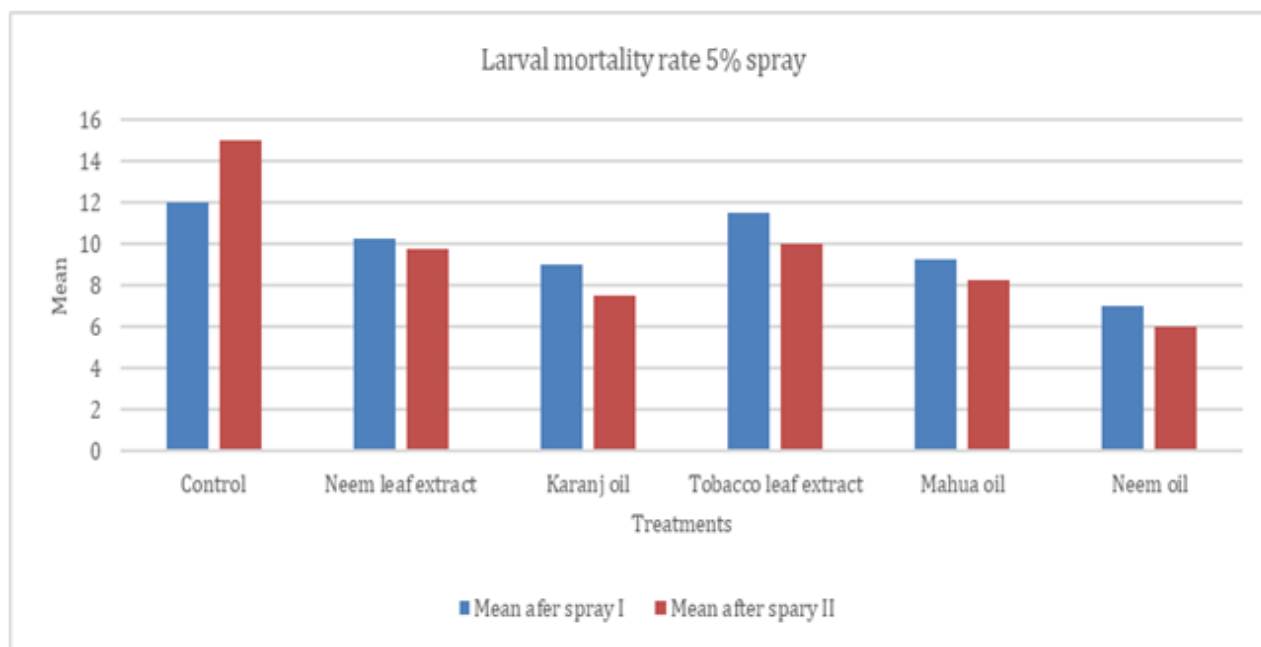


Fig 3: Larval mortality rate after 5% spray

#### Overall mean population of *Chrysodeixis. Acuta* (Green semilooper) after first spray -2013

Mean larval population during spray I indicated that botanical insecticide i. e. Neem oil @ 2% 10 lit/ha recorded the minimum population of 8.5 larvae per meter row length and among the different plant products, Karanj oil @ 2% 10lit /ha recorded minimum larval population of 9.75 larval/mrl, followed by Mahau oil @2% 10lit /ha recorded Minimum larval Population of 10.75 larvae /mrl Neem leaf extract @2% 10 lit /ha recorded minimum larval population 11.5 larvae /mrl and it was maximum in Neem leaf extract @2% 13.5 larval /mrl.

### Over mean population of *Chrysodeixis. Acuta* (Green semilooper)

Mean larval population during second spray indicated that plant products botanicals insecticide i.e., Neem oil @2% 10lit/ha record the minimum population of 8 larva per meter row length and among the different plant products, Karanj oil @2% 10 lit /ha recorded minimum larval population with 9.75. larvae /mrl, followed by Mahau oil @2% 10.5 larvae /mrl and maximum population in Tobacco leaf extract @2% 12.75 larvae /mrl. Neem leaf extracts @2% 13.25 larvae/mrl.

