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# BIO–EFFICACY OF BIOPESTICIDES AGAINST SUCKING INSECT PESTS OF SUMMER GROUNDNUT

**M. K. YADAV AND P. K. BORAD**

Department of Entomology B.A.C.A., A.A.U., Anand, Gujarat 388110; mukeshyadav_rca@yahoo.com

## ABSTRACT

Field experiments was conducted at BACA. AAU. Anand on relative efficacy of different ten biocides against sucking insect pests of groundnut. Neem seed kernel extract (NSKE) @ 5 % and Vanguard 0.15 % EC @ 0.0006 % was found highly effective against jassid and thrips infesting groundnut and exhibited significantly higher pod and stover yield.

**Key words**: Botanicals, sucking pests and pod yield

## INTRODUCTION

Groundnut (*Arachis hypogaea* Linnaeus*)* is an annual legume crop which belongs to family Leguminoseae. It is world's largest source of edible oil and ranks 13th among the food crops as well as 4th most important oilseed crops of the world (Ramanathan, 2001). It is grown in tropical and sub–tropical regions and in the continental part of temperate countries. The seed (kernel) contains up to 50 % of a non drying oil, 40–50% fat, 20–50 % protein and 10–20 % carbohydrate (Mehta, 2002). Of the various oilseed crops, groundnut alone accounts 48 % of the oilseeds area and 60 % of total production in India (Singh *et al*., 2009). The crop is mainly attacked by 500 species of arthropod. The major insect pests damaging to groundnut crop are aphid (*Aphis craccivora* Koch), jassid (*Empoasca kerri* Pruthi), thrips (*Scritothrips dorsalis* Lindman).

## MATERIALS AND METHODS

With a view to find out the effective and economical biopesticides against sucking insect pests of groundnut, the field experiment was carried out in Randomized Block Design (RBD). Groundnut GG–20 was sown during the 2nd week of February and 2nd week of July, during 2010 at spacing of 60 x 15 cm. The gross and net plot size was 4.05 × 3.00 m and 3.45 x 1.80 m, respectively. Each treatment was replicated thrice.

First spray of biopesticides was applied on the appearance of the sucking insect pests. The second spray was applied after 15 days of first spray with help of manually operated knapsack sprayer having duromist nozzle. Leaf extract of *Ipomoea fistulosa* was made by grinding the sufficient quantity of leaves using grinder. To prepare neem seed kernel extract, the required quantity of kernels was weighed (250 g) on electric balance and grinded in Electric Grinder. The powder was kept in muslin cloth bag and soaked into 2 litre of water for overnight and thereafter, the bag was squeezed repeatedly until the out flowing fluid turned light brownish in colour. Finally, the required volume (5 litre) was prepared by adding water. Freshly prepared extract was diluted with water just before spraying. Five plants were selected randomly and tagged in each net plot area. The observations on sucking insect pests (jassid and thrips) was counted on three randomly selected branches of each plant. The observation were recorded prior to spray as well as 3, 7, 10 and 15 days after each spray. The groundnut crop was harvested at proper time. The pod and stover yield for each treatment was recorded separately from the net plot area and was computed as converted into kilogram per hectare.

## RESULT AND DISCUSSION

Pooled analysis (Table 1) showed that the plots treated with NSKE registered lowest (0.58) jassid population and it was at par with Vanguard (0.69) and Gronim (0.94). These three treatments were significantly superior to rest of the treatments. The NFLE, karanj oil, neem oil and Neemazal–T/S treated plots equally effective in checking the jassid population. The highest (3.07) jassid population was recorded in *V. lecani* followed by *M. anisopliae.*

Pooled analysis of second spray showed that the plot treated with NSKE registered lowest (0.50) jassid population and it was at par with Gronim (0.73) and Vanguard (0.80). These three treatments were significantly superior to rest of the biopesticides in controlling the jassid population. The NFLE treated plots exhibited 1.93 jassid and was at par with remaining biopesticides in

