SHORT COMMUNICATION

# EVALUATION OF PLANT PRODUCTS AGAINST TOBACCO CATERPILLAR, *SPODOPTERA LITURE* (FABRICIUS) ON SOYBEAN

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**Abstract:** The tobacco caterpillar, *Spodoptera litura* (Fabricius) is the most serious pest of soybean. Plant products or botanical pesticides are the important alternatives to minimize or replace the use of synthetic pesticides.The present study was conducted during *kharif,* 2016 at S K College of Agriculture and Research Station, Kawardha (Kabirdham) Chhhattisgarh. The experiment was carried out in RBD design with eight treatments and three replications. Tobacco caterpiller, *S. litura* is the most damaging insect pest of soybean. In the evaluation of plant products against *S. litura* NSKE @5% was found second most effective botanicals after recommended insecticide on soybean after both the sprays 1st as well 2nd with benefit cost ratio of 1.14.

**Keywords:** Botanicals, Soybean, *Glycine max* (L.), *Spodoptera litura*

## INTRODUCTION

Soybean, *Glycine max* (L.) occupied first rank in the world production. India ranks third in respect of area and production.Soybean is a major source ofedible oil (20%) and high quality protein (40%). It is a rich source of aminoacids, vitamins andminerals. Soybean oil is used as a raw material in manufacturing antibiotics, paints,varnishes, adhesives, lubricants. Soybean meal is used as protein supplement in humandiet, cattle and poultry feeds.Soybean is mainly cultivated in USA,China, Brazil, Argentina and India. Major Soybean growing states in India are Madhya Pradesh,Maharashtra, Rajasthan, Karnataka, Uttar Pradesh, Andhra Pradesh and Gujarat. In Chhattisgarh soybean is generally grown under rainfed conditions in*Kharif* season. Chhattisgarh is growing at fast pace in the farm sector. In 2015-16, area under oilseed in the state was 1.21 thousand hectares.Soybean is cultivated as one of the major oilseed crops in Kabirdham district of Chhattisgarh.The low productivity of soybean both at national and state level is attributed to abioticand biotic stresses like drought, weeds, insect pests and diseases. Among these, insect pestsoften pose a serious threat to soybean production by increasing cost of cultivation andimpairing quality of produce in many ways.Soybean crop is reported to be attackedby about 350 species of insects in many parts of the world (Luckmann, 1971, Rai *etal*., 1973; Adimani, 1976; Thippaiah, 1997 and Jayappa, 2000). Defoliators like *Spodoptera litura* (Fab.), *Thysanoplusia orichalcea* (Fab.) damagesoybean extensively by skelatalization of leaves in early stage and severe defoliation in laterstage and thus reducing the photosynthetic capacity of plants.The tobacco caterpillar, *Spodoptera litura* is serious pest of soybean at District Kabirdham. Excessive and indiscriminate use of pesticide come several problems like development of resistance in targeted species, resurgence of secondary pest, elimination of natural enemies and contamination of soil, water and food chain. Plant products or botanical pesticides are the important alternatives to minimize or replace the use of synthetic pesticides.Hence the present study was conducted during *kharif,* 2016 at S K College of Agriculture and Research station, Kawardha (Kabirdham) Chhhattisgarh against *S. litura*.

## MATERIAL AND METHOD

Evaluation of plant products against tobacco caterpillar, *Spodoptera liture* (Fabricius) on soybeanwas studied at the experimental area of S. K. College of Agriculture & Research Station Kawardha (Kabirdham), Chhattisgarh during *kharif*, 2016-17. For the sustainable management of Tobacco caterpillar, *Spodoptera liture*at kabirdham different plant products viz. neem oil @ 2% (2 ml/L), karanj Oil @ 2% (2m/L), NSKE @ 5% (50gm of neem seed extract soaked overnight in one litter of water), karanj seed extract @30 Kg/ ha (60gm of extract soaked overnight in one litter of water), garlic 500 gm +green chilli @9 kg/ha and green chilli @ 10

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Kg/hawas examined as treatments. A field experiment was laid out in randomized block design (RBD) with eight treatments including untreated control, replicated three times. The crop was sown on last week of Junein plot size of 6X5=30 sq. meters. In this experiment from each plot thenumbers of caterpillars werecounted 24 hours before of treatment and the post treatment 1, 3, 5, 7, 10 and 15 days after treatment from randomly selected five different spots of one square meter area.B: C ratio wasalso calculated.