### Reduction of *Chrysodeixis. Acuta* (Green semilooper) population over control

Reduction was higher in Neem oil @ 2% 10lit/ha 6 treated crop. Among the plant products, followed by Karanj oil @2 % 10.5 L/mrl Mahau oil@ 2 % 9.7 5 L/mrl, Neem leaf extract @2 % 12.75 L/mrl It was lowest in tobacco leaf extract @2 % treated plots and recorded only 13 .25 L/mrl reduction insect population.

### Overall mean population of *Chrysodeixis. Acuta* (Green semilooper) after second spray -2013

Mean larval population during population during first indicated that botanical insecticide i. e. Neem

oil @ 2% 10 lit/ha recorded the minimum population of 8 larvae per meter row length and among the different plant products, Mahau oil @ 2% 10lit /ha recorded minimum larval population of 9.75 larvae /mrl , followed by karani oil @2% 10lit /ha recorded Minimum larval Population of 10.5 larvae /mrl. Neem leaf extract @2% 10 lit /ha recorded minimum larval population 12.75 larvae /mrl and it was maximum in Tobacco leaf extract @2% 13.25 larval /mrl.

### Over mean population of *Chrysodeixis. Acuta* (Green semilooper)

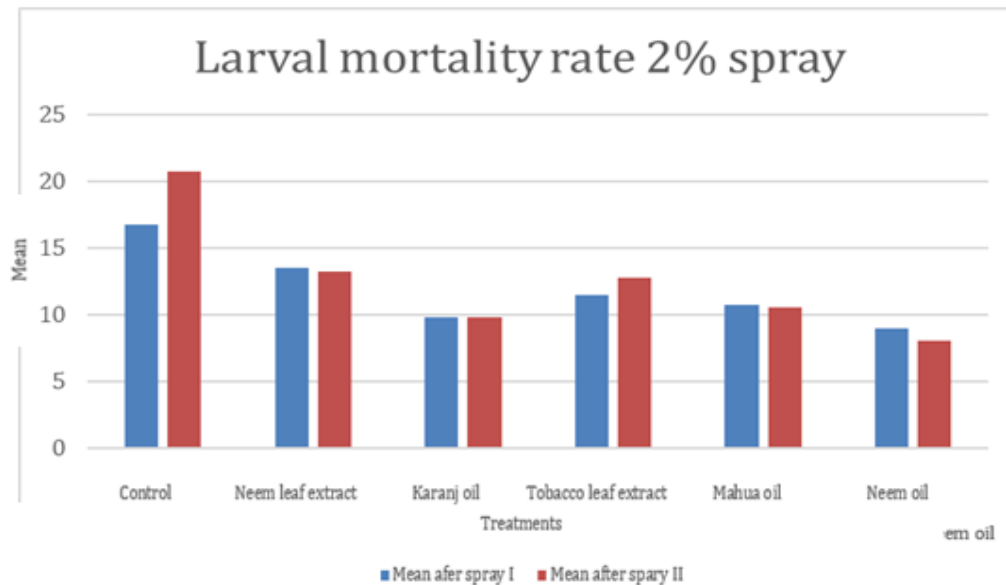
Mean larval population during second spray indicated that plant products botanicals insecticide i.e., Neem oil @2% 10lit/ha record the minimum population of 8. larva per meter row length and among the different plant products, Karanj oil @2% 01 lit /ha recorded minimum larval population with 9.75 larvae /mrl, followed by Mahau oil @2% 10.50 larvae /mrl maximum population in Tobacco leaf extract @2% 12.75 larvae /mrl and Neem leaf extract @2% 13.75 larvae /mrl.

### Reduction of *Chrysodeixis. Acuta* (Green semilooper) population over control

Reduction was higher in Neem oil @ 3% 8 larvae /mrl treated crop. Among the plant products, followed by Karanj oil @3% 9.75 L/mrl Mahau oil@ 3% 10.5 L/mrl, Tobacco leaf extract @3% 12.75 L/mrl It was lowest in Neem leaf extract @3% treated plots and recorded only 13.25 L/mrl reduction insect population.

