Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2018; 7(1): 1191-1194
Received: 29-11-2017
Accepted: 30-12-2017

U Lakshminarayana
Department of Entomology, S. V. Agricultural College, Tirupati, Acharya N.G. Ranga Agricultural University, Tirupati, Andhra Pradesh, India

NC Venkateswarlu
Department of Entomology, S. V. Agricultural College, Tirupati, Acharya N.G. Ranga Agricultural University, Tirupati, Andhra Pradesh, India

KV Hariprasad
Department of Entomology, S. V. Agricultural College, Tirupati, Acharya N.G. Ranga Agricultural University, Tirupati, Andhra Pradesh, India

R Sarada Jayalakshmi Devi
University librarian, Guntur, Acharya N.G. Ranga Agricultural University, Andhra Pradesh, India

TNVKV Prasad
Institute of Frontier Technology, RARS, Tirupati, Andhra Pradesh, India

Correspondence
U Lakshminarayana
Department of Entomology, S. V. Agricultural College, Tirupati, Acharya N.G. Ranga Agricultural University, Tirupati, Andhra Pradesh, India

Management of groundnut leaf miner, *A. modicella* with Nano scale NSKE formulations

U Lakshminarayana, NC Venkateswarlu, KV Hariprasad, R Sarada Jayalakshmi Devi and TNVKV Prasad

Abstract
Groundnut leaf miner, *Aproaerema modicella* (Deventer) belonging to the family Gelechiidae causing considerable yield losses to groundnut crop. An experiment was conducted to study management of groundnut leaf miner with nano scale NSKE formulations during *kharif*, 2015. Different concentrations of nano scale Zn coated NSKE treatments were used i.e. nano scale (Zn) coated NSKE formulations @ 5 g/l, nano scale (Zn) NSKE formulations @ 10 g/l, nano scale (Zn) NSKE formulations @ 20 g/l, nano scale (Zn) NSKE formulations @ 30 g/l, and nano scale NSKE formulations @ 50 g/l, without nano scale NSKE formulations @ 50 g/l, quinalphos @ 2.0 ml/l, only silver nano particles @ 100 ppm. The efficacy of all treatments were evaluated at different stages. Results revealed that nano scale (Zn) coated NSKE formulation @ 30 g/l was found to be most effective treatment followed by nano scale NSKE formulations @ 50 g/l, quinalphos @ 2.0 ml/l, only silver nano particles @ 50 g/l, nano scale (Zn) NSKE formulations @ 20 g/l for management of groundnut leaf miner damage and also reduction of *Aproaerema modicella* larval population.

Keywords: Groundnut leaf miner, weather parameters

Introduction
Groundnut (*Arachis hypogaea* L.) belongs to Fabaceae family, commonly known as peanut. The botanical name of groundnut, *Arachis hypogaea* is derived from two Greek words, *Arachis* means a legume and *hypogaea* means below ground, referring to the formation of pods in the soil. Among all oilseed crops, it is one of the most important oil, food and cash crop in our country. It is also called as the 'King' of oilseeds. Groundnut is also called as wonder nut and poor men's cashew nut, is grown under varied soil and climatic conditions during *kharif* (rainy), *rabi* (winter) and summer seasons in India. The low level of productivity in India is largely because India about 100 species of insect pests and three mite species are considered to be economically important and causing damage to the crop. Among them red hairy caterpillar *Amsacta albistriga* (Walker), gram caterpillar *Helicoverpa armigera* (Hubner), tobacco caterpillar *Spodoptera litura* (Fabricius), leaf miner *Aproarema modicella* (Deventer), root grub *Holotrichia consanguinea* (Blanchard), leaf hopper *Emposca kerri* Pruthi, thrips *Scirtothrips dorsalis* (Hood), *Frankliniella schultzei* (Trybom) and *Thrips palmi* (Kamy), aphids *Aphis craccivora* (Koch) are causing damage to the crop. Groundnut leaf miner is an oligophagous pest and it feeds on groundnut and soybean (Ayyar, 1963, Nair 1975, Reddy, 1988) [2, 6, 10] causing yield losses to the extent of 76 per cent (Anonymous, 1986).

Material and methods
The management trial was laid out in randomized block design (RBD) with 3 replications, with nine treatments. The plot size was 4 × 3 m, Spacing maintained between row to row was 30 cm and plant to plant 10 cm nano coated NSKE formulations were tested with different concentrations to find out the efficiency with the following dosage. Two sprays were given with different concentrations of nano scale NSKE formulations on groundnut for the management of leaf miner. The first spray was taken as soon as the leaf miner incidence was appeared in first week of September month and second spray was given with the gap of 25 days after first spray. Fifteen plants were selected randomly in each plot. The observations were recorded on incidence of leaf miner before spraying and after spraying of nano scale NSKE treated solution. The data was recorded at 5 days intervals starting from first spray of the crop to find out the efficacy of different concentrations of NSKE formulations. Four leaflets of groundnut were considered as one leaf and calculated the per cent incidence of leaf miner. Field observations were recorded during cool hours of the day.

The incidence of groundnut leaf miner *A. modicella* was assessed in terms of leaf mines and webbed leaves as well as number of larvae in webbed leaves and pupae per leaf on 15 plants of each plot. Data on percent damage was recorded by counting the number of damaged leaves and total number of leaves present on the plant.