**Table 1.** Evaluation plant products against soybean defoliator *Spodoptera litura*at S. K. CARS, Kabirdham during *Kharif* 2016-17

| Notation | Treatments | Dose /ha (g or ml) | Mean number of larvae per plant | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1DBS | 1st Spray | | | | | 2nd Spray | | | | |
| | | | | 1 DAS | 3 DAS | 7 DAS | 10 DAS | 14 DAS | 1 DAS | 3 DAS | 7 DAS | 10 DAS | 14 DAS |
| $T_1$ | Neem oil | 2% | 0.57 (1.34) | 0.50 (1.23) | 0.60 (1.26) | 0.57 (1.26) | 0.59 (1.26) | 0.63 (1.27) | 0.73 (1.32) | 0.70 (1.34) | 0.60 (1.27) | 0.03 (1.02) | 0.03 (1.02) |
| $T_2$ | NSKE | 5% | 0.53 (1.31) | **0.40 (1.19)** | **0.50 (1.22)** | **0.57 (1.25)** | **0.57 (1.26)** | **0.59 (1.26)** | **0.37 (1.17)** | **0.63 (1.28)** | **0.57 (1.25)** | **0.03 (1.02)** | **0.00 (1.00)** |
| $T_3$ | Karanj oil | 2% | 0.59 (1.3) | 0.59 (1.26) | 0.69 (1.30) | 0.80 (1.34) | 0.72 (1.31) | 0.75 (1.32) | 0.53 (1.24) | 0.70 (1.30) | 0.70 (1.30) | 0.10 (1.05) | 0.00 (1.00) |
| $T_4$ | Karanj Seed powder | 30Kg | 0.65 (1.33) | 0.55 (1.25) | 0.63 (1.28) | 0.57 (1.26) | 0.68 (1.29) | 0.80 (1.34) | 0.87 (1.37) | 0.80 (1.34) | 0.63 (1.27) | 0.10 (1.05) | 0.00 (1.00) |
| $T_5$ | Chilli- garlic Solution | 9Kg | 0.50 (1.28) | 0.57 (1.26) | 0.67 (1.29) | 0.87 (1.37) | 0.70 (1.30) | 0.69 (1.3) | 0.57 (1.25) | 0.67 (1.29) | 0.70 (1.30) | 0.07 (1.03) | 0.00 (1.00) |
| $T_6$ | Chilli Solution | 10 kg | 0.63 (1.28) | 0.53 (1.24) | 0.63 (1.27) | 0.69 (1.30) | 0.63 (1.27) | 0.67 (1.29) | 0.6 (1.26) | 0.63 (1.28) | 0.70 (1.30) | 0.03 (1.02) | 0.00 (1.00) |
| $T_7$ | Triazophos | 1000 ml | 0.67 (1.23) | **0.30 (1.14)** | **0.40 (1.18)** | **0.43 (1.19)** | **0.48 (1.22)** | **0.53 (1.24)** | **0.1 (1.05)** | **0.40 (1.18)** | **0.47 (1.21)** | **0.00 (1.00)** | **0.00 (1.00)** |
| $T_8$ | Untreated | - | 0.70 (1.32) | 0.93 (1.39) | 1.03 (1.43) | 0.93 (1.38) | 1.17 (1.47) | 1.31 (1.52) | 1.17 (1.45) | 1.33 (1.52) | 1.03 (1.43) | 0.17 (1.08) | 0.03 (1.02) |
| | **SE (m)±** | | **0.03** | **0.06** | **0.05** | **0.03** | **0.04** | **0.03** | **0.06** | **0.05** | **0.03** | **0.01** | **0.01** |
| | **CD 5%** | | **NS** | **0.21** | **0.16** | **0.10** | **0.11** | **0.10** | **0.21** | **0.17** | **0.10** | **0.04** | **NS** |

Note : Figure in parenthesis are Square root transformed value, DBS= Day before spray, DAS= Days after spray