Efficacy of botanicals in the management of *Chrysodeixis. Acuta* (Green semilooper) =2013

Effect of different plant extracts and oils on the growth of larvae of <i>Spodoptera litura</i> (F)														
S.No	Treatments	Dose	No. of larvae meter row length plants during 1st Spray						No. of larvae meter row length plants during 2nd Spray					
			Day Before Spray	Days after spray					Day Before Spray	Days after spray				
				3 Day	7 Day	14 Day	Mean	SD		3 Day	7 Day	14 Day	Mean	SD
1	Control (Untreated)	–	14	15(3.999)	18(4.465)	20(4.574)	16.75	2.75	18	20(4.569)	21(4.659)	24(4.659)	20.75	2.5
2	Neem leaf extract	2%	14	14(3.807)	13(3.634)	13(3.722)	13.5	0.58	14	14(3.859)	13(3.618)	12(3.570)	13.25	0.96
3	Karanj Oil	2%	12	10(3.308)	9(3.142)	8(2.982)	9.75	1.71	12	10(3.310)	9(3.142)	8(2.991)	9.75	1.71
4	Tobacco leaf extract	2%	13	12(3.454)	11(3.449)	10(3.310)	11.5	1.29	14	12(3.584)	13(3.620)	12(3.601)	12.75	0.96
5	Mahua Oil	2%	13	11(3.457)	10(3.308)	9(3.142)	10.75	1.71	12	11(3.449)	10(3.281)	9(3.142)	10.5	1.29
6	Neem Oil	2%	12	10(3.299)	8(3.130)	6(2.603)	9	2.58	10	9(3.142)	7(2.800)	6(2.403)	8	1.83
	C.D			0.278	0.192	0.344				0.178	0.192	0.279		
	S .E.M			0.092	0.063	0.113				0.059	0.063	0.092		
	C.V			5.15	3.586	6.673				3.208	3.587	5.409		



#### Overall mean population of *Chrysodeixis. Acuta* (Green semilooper) after first spray-2014

Mean larval population during population during first indicated that botanical insecticide i. e. Neem oil @ 3% 10 lit/ha recorded the minimum population of 7.25 larvae per meter row length and among the different plant products, Karanj oil @ 3% 10lit /ha recorded minimum larval population of 9.25 larval/mrl, followed by Mahau oil @3% 10lit /ha recorded Minimum larval Population of 10.5 larvae /mrl. Tobacco leaf extract @3% 10 lit /ha recorded minimum larval population 10.75 larvae /mrl and it was maximum in Neem leaf extract @3% 11 .75 larval /mrl.

#### Over mean population of *Chrysodeixis. Acuta* (Green semilooper)

Mean larval population during second spray indicated that plant products botanicals insecticide i.e., Neem oil @3% 10lit/ha record the minimum population of 7 .5 larva per meter row length and among the different plant products, Karanj oil @3% 10 lit /ha recorded minimum larval population with 9.75 larvae /mrl, followed by Mahau oil @3% 10.75 larvae /mrl maximum population in Tobacco leaf extract @3% 11.25 larvae /mrl and Neem leaf extract @3% 12 larvae /mrl.

#### Reduction of *Chrysodeixis. Acuta* (Green semilooper) population over mean control

Reduction was higher in Neem oil @ 3% 10lit/ha 6 treated crop. Among the plant products, followed by Karanj oil @3%,9.75 larvae/mrl Mahau oil@ 3% 10.75 larvae /mrl, Tobacco leaf extract @3% 11.25 larvae /mrl It was lowest in and Tobacco leaf extract @3% treated plots and recorded only 12 reduction insect population.