**Table 1. Bioefficacy of biopesticides against jassids infesting summer groundnut**

| Insecticides | Conc. (%) | No. of jassids/ 3 branches, Days after spray | | | | | | | | | | | | Pooled over sprays |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | First spray | | | | | | Second spray | | | | | | |
| | | Before spray | 3 | 7 | 10 | 15 | Pooled | Before spray | 3 | 7 | 10 | 15 | Pooled | |
| NSKE | 5 | 1.84 | 1.42 | 1.19 | 0.81 | 0.75 | 1.04 | 1.96 | 1.30 | 1.03 | 0.90 | 0.77 | 1.00 | 1.02 |
| | | (2.89) | (1.52) | (0.92) | (0.16) | (0.06) | (0.58) | (3.34) | (1.19) | (0.56) | (0.31) | (0.09) | (0.50) | (0.54) |
| Neem oil | 0.3 | 1.80 | 1.89 | 1.74 | 1.68 | 1.75 | 1.77 | 1.95 | 1.75 | 1.58 | 1.68 | 1.73 | 1.69 | 1.73 |
| | | (2.74) | (3.07) | (2.53) | (2.32) | (2.56) | (2.63) | (3.30) | (2.56) | (2.00) | (2.32) | (2.49) | (2.36) | (2.49) |
| Karanj oil | 0.3 | 1.83 | 1.76 | 1.71 | 1.60 | 1.77 | 1.71 | 1.99 | 1.73 | 1.69 | 1.70 | 1.70 | 1.70 | 1.70 |
| | | (2.85) | (2.60) | (2.42) | (2.06) | (2.63) | (2.42) | (3.46) | (2.49) | (2.36) | (2.39) | (2.39) | (2.39) | (2.39) |
| NFLE | 5 | 1.76 | 1.67 | 1.58 | 1.45 | 1.76 | 1.61 | 1.92 | 1.62 | 1.71 | 1.45 | 1.44 | 1.56 | 1.58 |
| | | (2.59) | (2.28) | (1.99) | (1.60) | (2.59) | (2.09) | (3.18) | (2.12) | (2.42) | (1.60) | (1.57) | (1.93) | (1.99) |
| Vanguard 0.15 % EC | 0.0006 | 1.81 (2.78) | 1.42 (1.52) | 1.11 (0.73) | 0.96 (0.42) | 0.86 (0.24) | 1.09 (0.69) | 1.96 (3.34) | 1.57 (1.96) | 1.13 (0.78) | 0.95 (0.40) | 0.89 (0.29) | 1.14 (0.80) | 1.11 (0.73) |
| Gronim 0.30 % EC | 0.0006 | 1.90 (3.11) | 1.46 (1.63) | 1.32 (1.24) | 1.01 (0.52) | 1.00 (0.50) | 1.20 (0.94) | 1.98 (3.42) | 1.31 (1.22) | 1.16 (0.85) | 0.98 (0.46) | 0.96 (0.42) | 1.11 (0.73) | 1.15 (0.82) |
| Neemazal T/S 1 % EC | 0.0006 | 1.90 (3.11) | 1.95 (3.30) | 1.75 (2.56) | 1.74 (2.53) | 1.89 (3.07) | 1.83 (2.85) | 1.98 (3.42) | 1.77 (2.63) | 1.75 (2.56) | 1.60 (2.06) | 1.77 (2.66) | 1.72 (2.46) | 1.77 (2.63) |
| *Verticillium lecani* | 0.4 | 1.94 (3.26) | 1.94 (3.26) | 1.88 (3.03) | 1.81 (2.78) | 1.96 (3.34) | 1.89 (3.07) | 1.98 (3.42) | 1.72 (2.46) | 1.60 (2.06) | 1.68 (2.32) | 1.75 (2.56) | 1.69 (2.36) | 1.80 (2.74) |
| *Metarhizium anisopliae* | 0.4 | 2.00 (3.50) | 1.96 (3.34) | 1.84 (2.89) | 1.65 (2.22) | 2.02 (3.58) | 1.87 (3.00) | 1.92 (3.19) | 1.66 (2.26) | 1.70 (2.39) | 1.76 (2.60) | 1.76 (2.60) | 1.72 (2.46) | 1.79 (2.70) |
| Control | | 2.04 (3.66) | 2.60 (6.26) | 2.73 (6.95) | 2.91 (7.97) | 3.13 (9.30) | 2.84 (7.57) | 1.96 (3.34) | 2.55 (6.00) | 2.77 (7.17) | 2.91 (7.97) | 2.58 (6.16) | 2.71 (6.84) | 2.77 (7.17) |
| S. Em. ± | – | 0.06 | 0.12 | 0.14 | 0.17 | 0.16 | 0.07 | 0.03 | 0.15 | 0.10 | 0.13 | 0.13 | 0.06 | 0.08 |
| C. D. at 5% | – | NS | 0.37 | 0.42 | 0.51 | 0.48 | 0.22 | NS | 0.43 | 0.29 | 0.38 | 0.38 | 0.18 | 0.25 |
| C. V. % | – | 5.41 | 11.86 | 14.38 | 19.06 | 16.64 | 15.48 | 3.00 | 14.85 | 10.57 | 14.21 | 14.43 | 13.64 | 13.10 |

