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# Effect of Bio-Rational Insecticides on Major Defoliators of Groundnut

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## Abstract

Field experiments were laid out at Regional Research Station,Vridhachalam to manage the foliage feeding insects in VRI 2 groundnut during *kharif* 2020 and *kharif* 2021 with randomised block design. The following treatments were imposed T1- Bt-127 SC formulation @ 3 ml/l, T2-Bt Commercial formulation (Delfin) @ 1 g/l, T3-Quinalphos 25 EC @ 2 ml/l, T4- Chlorantraniliprole 18.5 SC @ 0.3 ml/l, T5- Untreated check. Defoliation by *S.litura* was minimum in chlorantraniliprole 18.5SC @ (2.23%) followed by quinalphos (2.30%) and bt commercial formulation(2.60%) and bt127SC (3.00%). *A.modicella* defoliation was maximum in untreated control (13.21%) and minimum in chlorantraniliprole (1.31%). Among the Bt formulations 2.20% defoliation was recorded in bt commercial formulation followed by bt 127SC (2.80%).

***Key words :*** *Groundnut, bio-rational insecticides, defoliators, Bt formulations.*

## Introduction

Groundnut is an important oilseed crop grown in India during *kharif*, *rabi* and summer seasons. India has the largest groundnut growing area in the world and is the second largest producer after China. Gujarat, Andhra Pradesh, Tamil Nadu, Rajasthan, Karnataka and Maharashtra are the major groundnut growing states of India and together account for about 90% of the national area under groundnut. Most important defoliator pests of groundnut in India are, tobacco caterpillar, groundnut leaf miner, gram pod borer and red hairy caterpillar are major threat to groundnut cultivation (1). Among several pests attacking groundnut, *Spodoptera litura* and *Aproaerema modicella* are the major defoliator causing considerable yield loss. An indiscriminate use of chemical insecticides is posing threat to the environment and human health and development of resistance to different insecticides (2). This experiment has been formulated to manage the defoliators by bt formulations and new generation bio-rational insecticides. (3)

## Materials and Methods

Field experiments were laid out at Rregional Rresearch Rstation,Vridhachalam to manage the foliage feeding insects in VRI 2 groundnut during *kharif* 2020 and *kharif* 2021 with randomised block design. The following treatments were imposed T1- Bt-127 SC formulation @ 3 ml/l, T2-Bt Commercial formulation (Delfin) @ 1 g/l, T3-Quinalphos 25 EC @ 2 ml/l, T4- Chlorantraniliprole 18.5 SC @ 0.3 ml/l, T5- Untreated check, on the notice of defoliators. Pre treatment and post treatment observations of percent leaf damage by *Spodoptera litura* , *Aproaerema modicella* and *A. modicella* larvae per plant, predators population and yield were recorded on 7 days after spray and benefit cost ratio calculated and data were statistically analysed by AGRESS software.

## Results and Discussion

**Kharif 2020 :** Kharif 2020 results were tabulated in Table 1. *S.litura* leaf damage was ranged in between 5.00 – 6.30% prior to the treatment. Minimum *S.litura* leaf damage was recorded in chlorantraniliprole (1.73%) followed by quinalphos (1.80%). Among the biocides Bt commercial formulation was recorded 2.10% *S.litura* leaf damage followed by new formulation bt-127 SC(2.50%) while in control it was 9.80%.A.modicella defoliation was minimum in chlorantraniliprole (0.82%) followed by quinalphos (1.22%). Bt 127SC recorded 2.30% defoliation while the commercial bt formulation recorded 1.70% defoliation. Post count revealed that quinalphos recorded 0.20 *A. modicella* larvae while in chlorantraniliprole it was 0.26%. Both Bt formulations recorded 0.30 and 0.32 larvae respectively. Coccinelid population was maximum in control (1.16/plant) and in chemical insecticides quinalphos and chlorantraniliprole it was 0.61 and 0.66/plant respectively. Insecticides treated plots recorded 0.46 spiders /plant and in Bt formulations recorded 0.63 and 0.68 respectively. Pod yield (1850kg) and haulm (3420kg) yield was maximum in chlorantraniliprole with BCR of 1:2.00 while in control it was 1390kg pod and 2360kg haulm and BCR 1:1.40 (Table-1).