#### Overall mean population of *Chrysodeixis. Acuta* (Green semilooper) after second spray -2014

Mean larval population during population during first indicated that botanical insecticide i. e. Neem oil @ 3% 10 lit/ha recorded the minimum population of 7.5 larvae per meter row length and among the different plant products Karanj oil @ 3% 10lit /ha recorded minimum larval population with 9.75 larval/mrl, followed by Mahau oil @3% 10lit /ha recorded with 10.75 larval/mrl Tobacco leaf extract @3% 10 lit /ha 11.25 and it was maximum in Neem leaf extract @3% 12 larval /mrl.

#### Reduction of *Chrysodeixis. Acuta* (Green semilooper) population over control

Reduction of *S. litura* population was higher in Neem oil @3%10 lit/ha 7.5 larvae/mrl treated crop. Which was followed by Karanj oil @3 %,9.75 Mahau oil @3% 10.75 larvae/mrl, Tobacco leaf extract @3% 11.25 and lowest in Neem leaf extract @ 3% Treated crop was recorded only 12 larvae/mrl reductions in insect population.

#### Over mean population of *Chrysodeixis. Acuta* (Green semilooper)

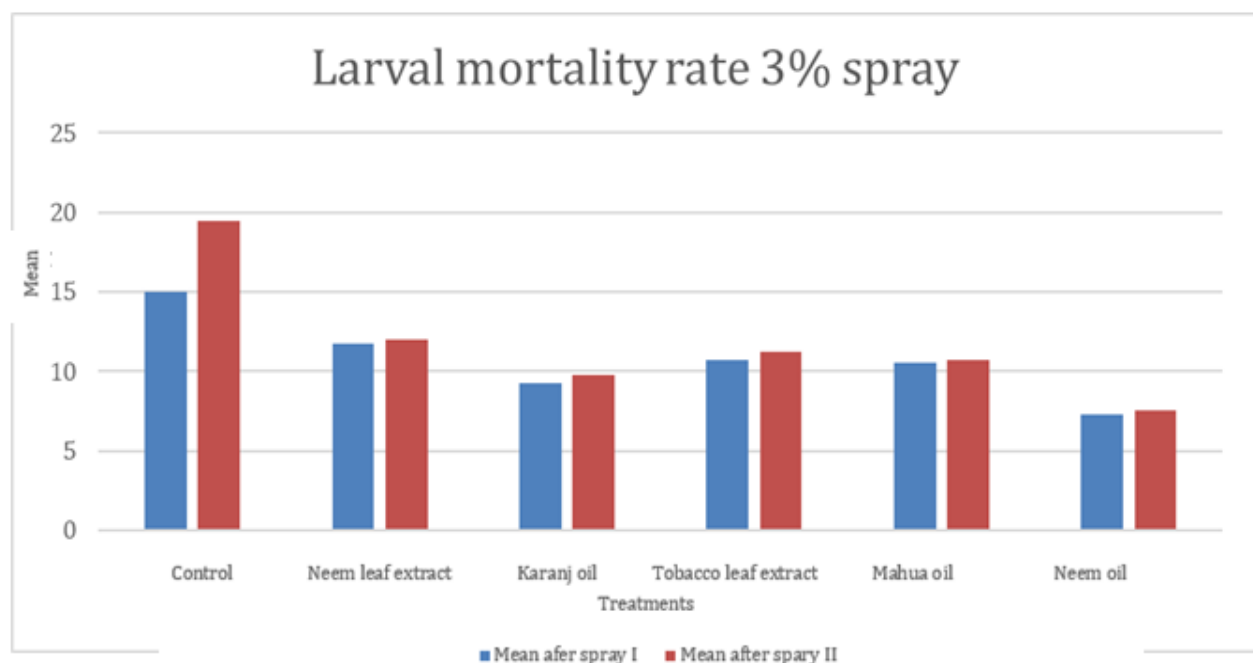
Mean larval population during second spray indicated that plant products botanicals insecticide i.e., Neem oil @3% 10lit/ha record the minimum population of 7.5 larva per meter row length and among the different plant products, Karanj oil @3% 10 lit /ha recorded minimum larval population with 9.75 larvae /mrl, followed by Mahau oil @3% 8 and maximum population Tobacco leaf extract @3% 11.25 larvae/mrl and Neem leaf extract @3% 12 larvae /mrl .