Figures in the parentheses are retransformed values, those outside are $\sqrt{X + 0.5}$ values

**Table 2. Bioefficacy of biocides against thrips infesting on summer groundnut**

| Insecticides | Conc. (%) | No. of thrips/ 3 branches Days after spray | | | | | | | | | | | | Pooled over sprays |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | First spray | | | | | | Second spray | | | | | | |
| | | Before spray | 3 | 7 | 10 | 15 | Pooled | Before spray | 3 | 7 | 10 | 15 | Pooled | |
| NSKE | 5 | 2.01 (3.54) | 1.47 (1.66) | 1.17 (0.87) | 0.80 (0.14) | 0.79 (0.12) | 1.06 (0.62) | 1.93 (3.22) | 1.35 (1.32) | 1.15 (0.82) | 0.90 (0.31) | 0.80 (0.14) | 1.05 (0.60) | 1.05 (0.60) |
| Neem oil | 0.3 | 1.99 (3.46) | 1.86 (2.96) | 1.74 (2.53) | 1.68 (2.32) | 1.54 (1.87) | 1.70 (2.39) | 1.94 (3.26) | 1.62 (2.12) | 1.49 (1.72) | 1.54 (1.87) | 1.54 (1.87) | 1.54 (1.87) | 1.62 (2.12) |
| Karanj oil | 0.3 | 1.96 (3.34) | 1.68 (2.32) | 1.71 (2.42) | 1.60 (2.06) | 1.60 (2.06) | 1.65 (2.22) | 1.98 (3.42) | 1.65 (2.22) | 1.54 (1.87) | 1.45 (1.60) | 1.48 (1.69) | 1.53 (1.84) | 1.59 (2.03) |
| NFLE | 5 | 1.98 (3.42) | 1.77 (2.63) | 1.58 (1.99) | 1.37 (1.37) | 1.45 (1.60) | 1.54 (1.87) | 1.92 (3.18) | 1.74 (2.52) | 1.51 (1.78) | 1.32 (1.24) | 1.50 (1.75) | 1.52 (1.81) | 1.53 (1.84) |
| Vanguard 0.15 % EC | 0.0006 | 1.92 (3.19) | 1.48 (1.69) | 1.32 (1.24) | 0.99 (0.48) | 0.89 (0.29) | 1.17 (0.87) | 1.94 (3.26) | 1.51 (1.78) | 1.15 (0.82) | 1.03 (0.56) | 0.90 (0.31) | 1.15 (0.82) | 1.16 (0.85) |
| Gronim 0.30 % EC | 0.0006 | 2.00 (3.50) | 1.50 (1.75) | 1.49 (1.72) | 1.01 (0.52) | 0.93 (0.36) | 1.23 (1.01) | 2.00 (3.50) | 1.41 (1.49) | 1.26 (1.09) | 1.04 (0.58) | 0.93 (0.36) | 1.16 (0.85) | 1.19 (0.92) |
| Neemazal T/S 1 % EC | 0.0006 | 1.97 (3.38) | 1.87 (3.00) | 1.78 (2.67) | 1.74 (2.53) | 1.70 (2.39) | 1.77 (2.63) | 1.94 (3.26) | 1.46 (1.63) | 1.66 (2.26) | 1.44 (1.57) | 1.33 (1.27) | 1.47 (1.66) | 1.62 (2.12) |
| *Verticillium lecani* | 0.4 | 2.04 (3.66) | 1.86 (2.96) | 1.67 (2.29) | 1.81 (2.76) | 1.77 (2.63) | 1.78 (2.67) | 1.90 (3.11) | 1.80 (2.74) | 1.74 (2.53) | 1.70 (2.39) | 1.70 (2.39) | 1.73 (2.49) | 1.75 (2.56) |
| *Metarhizium anisopliae* | 0.4 | 2.03 (3.62) | 1.70 (2.39) | 1.83 (2.85) | 1.86 (2.96) | 1.81 (2.78) | 1.80 (2.74) | 1.91 (3.15) | 1.82 (2.81) | 1.74 (2.53) | 1.70 (2.39) | 1.72 (2.46) | 1.75 (2.56) | 1.77 (2.63) |
| Control | | 2.00 (3.50) | 2.77 (7.17) | 2.98 (8.38) | 3.19 (9.68) | 3.42 (11.20) | 3.09 (9.05) | 1.95 (3.30) | 2.91 (7.97) | 3.28 (10.26) | 2.61 (6.31) | 2.56 (6.05) | 2.84 (7.57) | 2.98 (8.38) |
| S. Em. ± | – | 0.14 | 0.11 | 0.11 | 0.10 | 0.10 | 0.27 | 0.14 | 0.14 | 0.13 | 0.15 | 0.16 | 0.20 | 0.07 |
| C. D. at 5% | – | NS | 0.31 | 0.31 | 0.30 | 0.30 | 0.09 | NS | 0.40 | 0.39 | 0.43 | 0.48 | 0.07 | 0.21 |
| C. V. % | – | 12.31 | 10.17 | 10.17 | 10.05 | 11.09 | 11.33 | 12.55 | 13.59 | 13.74 | 17.17 | 19.48 | 15.88 | 10.11 |

