Madras Agric. J., 100 (4-6): 551-553, June 2013
https://doi.org/10.29321/MAJ.10.001355

# Management of Lepidopteran Pests of Groundnut Using Plant Origin Insecticides

**R.K. Murali Baskaran* and D.S. Rajavel**
Department of Agricultural Entomology, Agricultural College and Research Institute
Tamil Nadu Agricultural University, Madurai - 625 104

**A field experiment was conducted during August 2011 to November 2011 at Thumpaipatti, Madurai to evaluate field efficacy of botanicals and fish oil rosin soap for the management of lepidopteran pests of groundnut. Five rounds of application of six botanical insecticides at ten days interval were made starting from 30 days after sowing up to 70 days and the leaf damage caused by leafminer (*Aproaerema modicella* Dev.), tobacco caterpillar (*Spodoptera litura* F.) and gram pod borer (*Helicoverpa armigera* L.) on groundnut were recorded. Azadirachtin 0.15 EC (Neem Gold @ 1.5 ml/lit.) was effective in reducing leaf damage caused by leafminer, tobacco caterpillar and gram pod borer, recording the mean leaf damages of 8.4, 8.8 and 9.7 per cent as against 25.9, 28.2 and 22.9, respectively, while it was 25.9, 28.2 and 22.9 in untreated check. Azadirachtin recorded the highest yield of 1630 kg wet pods/ha while it was 926 kg wet pods/ha in untreated check.**

**Key words**: Botanicals, *Aproaerema modicella*, *Spodoptera litura*, *Helicoverpa armigera*

Groundnut (*Arachis hypogaea* L.) belonging to the family Fabaceae (Leguminosae) is one of the main oilseed crops of India and it ranks second in the world in production. Groundnut yield in Tamil Nadu (1784 kg of pods /ha) is higher than world average (1336 kg/ha) and it ranks first in India. Groundnut ranks first among oilseeds with high oil recovery (40%). Around 40 to 50 per cent of the output is used in oil production and the rest being used as seed and feed. Groundnut is a good source of niacin, and thus contributes to brain health and blood flow. More than 100 species of insects and mites are known to attack groundnut (Nandagobal, 1992). Total annual loss from these pests is estimated at about Rs.1600 million (Amin, 1983). Groundnut leaf miner, *Aproaerema modicella* Dev., tobacco caterpillar, *Spodoptera litura* F., and gram pod borer, *Helicoverpa armigera* L. are considered as major pests of groundnut (Paras Nath, 1993). Botanical insecticides are one of the avenues in plant protection. Formulated products of neem were reported to be superior than crude products of neem in managing major insect pests of agricultural and horticultural crops (Regupathy and Ayyasamy, 1999). The present study was carried out to generate information on the field efficacy of formulated product of neem and few botanicals for the management of lepidopteran pests of groundnut.

## Materials and Methods

A field experiment was conducted during August 2011 to November 2011 at 31.8 ± 2.2$^0$C and 79.8 ± 3.6 per cent relative humidity to evaluate field efficacy of botanicals against lepidopteran pests of groundnut at Thumpaipatti, Madurai district Neem oil 3%, Karanj oil 3%, Mahua oil 3%, Neem gold 0.15% @ 1.5 ml/lit, NSKE 5%, Neem cake extract 5% and untreated check. Groundnut seeds were dibbled in ridges and furrows with a spacing of 30 x 10 cm. Each plot measuring 5 x 4 m was replicated thrice for each treatment using randomized block design. Five rounds of application of above said treatments were given at ten days interval, starting from 30 days after dibbling. Leaf mining and folding of leaflets caused by *A. modicella*, symmetrical holes on unfurled leaves caused by *H. armigera* and scrapping and defoliation leaving the veins of the leaflets caused by *S. litura* were recorded on 30, 40, 50, 60 and 70 DAS. Yield of wet pod was recorded during harvest. Arcsine transformations were applied to data on per cent damage by insect pests during statistical analysis and means were separated by DMRT (Duncan, 1995).