**Table 2.** Economics of different plant products against soybean defoliator *Spodoptera litura*at S. K. CARS, Kabirdham during *Kharif* 2016-17

| Notation | Botanicals | Dose /ha (g or ml) | Yield (q/ha) | Net profit over control (Rs./ha) | cost of cultivation (Rs./ha) | gross return | Benefit :cost ratio |
|---|---|---|---|---|---|---|---|
| $T_1$ | Neem oil | 2% | 6.87 | 3458.00 | 13330.00 | 17862.00 | **1:1.34** |
| $T_2$ | NSKE | 5% | 6.93 | 3614.00 | 15810.00 | 18018.00 | **1:1.14** |
| $T_3$ | Karanj oil | 2% | 6.81 | 3302.00 | 13330.00 | 17706.00 | **1:1.33** |
| $T_4$ | Karanj Seed powder | 30Kg | 6.97 | 3718.00 | 16410.00 | 18122.00 | **1:1.10** |
| $T_5$ | Chilli- garlic Solution | 9Kg | 6.19 | 1690.00 | 13590.00 | 16094.00 | **1:1.21** |
| $T_6$ | Chilli Solution | 10 kg | 6.88 | 3484.00 | 13622.00 | 17888.00 | **1:1.35** |
| $T_7$ | Recommended Insecticide (Trizophos 40EC) | 1000 ml | 6.81 | 3302.00 | 13310.00 | 17706.00 | **1:1.33** |
| $T_8$ | Untreated | - | 5.54 | | 12042.00 | 14404.00 | **1:1.20** |

**Cost of chemicals:** Neem oil 1 Lit- Rs 240, NSKE 1 kg- Rs 120, Karanj oil 1 Lit- Rs 240, Karanj Seed powder l kg- Rs 120kg, Chilli 1 kg - Rs 40, garlic1 kg - Rs 160, Kerosin oil-1 Lit- Rs 50, Surf- 100gm- Rs 10, Teepol 1 Lit- Rs 280, Trizophos 40EC 1 Lit- Rs 500.**Cost of cultivation soybean** =Rs- 12042/ha,**Price of Soybean**= Rs 2,600 per quintal.

## RESULT AND DISCUSSION

The incidence of tobacco caterpillar was recorded prior and post application of insecticide treatment on the basis of population density. The caterpillar population in the pre treatment observation ranged from 0.50 to 0.70larvae per plant showing statistically non significant difference in different treatments denoting as uniform population. In post treatment observation after 1st , 3rd , 7th , 10th and 14th day of first spray, all the tested doses of plant products showed significant differences over untreated control. Among the treatments, NSKE @5% was found second most effective after recommended insecticide with 0.04, 0.50,0.57,0.57 and 0.59 larvae per plant, respectively. Similar trend of result was foundafter 1st , 3rd , 7th , 10th and 14th day of second spray, all the tested doses of plant products showed significant differences over untreated control, NSKE @5% was found second most effective after recommended insecticide with 0.37, 0.63,0.57 and 0.03 larvae per plant, respectively (Table 1).

NSKE @ 5% caused highest mortality among treatment.The present findings of effect of NSKE are in line with Sayed (1983), Sahayaraj andSekar, (1996) and Patil (2000) who reported the effectiveness of NSKE against variousinstars of *S. litura*.Barapatre (2001) who recorded 20 and 24.65 per cent mortality of thirdinstar *S. litura* treated with neem oil (2.5%) and Garlic (0.5%) + Chilli (0.5%) + Kerosene(0.3%) + Ginger (1.5%), respectively. The difference in mortality may be due to variation inconcentration used and also different experimental conditions.

Among the plant products, the maximum benefit cost ratio was found in the treatment green chilli @ 10kg/ha having 1.35. In rest of the plant products, more or less similar benefit cost ratio was obtained like 1.34 in Neem oil @ 2% (1.34) which was followed by Karanj oil @ 2% (1.33), garlic+ green chilli @ 9kg/ha (1.21), NSKE @ 5% (1.14) and the minimum benefit cost ratio was recorded in the treatment having Karanj seed extract @ 30 kg/ ha only 1.10 and among the chemical treatment triazophos @ 1000ml/ha which was used for management of insect pests of soybean the benefit cost ratio was maximum with 1.33 (Table 2). Present findings are in agreement with the Raghuvanshi *et al.*, (2014) as they reported that triazophos gave the maximum better return on soybean crop. Panchabhavi *et al.*, (1994) obtained highest cost benefit ratio in NSKE sprayed at 15 days interval with a seed yield of 12.0 q/ha.

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