#### Reduction of *Chrysodeixis. Acuta* (Green semilooper) population over control

Reduction was higher in Neem oil @ 3% 10lit/ha 6 treated crop. Among the plant products, followed by Karanj oil @3% 9.75, Mahau oil@ 3% 10.75, Tobacco leaf extract @3% 11.25 larvae /mrl. It was lowest in Neem leaf extract @3% treated plots and recorded only 12 reduction insect population.



Efficacy of botanicals in the management of <i>Chrysodeixis. Acuta</i> (Green Semi looper)-2014														
S.No	Treatments	Dose	No.of larvae/ 10 plants during 1st Spray						No.of larvae/ 10 plants during 2nd Spray					
			Day Before Spray	Days after spray					Day Before Spray	Days after spray				
				3 Day	7 Day	14 Day	Mean	SD		3 Day	7 Day	14 Day	Mean	SD
1	Control (Untreated)	-	14	14(3.851)	16(4.132)	16(4.105)	15	1.15	16	18(4.339)	20(4.569)	24(4.990)	19.5	3.42
2	Neem leaf extract	3%	14	14(3.806)	11(3.325)	8(2.991)	11.75	2.87	13	13(3.740)	10(3.281)	12(3.578)	12	1.41
3	Karanj Oil	3%	11	9(3.106)	9(3.080)	8(2.951)	9.25	1.26	12	10(3.281)	9(3.183)	8(3.001)	9.75	1.71
4	Tobacco leaf Extract	3%	12	12(3.570)	10(3.310)	9(3.142)	10.75	1.5	13	13(3.619)	10(3.343)	9(3.142)	11.25	2.06
5	Mahua Oil	3%	12	11(3.449)	10(3.281)	9(3.142)	10.5	1.29	12	12(3.600)	10(3.310)	9(3.090)	10.75	1.5
6	Neem Oil	3%	11	7(2.800)	6(2.571)	5(2.403)	7.25	2.63	12	8(2.951)	6(2.571)	4(2.266)	7.5	3.42
CD				0.221	0.386	0.258				0.686	0.375	0.304		
SEM				0.073	0.127	0.085				0.226	0.123	0.1		
CV				4.331	7.799	5.586				12.573	7.299	5.977		



#### Overall mean population of *Green semilooper* after first spray-2015

Mean larval population during population during first indicated that botanical insecticide i. e. Neem oil @ 5% 10 lit/ha recorded the minimum population of 8 larvae per meter row length and among the different plant products, Karanj oil @ 5% 10lit /ha recorded minimum larval population with 9.5 larval/mrl, followed by Mahau oil @5% 10lit /ha recorded minimum10.5 larvae/mrl Tobacco leaf extract @5% 10 lit /ha 10.25 and it was maximum in Neem leaf extract @5% 11.5 larval /mrl.

### Reduction of *Chrysodeixis. Acuta* (Green semilooper) population over control

Reduction of *S. litura* population was higher in Neem oil @5% 10 lit/ha 7 treated crop. which was followed by Karanj oil @5 % 8, Mahau oil @5 9.25, Neem leaf extract @5% 10.25 and lowest in Tobacco leaf extract @ 5 % Treated crop was recorded only 11 larvae/mrl reduction and it was maximum in Neem leaf extract @5% 11.5 larval /mrl in insect population.

### Over mean population of *Chrysodeixis. Acuta* (Green semilooper)

Mean larval population during second spray indicated that plant products botanicals insecticide i.e., Neem oil @5% 10lit/ha record the minimum population of 6.5 larva per meter row length and among the different plant products, Karanj oil @5 % 10 lit /ha recorded minimum larval population with 7.5 larvae /mrl, followed by Mahau oil @5% 8.25 Tobacco leaf extract @5% 10.5 and maximum population in Neem leaf extract @5% 11 larvae /mrl.