*Corresponding author email: muralibaskaran2007@rediffmail.com

## Results and Discussion

### *a. Leaf damage by A. modicella*

Plots applied with five rounds of Neem Gold recorded the lowest mean leaf damage of 8.4% with a reduction of leaf damage over untreated check of 66.9 per cent, followed by NSKE (12.0%) and neem oil (12.5 %) with a reduction over untreated check of 53.6 and 51.3 per cent, respectively (Table 1). Five rounds of application of Neem Gold, NSKE and neem oil were effective in reducing the leaf damage by leafminer, resulting in 16.8, 15.5, 13.1, 6.3 and 2.7 per cent; 17.4, 16.1, 13.7, 8.9 and 4.3 per cent and 17.8, 16.5, 14.1, 9.8 and 4.7 per cent during 30,

**Table 1. Per cent leaf damage by *Aproaerema modicella* on groundnut, as influenced by botanicals**

| Treatment | Pre-count % leaf damage (30 DAS) % | Leaf damage by leafminer/5 plants* 30 DAS | 40 DAS | 50 DAS | 60 DAS | 70 DAS | Mean | % reduction over control |
|---|---|---|---|---|---|---|---|---|
| Neem oil 3% | 20.6 | 17.8 | 16.5 | 14.1 | 9.8 | 4.7 | 12.5 | 50.1 |
| | | (25.10)$_{d}$ | (24.04)$_{cd}$ | (22.05)$_{c}$ | (18.24)$_{d}$ | (12.52)$_{a}$ | | |
| Karanj oil 3% | 21.2 | 17.8 | 16.5 | 14.4 | 9.3 | 5.2 | 12.6 | 51.3 |
| | | (24.95)$_{c}$ | (23.96)$_{c}$ | (22.30)$_{d}$ | (17.75)$_{c}$ | (13.18)$_{ab}$ | | |
| Mahua oil 3% | 20.8 | 18.4 | 17.1 | 14.7 | 9.9 | 5.3 | 13.0 | 49.8 |
| | | (25.40)$_{e}$ | (24.42)$_{e}$ | (22.54)$_{e}$ | (18.33)$_{d}$ | (13.31)$_{ab}$ | | |
| Neem gold 0.15 % @ 1.5 ml/lit. | 21.4 | 16.8 | 15.5 | 13.1 | 6.3 | 2.7 | 8.4 | 69.9 |
| | | (24.19)$_{a}$ | (23.18)$_{a}$ | (21.21)$_{a}$ | (14.74)$_{a}$ | (7.09)$_{a}$ | | |
| NSKE 5% | 19.8 | 17.4 | 16.1 | 13.7 | 8.9 | 4.3 | 12.0 | 53.6 |
| | | (24.65)$_{b}$ | (23.65)$_{b}$ | (21.72)$_{b}$ | (17.35)$_{b}$ | (11.96)$_{a}$ | | |
| Neem cake extract 5% | 23.1 | 19.0 | 17.7 | 15.3 | 10.5 | 5.9 | 13.6 | 47.5 |
| | | (25.84)$_{f}$ | (24.88)$_{f}$ | (23.02)$_{f}$ | (18.90)$_{e}$ | (14.05)$_{c}$ | | |
| Untreated check | 20.9 | 26.3 | 28.0 | 30.4 | 24.6 | 18.2 | 25.9 | — |
| | | (30.85)$_{g}$ | (31.94)$_{g}$ | (33.46)$_{g}$ | (29.73)$_{f}$ | (25.25)$_{d}$ | | |
| SEd | | 0.0560 | 0.0673 | 0.0749 | 0.0678 | 0.6207 | — | — |
| CD 5% | | 0.1200 | 0.1444 | 0.1607 | 0.1454 | 1.3315 | | |

*Mean of three replications; Five rounds of spray given at 10 days interval starting from 30 DAS; Figures in parentheses are arcsine transformed values. In a column, means followed by same letter(s) are not significantly different by DMRT (P=0.05)

40, 50, 60 and 70 DAS, respectively, followed by karanj oil, mahua oil and neem cake extract. The leaf damage was 26.3, 28.0, 30.4, 24.6 and 18.2 per cent in untreated check (Table 1).