Figures in the parentheses are retransformed values, those outside are $\sqrt{X + 0.5}$ values

**Table 3. Economics of various biocides used for the control sucking insect pests of summer groundnut**

| Biocides | Conc. (%) | Qty. of botanicals for two sprays (l or kg/ha) | Total cost of treatment for two sprays (Rs/ha) | Yield (q/ha) | | Gross realization (Rs/ha) | Net realization (Rs/ha) | Net profit (Rs/ha) | ICBR | NICBR |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Pod | Stover | | | | | |
| NSKE | 5 | 40.00 | 840.00 | 27.84 | 45.42 | 87036 | 26410 | 25570.0 | 1:30.44 | 1:29.44 |
| Neem oil | 0.3 | 2.40 | 893.40 | 24.42 | 35.33 | 75436 | 14810 | 13916.6 | 1:15.57 | 1:14.57 |
| Karanj oil | 0.3 | 2.40 | 893.40 | 22.66 | 32.67 | 69982 | 9356 | 8462.6 | 1:09.47 | 1:08.47 |
| NFLE | 5 | 40.00 | 833.40 | 22.46 | 30.21 | 69490 | 8864 | 8030.6 | 1:09.63 | 1:08.63 |
| Vanguard | 0.0006 | 6.40 | 2748.00 | 25.47 | 42.93 | 79902 | 19276 | 16528.0 | 1:06.01 | 1:05.01 |
| Gronim | 0.0006 | 3.20 | 1169.40 | 23.50 | 43.45 | 74490 | 13864 | 12694.0 | 1:10.85 | 1:09.85 |
| Neemazal–T/S | 0.0006 | 0.80 | 1233.40 | 25.32 | 34.23 | 77742 | 17116 | 15882.6 | 1:12.87 | 1:11.87 |
| *V. lecani* | 0.4 | 3.20 | 1136.00 | 21.32 | 32.40 | 66176 | 5550 | 4414.0 | 1:03.88 | 1:02.88 |
| *M. anisopliae* | 0.4 | 3.20 | 1872.00 | 21.05 | 31.77 | 65294 | 4668 | 2797.0 | 1:01.49 | 1:00.49 |
| Control | – | – | – | 19.50 | 30.13 | 60626 | – | – | – | – |

Labour charge: 160 Rs/labour/day  Market price of groundnut pod and stover 2800 and 200 Rs/q, respectively

checking the pest population. The highest (2.46) jassid incidence was recorded in plots treated with *M. anisopliae* and was at par with, Neemazal–T/S, karanj oil and neem oil.