**Kharif 2021 :** Kharif 2021 results were tabulated in Table 2. *S.litura* leafdamage was maximumin control (10.60%) after the treatment. Minimum was recorded in

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**Table-1 : Effect of bio rational insecticides on groundnut defoliators (Kharif 2020).**

| S. No. | Treatments | Defoliators Damage (%) | | | | Larval population/plant | | Predators population/plant | | Yield (kg/ha) | | BCR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *S. litura* | | *A. modicella* | | *A. modicella* | | Cocci nelids | Spider | Pod | Haulm | |
| | | Pre count | Post count | Pre count | Post count | Pre count | Post count | | | | | |
| $T_1$ | Bt-127 SC @ 3ml/l | 5.0 (12.92) | 2.5 (9.10) | 5.7 (13.81) | 2.3 (8.72) | 0.9 (0.95) | 0.30 (0.55) | 0.86 (0.93) | 0.63 (0.79) | 1430 | 2570 | 1:1.5 |
| $T_2$ | Bt Commercial formulation (Delfin) @1g/l | 5.7 (13.81) | 2.1 (8.33) | 4.7 (12.52) | 1.7 (7.49) | 0.94 (0.97) | 0.32 (0.57) | 0.86 (0.93) | 0.68 (0.82) | 1530 | 2710 | 1:1.6 |
| $T_3$ | Quinalphos 25EC @ 2ml/l | 6.2 (14.42) | 1.8 (7.71) | 5.2 (13.18) | 1.22 (6.34) | 0.95 (0.97) | 0.20 (0.45) | 0.61 (0.78) | 0.46 (0.68) | 1540 | 2870 | 1:1.6 |
| $T_4$ | Chlorantraniliprole 18.5 SC @ 0.3 ml/l | 5.2 (13.18) | 1.73 (7.56) | 5.5 (13.56) | 0.82 (5.20) | 0.92 (0.96) | 0.26 (0.51) | 0.66 (0.81) | 0.46 (0.68) | 1760 | 3420 | 1:2.0 |
| $T_5$ | Control | 6.2 (14.42) | 10.6 (19.00) | 5.8 (13.94) | 14.22 (22.15) | 1.10 (1.05) | 1.50 (1.22) | 1.16 (1.08) | 0.75 (0.87) | 1390 | 2360 | 1:1.4 |
| C.D. | | 0.050 | 0.520 | 0.041 | 0.952 | 0.025 | 0.343 | 0.092 | 0.194 | 0.0006 | 0.0007 | - |
| SE(d) | | 0.022 | 0.238 | 0.018 | 0.437 | 0.011 | 0.157 | 0.042 | 0.089 | 0.0003 | 0.0003 | - |

**Table-2 : Effect of bio rational insecticides on groundnut defoliators (*Kharif* 2021).**

| S. No. | Treatments | Defoliators Damage (%) | | | | Larval population/plant | | Predators population/plant | | Yield (kg/ha) | | BCR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *S. litura* | | *A. modicella* | | *A. modicella* | | Cocci nelids | Spider | Pod | Haulm | |
| | | Pre count | Post count | Pre count | Post count | Pre count | Post count | | | | | |
| $T_1$ | Bt-127 SC @ 3ml/l | 6.00 (14.18) | 3.50 (10.78) | 6.70 (15.00) | 3.30 (10.47) | 0.80 (0.89) | 0.47 (0.69) | 0.74 (0.87) | 0.50 (0.73) | 1320 | 2480 | 1:1.37 |
| $T_2$ | Bt Commercial formulation (Delfin)@1g/l | 6.20 (14.42) | 3.10 (10.14) | 5.70 (13.81) | 2.70 (9.46) | 0.84 (0.92) | 0.45 (0.67) | 0.78 (0.88) | 0.54 (0.76) | 1450 | 2600 | 1:1.42 |
| $T_3$ | Quinalphos 25EC @ 2ml/l | 6.10 (14.30) | 2.80 (9.68) | 6.20 (14.42) | 2.20 (8.57) | 0.85 (0.92) | 0.35 (0.59) | 0.50 (0.71) | 0.32 (0.60) | 1580 | 2740 | 1:1.68 |
| $T_4$ | Chlorantraniliprole 18.5 SC @ 0.3 ml/l | 6.00 (14.18) | 2.73 (9.51) | 6.50 (14.77) | 1.80 (7.75) | 0.82 (0.91) | 0.38 (0.62) | 0.52 (0.75) | 0.34 (0.60) | 1860 | 3120 | 1:1.74 |
| $T_5$ | Control | 6.20 (14.42) | 10.60 (19.00) | 6.80 (15.12) | 12.20 (20.53) | 1.15 (1.07) | 1.84 (1.36) | 1.00 (1.00) | 0.60 (0.81) | 1240 | 2250 | 1:1.03 |
| | C.D. | 0.007 | 0.361 | 0.032 | 0.501 | 0.050 | 0.336 | 0.144 | 0.166 | 0.0009 | 0.0005 | - |
| | SE(d) | 0.003 | 0.165 | 0.015 | 0.230 | 0.023 | 0.154 | 0.066 | 0.076 | 0.0004 | 0.0002 | - |