***b. Leaf damage by S. litura***

Five rounds of Neem Gold recorded the lowest mean leaf damage of 8.8 % with a reduction of leaf damage over untreated check of 68.7 per cent, followed by NSKE (9.4%) which is on par with karanj oil (9.4 %) with a reduction over untreated check of 66.6 and 66.6 per cent, respectively (Table 2). Neem gold (1.5 ml/lit.) recorded the lowest leaf damage by *S. litura* (17.6, 14.4, 8.2, 2.6 and 1.3%) during 30, 40, 50, 60 and 70 DAS, respectively, which was significantly different from the remaining treatments,

**Table 2. Per cent leaf damage by *Spodoptera litura* on groundnut, as influenced by botanicals**

| Treatment | Pre-count % leaf damage (30 DAS) % | Leaf damage by *S. Litura* /5 plants* 30 DAS | 40 DAS | 50 DAS | 60 DAS | 70 DAS | Mean | % reduction over control |
|---|---|---|---|---|---|---|---|---|
| Neem oil 3% | 22.2 | 18.6 | 15.4 | 9.2 | 3.6 | 2.3 | 9.8 | 65.2 |
| | | (25.54)$_{c}$ | (23.10)$_{c}$ | (17.65)$_{c}$ | (10.93)$_{d}$ | (8.72)$_{c}$ | | |
| Karanj oil 3% | 22.6 | 18.2 | 15 | 8.8 | 3.2 | 1.9 | 9.4 | 66.6 |
| | | (25.25)$_{b}$ | (22.78)$_{b}$ | (17.25)$_{b}$ | (10.30)$_{c}$ | (7.92)$_{b}$ | | |
| Mahua oil 3% | 21.8 | 19.8 | 16.6 | 10.4 | 4.8 | 3.5 | 11.0 | 60.9 |
| | | (26.42)$_{d}$ | (24.04)$_{d}$ | (18.81)$_{d}$ | (12.65)$_{e}$ | (10.78)$_{d}$ | | |
| Neem gold 0.15 % @ 1.5 ml/lit. | 21.1 | 17.6 | 14.4 | 8.2 | 2.6 | 1.3 | 8.8 | 68.7 |
| | | (24.80)$_{a}$ | (22.30)$_{a}$ | (16.64)$_{a}$ | (9.27)$_{a}$ | (6.54)$_{a}$ | | |
| NSKE 5% | 21.7 | 18.2 | 15 | 8.8 | 3.2 | 1.9 | 9.4 | 66.6 |
| | | (25.25)$_{b}$ | (22.78)$_{b}$ | (17.25)$_{b}$ | (10.30)$_{b}$ | (7.92)$_{b}$ | | |
| Neem cake extract 5% | 21.9 | 20.3 | 17.1 | 10.9 | 5.3 | 4 | 11.5 | 59.2 |
| | | (26.78)$_{e}$ | (24.42)$_{e}$ | (19.27)$_{e}$ | (13.31)$_{g}$ | (11.53)$_{e}$ | | |
| Untreated check | 22.4 | 26.8 | 30.4 | 34.6 | 33.2 | 10.5 | 28.2 | — |
| | | (31.17)$_{f}$ | (33.46)$_{f}$ | (36.03)$_{f}$ | (35.18)$_{g}$ | (33.33)$_{f}$ | | |
| SEd | | 0.0609 | 0.0503 | 0.0828 | 0.0958 | 0.1454 | | |
| CD 5% | | 0.1305 | 0.1080 | 0.1777 | 0.2055 | 0.3118 | — | — |

*Mean of three replications; Five rounds of spray given at 10 days interval starting from 30 DAS; Figures in parentheses are arcsine transformed values. In a column, means followed by same letter(s) are not significantly different by DMRT (P=0.05)

followed by NSKE (18.2, 15.0, 8.8, 3.2 and 1.9 %) and karanj oil (18.2, 15.0, 8.8, 3.2 and 1.9 %) for the same periods of observation. The next best treatment was neem oil (18.6, 15.4, 9.2, 3.6 and 2.3%) which was significantly different from neem cake extract and mahua oil. The leaf damage was 26.8, 30.4, 34.6, 33.2 and 10.5 per cent in untreated check during 30, 40, 50, 60 and 70 DAS (Table 2).