### Reduction of *Chrysodeixis. Acuta* (Green semilooper) population over control

Reduction was higher in Neem oil @ 5% 10lit/ha 6.5 treated crop. Among the plant products, followed by Karanj oil @5% 7.5, Mahau oil@ 5% 8.25, Tobacco leaf extract @5% 10.5. It was lowest in Neem leaf extract @5% treated plots and recorded only 11. Larvae /mrl reduction insect populations.

### Overall mean population of *Chrysodeixis. Acuta* (Green semilooper) after second spray-2015

Mean larval population during population during first indicated that botanical insecticide i. e. Neem oil @ 5% 10 lit/ha recorded the minimum population of 6.5 larvae per meter row length and among the different plant products, Karanj oil @ 5% 10lit /ha recorded minimum larval population with 7.5 larval/mrl, followed by Mahau oil @5% 10lit /ha 8.25 Tobacco leaf extract @5% 10 lit /ha 10.5 and it was maximum in Neem leaf extract @5% 11 larval /mrl.

### Reduction of *Chrysodeixis. Acuta* (Green semilooper) a population over control

Reduction of *Green semilooper* population was higher in Neem oil @5%10 lit/ha 6 .5 larvae/mrl treated crop. Which was followed by Karanj oil @5 % 7.5, Mahau oil @5% 8.25, Tobacco leaf extract @5% 10.5 and lowest in Neem leaf extract @ 5% Treated crop was recorded only 11 larvae /mrl reductions in insect population.

### Over mean population of *Chrysodeixis. Acuta* (Green semilooper)

Mean larval population during second spray indicated that plant products botanicals insecticide i.e., Neem oil @5% 10lit/ha record the minimum population of 6 .5 larva per meter row length and among the different plant products, Karanj oil @5% 10 lit /ha recorded minimum larval population with 7.5 larvae /mrl, followed by Mahau oil @5% 8.25 maximum population in Tobacco leaf extract @5% 10.5 and Neem leaf extract @ 5% 11 larvae /mrl.

### Reduction of *Chrysodeixis. Acuta* (Green semilooper) population over control

Reduction was higher in Neem oil @ 5% 10lit/ha 6 treated crop. Among the plant products, followed by Karanj oil @5 % 7.5, Mahau oil@ 5% 8.25, Tobacco leaf extract @5% 10.5. It was lowest in Neem leaf extract @5% treated plots and recorded only 11 reduction insect populations.

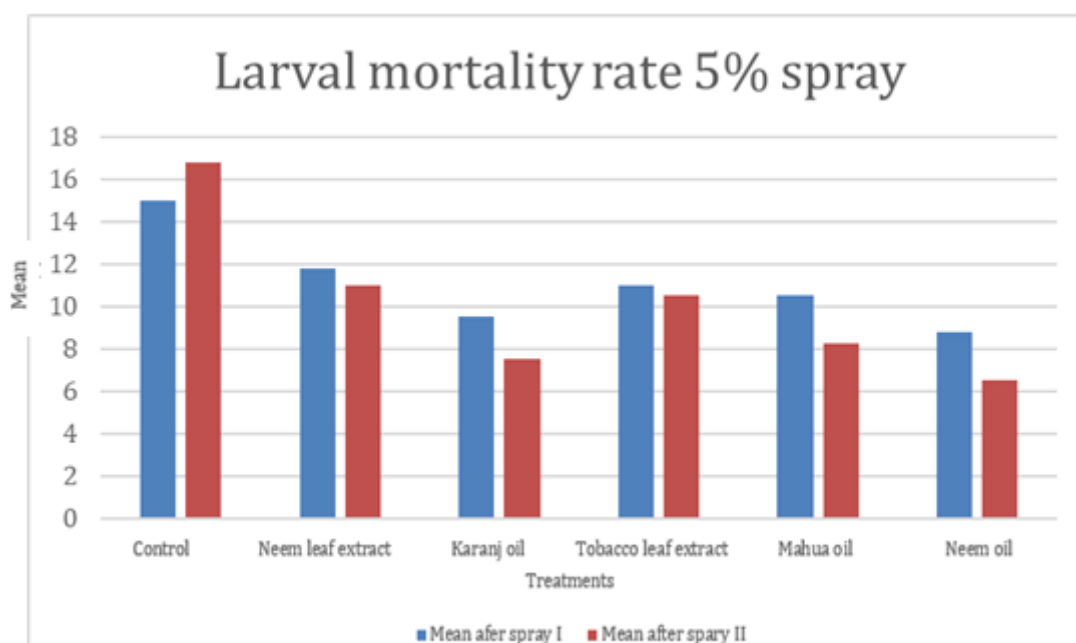
The results are in conformity with the findings of Vijayalakshmi et al. (1997) who reported that ginger extract as natural pesticide, alone and in combination with other plant products like chilli, garlic and cow urine as effective plant products against *H. armiger*.