**Table-3 : Effect of bio rational insecticides on groundnut defoliators (pooled).**

| S. No. | Treatments | Defoliators Damage (%) | | | | Larval population/plant | | Predators population/plant | | Yield (kg/ha) | | BCR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *S. litura* | | *A. modicella* | | *A. modicella* | | Coccin elids | Spider | Pod | Haulm | |
| | | Pre count | Post count | Pre count | Post count | Pre count | Post count | | | | | |
| 1. | Bt-127 SC @ 3ml/lit | 5.50 (13.55) | 3.00 (9.94) | 6.20 (14.40) | 2.80 (9.37) | 0.85 (0.92) | 0.38 (0.62) | 0.80 (0.90) | 0.56 (0.76) | 1370 | 2530 | 1:1.43 |
| 2. | Bt Commercial formulation (Delfin) @1g/lit | 5.95 (14.11) | 2.60 (9.23) | 5.20 (13.16) | 2.20 (8.47) | 0.89 (0.94) | 0.38 (0.62) | 0.82 (0.90) | 0.63 (0.72) | 1490 | 2650 | 1:1.51 |
| 3. | Quinalphos 25EC @ 2ml/lit | 6.15 (14.36) | 2.30 (8.69) | 5.70 (13.80) | 1.71 (4.89) | 0.90 (0.93) | 0.27 (0.52) | 0.55 (0.74) | 0.39 (0.64) | 1560 | 2810 | 1:1.64 |
| 4. | Chlorantraniliprole 18.5 SC @ 0.3 ml/l | 5.60 (13.68) | 2.23 (8.53) | 6.00 (14.16) | 1.31 (6.47) | 0.87 (0.93) | 0.32 (0.56) | 0.51 (0.78) | 0.40 (0.64) | 1810 | 3270 | 1:1.08 |
| 5. | Control | 6.30 (14.41) | 9.80 (18.71) | 6.30 (14.53) | 13.21 (21.34) | 1.12 (1.06) | 1.67 (1.29) | 1.08 (1.04) | 0.67 (0.84) | 1350 | 2310 | 1:1.21 |
| | C.D. | 0.028 | 0.440 | 0.036 | 0..726 | 0.037 | 0.339 | 0.118 | 0.180 | 0.0007 | 0.0006 | - |
| | SE(d) | 0.012 | 0.201 | 0.016 | 0.333 | 0.017 | 0.155 | 0.054 | 0.082 | 0.0003 | 0.0002 | - |

chlorantraniliprole (2.73%) followed by quinalphos (2.80%). Bt 127SC and Bt commercial formulations recorded 3.50 and 3.10% respectively. *A. modicella* leaf damage was minimum in chlorantraniliprole (1.80%) followed by quinalphos (2.20%). Bt commercial formulations recorded 2.70% and bt 127SC recorded 3.30%. quinalphos recorded 0.35 *A.modicella* larvae and chlorantraniliprole it was 0.38. Bt formulations recorded 0.47 and 0.45 respectively. Maximum coccinelid population (0.78) was recorded in bt commercial formulation followed by Bt-127 SC (0.74) while in control it was 1.00/plant. Minimum spider population was recorded in insecticides treated plots 0.32 and 0.34/plant respectively. Chlorantraniliprole recorded 1860kg of pod and 3120kg of haulm with 1:1.74 BC ratio.

**Pooled data :** Pooled data revealed that defoliation by *S.litura* was minimum in chlorantraniliprole 18.5SC @(2.23%) followed by quinalphos (2.30%) and bt commercial formulation(2.60%) and bt127SC (3.00%). *A.modicella* defoliation was maximum in untreated control (13.21%) and minimum in chlorantraniliprole (1.31%). Among the Bt formulations 2.20% defoliation was recorded in bt commercial formulation followed by bt 127SC (2.80%). Among the biopesticides, two scheduled sprays of *Bt.k* recorded higher incremental CB ratio as compared to other biopesticide treatments. *Helicoverpa* larval population was significantly lower in V-Bt, Bt-Halt sprayed sunflower (4). Commercial Bt formulation spray reduced 6.67% GLM mortality (5). *Bacillus thuringiensis* (*Bt*) at 2 ml/lit effectively reduced the *Spodoptera* larve in gloriosa (6). *A.modicella* larval population was minimum in quinolphos (0.27/plant) followed by chlorantraniliprole (0.32%) while in control it was 1.67/plant. Similar findings reported the superiority of chlorantraniliprole in reducing the defoliators (7). Two sprays of quinalphos reduced 79.6% groundnut leafminer larval population and Bt.k spray reduced 55.9% leafminer larvae (8). Coccinelid population was ranged in between 0.51-1.08/plant and spider population was ranged in between 0.40-0.67/plant. Predator population was reduced in insecticides treatment. Pod yield was maximum in chlorantraniliprole (1810kg/ha) followed by quinalphos (1560kg/ha), Bt commercial formulation (1440kg/ha) and Bt-127SC (1370kg/ha) while in control it was 1350kg/ha. Even though bt formulations recorded significant yield it stood behind chemical insecticides (9). Chlorantraniliprole recorded high BCR of 1: 1.87.

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