***c. Leaf damage by H. armigera***

Plots applied with five rounds of Neem Gold recorded the lowest mean leaf damage of 8.4% with a reduction of leaf damage over untreated check of 63.3 per cent, followed by NSKE (11.3%) and mahua oil (11.4 %) with a reduction over untreated check of 50.6 and 50.2 per cent, respectively (Table 3). Neem gold (1.5 ml/lit.) recorded the lowest leaf damage by

**Table 3. Per cent leaf damage by *Helicoverpa armigera* on groundnut, as influenced by botanicals**

| Treatment* | Pre-count % leaf damage (30 DAS) % | Leaf damage by *H. armigera* /5 plants | | | | | Mean | % reduction over control | Wet pods (kg / ha) |
|---|---|---|---|---|---|---|---|---|---|
| | | 30 DAS | 40 DAS | 50 DAS | 60 DAS | 70 DAS | | | |
| Neem oil 3% | 14.5 | 11.8 (17.65)$_{e}$ | 12.9 (16.74)$_{ab}$ | 13.7 (14.77)$_{d}$ | 11.7 (11.82)$_{c}$ | 8.8 (8.72)$_{d}$ | 11.7 | 48.9 | 1608$_{bc}$ |
| Karanj oil 3% | 15.1 | 11.7 (17.25)$_{d}$ | 13.5 (16.32)$_{ab}$ | 14.3 (14.29)$_{e}$ | 12.3 (11.24)$_{d}$ | 9.4 (7.92)$_{e}$ | 12.2 | 46.4 | 1589$_{d}$ |
| Mahua oil 3% | 14.3 | 10.9 (17.85)$_{b}$ | 12.7 (16.95)$_{a}$ | 13.5 (15.00)$_{c}$ | 11.5 (12.10)$_{c}$ | 8.6 (9.09)$_{bc}$ | 11.4 | 50.2 | 1581$_{e}$ |
| Neem gold 0.15 % @ 1.5 ml/lit. | 13.8 | 10.2 (16.74)$_{a}$ | 11.8 (15.78)$_{a}$ | 12.8 (13.68)$_{a}$ | 8.4 (8.68)$_{a}$ | 7.2 (6.79)$_{a}$ | 8.4 | 63.3 | 1630$_{a}$ |
| NSKE 5% | 14.2 | 10.8 (17.35)$_{b}$ | 12.6 (16.43)$_{a}$ | 13.4 (14.41)$_{b}$ | 11.4 (11.39)$_{b}$ | 8.5 (8.13)$_{b}$ | 11.3 | 50.6 | 1614$_{b}$ |
| Neem cake extract 5% | 14.4 | 11.0 (19.18)$_{c}$ | 12.8 (18.33)$_{b}$ | 13.6 (16.53)$_{cd}$ | 11.6 (13.93)$_{c}$ | 8.7 (11.39)$_{cd}$ | 11.5 | 49.7 | 1535$_{f}$ |
| Untreated check | 14.5 | 21.6 (27.63)$_{f}$ | 24.4 (29.60)$_{c}$ | 28.8 (32.45)$_{f}$ | 20.6 (26.99)$_{e}$ | 17.2 (24.50)$_{f}$ | 22.9 | — | 926$_{g}$ |
| SEd | | 0.0788 | 0.9240 | 0.0683 | 0.0770 | 0.0798 | | | 0.1082 |
| CD 5% | | 0.1690 | 1.9821 | 0.1466 | 0.1651 | 0.1712 | | | 0.1502 |

*Mean of three replications; Five rounds of spray given at 10 days interval starting from 30 DAS; Figures in parentheses are arcsine transformed values. In a column, means followed by same letter(s) are not significantly different by DMRT (P=0.05)