Lakshmanan (2001) also reported that the garlic bulb extracts alone or in combination with other plant extracts were effective in managing the several lepidopteran pests viz., *Eariasvitella*, *Chilopartellus* (Swinhoe), *Corcyra Cephalonia* Staint, *Helicoverpaarmigera* and *Spodoptera litura*. Choudhary and Shrivastava (2007) reported that application of neem seed kernel extract (NSKE) at 5% + neem leaf extract (NLE) at 10% reduced the maximum larval population.

Efficacy of botanicals in the management of *Chrysodeixis. Acuta* (Green semilooper) 2015

S.No	Treatments	Dose	No.of larvae/ 10 plants during 1st Spray						No.of larvae/ 10 plants during 2nd Spray					
			Day Before Spray	Days after spray-I					Day Before Spray	Days after spray-II				
				3 Day	7 Day	14 Day	Mean	SD		3 Day	7 Day	14 Day	Mean	SD
1	Control (Untreated)	—	14	14 (3.872)	16(4.297)	16(3.931)	15	1.15	13	16(3.990)	18(4.374)	20(4.528)	16.75	2.99
2	Neem leaf extract	5%	14	14 (3.526)	11(3.343)	8(3.114)	11.75	2.87	12	123.528)	11(3.367)	9(3.061)	11	1.41

3	Karanj Oil	5%	10	10(3.516)	9(2.993)	9(3.072)	9.5	0.96	8	10(3.549)	6(2.653)	6(2.618)	7.5	1.91
4	Tobacco leaf Extract	5%	13	13(3.638)	10(3.686)	8(3.087)	11	2.45	12	11(3.704)	10(3.286)	9(3.142)	10.5	1.29
5	Mahua Oil	5%	11	11(3.769)	10(3.888)	10(2.988)	10.5	0.5	10	8(3.526)	8(3.020)	7(2.800)	8.25	1.26
6	Neem Oil	5%	10	9(3.308)	8(3.199)	8(2.195)	8.75	0.96	8	7 (3.020)	6(2.662)	5(2.403)	6.5	1.29
	C D			N/A	0.168	0.668				N/A	0.225	0.277		
	SE(M)				0.147	0.237				0.347	0.074	0.091		
	CV				8.181	9.413				13.811	4.593	5.889		



## CONCLUSION

All growth thus character was significantly affected by application of botanical extracts. uses as treatment. The botanical extracts are Neem oil @ 2% 3% 5% Mahau oil @ 2%3% 5%, Karanj oil @2% 3% 5%, Neem leaf Extract @2% 3% 5%, and Tobacco leaf Extract oil@ 2% 3% 5% use for as the treatments. Through present findings it is concluded that soybean crop is heavily infested by various insect pests during its growth stages like vegetative, flowering and pod stages. As a maximum population of tobacco caterpillar, *Spodoptera litura* green semilooper infests itsvegetative stage hence it must be botanicals Soybean plants-controlled maximum at flowering and pod stages for the infestation of tobacco caterpillar, green semilooper. must be applied during these stages.

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