Results of overall pooled of two sprays (Table 1) revealed that the loweest jassid population (0.54) was observed in plots treated with NSKE and it was at par with Vanguard (0.73) and Gronim (0.82). These three biopesticides were significantly more effective than rest of the treatments. The NFLE, karanj oil and neem oil registered 1.99, 2.39 and 2.49 jassids per 3 branches, respectively. The highest (2.74) jassid population was noted in plots treated with *V. lecani* followed by *M. anisopliae* and Neemazal–T/S.

Pooled over period (Table 2) results of first spray indicated that the NSKE, Vanguard and Gronim (0.62, 0.87 and 1.01 thrips per 3 branches, respectively) were found superior to remaining treatments against thrips on groundnut. The NFLE, karanj oil and neem oil treatments exhibited thrips population between 1.84 and 2.39 per 3 branches. The highest (2.74) thrips population was observed in plots treated with *M. anisopliae* followed by *V. lecani* and Neemazal–T/S.

Pooled over period results of second spray in summer season indicated the superiority of NSKE, Vanguard and Gronim against thrips on groundnut. These three treatments were at par with each other and significantly superior to rest of the treatments. Neemazal–T/S, NFLE, karanj oil and neem oil treated plots exhibited thrips population between 1.66 and 1.87 per 3 branches of groundnut and were at par with each other. The highest (2.56) thrips population was recorded in plots treated with *M. anisopliae* and it was at par with *V. lecani*.

Pooled over period and spray results (Table 2) showed that the lowest (0.60) thrips population was observed in the plots treated with NSKE and it was at par with Vanguard (0.85) and Gronim (0.92). The NFLE, karanj oil, neem oil and Neemazal were found equally effective with mean population ranging from 1.84 to 2.12 thrips per 3 branches. The highest (2.63) thrips population was noted in plots treated with *M. anisopliae* followed by *V. lecani* and Neemazal–T/S.

Based on the results of two sprays, it can be concluded that the plots treated with NSKE 5 %, Vanguard 0.15 % EC @ 0.0006 and Gronim 0.30 % @ 0.0006 % per cent were found more effective against sucking insect pests (jassid and thrips) on groundnut. The effectiveness of NSKE 5% was proved against jassid and thrips infesting groundnut by Patil *et al*. (2003).The NFLE 5 per cent, karanj oil 0.3 per cent, neem oil 0.3 per cent *M. anisopliae* @ 40 g /10 litres of water and *V. lecani* @ 40 g /10 litres of water were observed comparatively lower effective against sucking insect pests (jassid and thrips). Neemazal–T/S 1 % EC @ 0.0006 % comparatively poor against jassid and thrips. Anitha (2007) evaluated 7 biopesticides with one standard check and found that *M. anisopliae* @ 0.1% found less effective against jassid, Sardana and Kumar (1989) tested effectiveness of neem (0.5 to 2%) and karanj (0.5 to 2%) oil against jassid and mentioned that the oil failed to provide any significant control of jassid population.

Maximum (26410 Rs/ha) net realization was obtained (Table 3) in the treatment of NSKE followed by Vanguard (19276 Rs/ha), Neemazal–T/S (17116 Rs/ha), neem oil (14810 Rs/ha) and Gronim (13864 Rs/ha). Rest of the treatments registered net realization between 4668 and 9356 Rs/ha. Looking to the NICBR, the highest (1: 29.44) return was obtained with the treatment of NSKE. The NICBR between 8 to 15 was for neem oil, Neemazal–T/S, Gronim, NFLE and karanj oil. The NICBR of *M. anisopliae, V. lecani* and Vanguard were 1: 00.49 1: 02.88, and 1: 05.01, respectively,

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