*H. armigera* (10.2, 11.8, 12.8, 8.4 and 7.2%) during 30, 40, 50, 60 and 70 DAS, respectively, which was significantly different from NSKE (10.8, 12.6, 13.4, 11.4 and 8.5%) and mahua oil (10.9, 12.8, 13.6, 11.6 and 8.6%) for the same periods of observation, which was significantly different from neem cake extract and neem oil. The leaf damage was 21.6, 24.4, 28.8, 20.6 and 17.2 per cent in untreated check during 30, 40, 50, 60 and 70 DAS (Table 3).

***d. Yield of Groundnut***

Five rounds of application of Neem Gold at ten days interval recorded the highest yield of 1630kg wet pods/ha, followed by NSKE 5% (1614 wet pods/ ha) neem oil 3% (1608 kg wet pods/ha) and karanj oil 3% (1589 wet pods/ha) while it was 926 kg wet pods/ha in untreated check Table 2).

The effectiveness of various botanicals in managing sucking pest and defoliators on groundnut was in the order of Neem Gold > NSKE > karanj oil > neem oil > mahua oil > Neem cake extract. Formulated products of neem were reported to be superior to crude products of neem in managing major insect pests of agricultural and horticultural crops (Regupathy and Ayyasamy, 1999). In the present study, Neem Gold 0.15% EC was found to be superior in reducing the incidence of defoliators and recorded lowest leaf damage of leafminer (8.4%; 69.9%), *S. litura* (8.8 per cent; 68.7 %) and *H. armigera* (8.4 per cent; 63.3 %). However, the efficacy of karanj oil and NSKE closely followed the neem gold. Insecticidal property of neem gold has been well demonstrated on many insect pests, including, *Amsacta albistriga* Walker (Regupathy and Ayyasamy, 1999) and *Catopsilia pyranthe* (L.), *Eurema hecabe* (Moore) and *Etiella zinckenella* (Treit.) (Murali Baskaran *et al.,* 2008) etc. The insecticidal activity of karanj oil is due to a furaflavone, pongamin and its efficacy was evident on stored product pests (Murali Baskaran and Janarthanan, 2000). The treatment, neem gold 0.15% (1.5ml/lit) recorded the highest yield of 1630 kg wet pods/ha.

## References


Amin, P.W. 1983. Major field insect pests of groundnut in India and associated crop losses. *Indian J. Entomol*., **2**: 337-334

Duncan, D. B. 1995. Multiple range and multiple F tests. *Biometrics,* **11**: 1- 42

Murali Baskaran, R. K. and Janarthanan, R. 2000. Effect of dust formulations of certain plant oils against important pests of paddy and cowpea in storage. *J. Entomol. Res.,* **24**: 271-278

Murali Baskaran, R. K., Rajavel, D. S., Shanthi, M., Kumar, S., Suresh, K. and Senthil Kumaran, S. 2008. Field evaluation of botanicals and Fish oil Rosin Soap for the management of major Pests of Senna. pp. 184-189. **In**: Ecofriendly Insect Pest Management (eds., S. Ignacimuthu and B.V. David), Elite Publishing House Pvt. Ltd., New Delhi. 333p.

Nandagobal, V. 1992. Studies on integrated pest management in groundnut in Saurashtra, Ph.D. Thesis, Saurashtra University, Rajkot. 246 p.

Paras Nath. 1993. Studies on the groundnut insect pests and their management in east Utter Pradesh. Final Technical report of ICAR Ad hoc Project, Dept. of Entomology and Agrl.Zoology, Institute of Agrl. Sciences, Banaras Hindu University, Varanasi

Regupathy, A. and Ayyasamy, R. 1999. Conjunctive use of neem and trap cropping, a pest diversionary approach in pest management. **In:** IV$_{th}$ World Neem Conference, 19-22 May 1999, University of British Columbia, Vancouver, Canada, Abst. 17p.


Received: November 29, 2012; Accepted: March 19, 2013