Table 1: Treatments- different concentrations of NSKE formulations.

Treatment No.	Name of the treatment	Dose
T1	Nano scale NSKE formulation (5%)	5.0 g/l
T2	Nano scale NSKE formulation	10.0 g/l
T3	Nano scale NSKE formulation	20.0 g/l
T4	Nano scale NSKE formulation	30.0 g/l
T5	Nano scale NSKE formulation	50.0 g/l
T6	Without Nano scale NSKE	50.0 g/l
T7	Quinalphos	2.0 ml/l
T8	Silver Nano particles	100 ppm
T9	Control without spray	

Results and discussion

The data on incidence of groundnut leaf miner that was collected from the field was correlated with weather parameters obtained from meteorological observatory, RARS, Tirupati.

1. Mean number of Larval Population of Leaf Miner, *A. modicella* After Second Spray

1 Pre-treatment count

The pre-treatment count was recorded on number of larvae present in webbed leaves and it was ranged from 5.38 to 6.27 at one day before spray. The data indicated that there was no significant difference between various treatments (Table 1.2).

1.1. Five days after treatment

The results showed that there was significant reduction in number of larvae present in webbed leaves over pre-count in all the treatments than untreated control. Among all the treatments, the lowest number of larvae of leaf miner (2.62) was observed in the nano scale (Zn) NSKE formulations @ 30 g/l followed by nano scale (Zn) NSKE formulations @ 50 g/l (2.70) and quinalphos @ 2.0 ml/l (2.79) treatments and are on par with each other. The remaining treatments *viz.*, nano scale (Zn) NSKE formulations @ 20 g/l, only silver nano particles @ 100 ppm, nano scale (Zn) NSKE formulations @ 10 g/l, without nano scale NSKE formulations @ 50 g/l and nano scale (Zn) NSKE formulations @ 5 g/l recorded 2.86, 2.92, 2.96, 3.12 and 3.26 larval in webbed leaves respectively. However, maximum number of larvae (4.55) were recorded in untreated control (Table 1.2).

1.2 Ten days after treatment

In all the treatments, the leaf miner larval population were decreased at Ten days after spraying as compared to Five days after spraying except untreated control. The number of larvae present in webbed leaves were 1.42, 1.47, 1.51, 1.54, 1.61, 1.65, 1.85 and 1.90 presented respectively in the treatments, *viz.*, nano scale (Zn) NSKE formulations @ 30 g/l, nano scale NSKE formulations @ 50 g/l, quinalphos @ 2.0 ml/l, only silver nano particles @ 100 ppm, nano scale (Zn) NSKE formulations @ 20 g/l, nano scale (Zn) NSKE formulations @ 10 g/l, without nano scale NSKE formulations (50 g/l), nano scale (Zn) NSKE formulations @ 5 g/l, respectively. Ten days after the treatment nano scale (Zn) NSKE formulations @ 30 g/l was recorded less number of larvae than best treatments. However, the maximum number of larvae (7.91) was recorded in untreated control (Table 1.2).

1.3 Fifteen days after treatment

There was slight increase in the larvae of groundnut leaf miner except nano scale (Zn) NSKE formulations @ 30 g/l. Less number of larvae of leaf miner was recorded in the treatment of nano scale (Zn) NSKE formulations 30 g/l (1.35) followed by quinalphos @ 2.0 ml/l (1.51), nano scale (Zn) NSKE formulations @ 50 g/l (1.59), nano scale (Zn) NSKE formulations @ 20 g/l (1.61), The treatments without nano scale NSKE formulations @ 50 g/l (1.78), nano scale (Zn) NSKE formulations @ 10 g/l (1.82), only silver nano particles @ 100 ppm (1.84), and nano scale (Zn) NSKE formulations @ 5 g/l (2.10) were showed lower efficacy. The untreated control recorded highest number of larvae in webbed leaves (7.94) (Table 1.2).

II. Mean number of Larval Population of Leaf Miner, *A. modicella* After Second Spray

2.1 Pre-treatment count

The pre-treatment count was taken on number of larvae present in webbed leaves and it was ranged from 6.09 to 9.89 one day before spray the data indicated that there was no significant difference between various treatments (Table 1.2).

2.2. Five days after treatment

The results showed that there was significant reduction in larval population of groundnut leaf miner over pre-count in all the treatments than untreated control Among all the treatments, the lowest number of larvae of leaf miner was (1.59) observed in the treatment nano scale (Zn) NSKE formulations @ 30 g/l followed by nano scale (Zn) NSKE formulations @ 50 g/l (1.75) and quinalphos @ 2.0 ml/l (2.06) treatments. The remaining treatments *viz.*, nano scale (Zn) NSKE formulations @ 20 g/l, only silver nano particles @ 100 ppm, (Zn) NSKE formulations @ 10 g/l, without nano scale NSKE formulations @ 50 g/l and nano scale (Zn) NSKE formulations @ 5 g/l recorded 2.17, 2.27, 3.03, 3.04 and 3.21, larval population respectively. However, maximum number of larvae (9.35) was recorded in untreated control (Table 1.2).

2.3 Ten days after treatment

In all the treatments even fifteen days after spray the larval population was reduced in webbed leaves than untreated control. The lowest number of larvae was (1.50) observed in the treatment of nano scale (Zn) NSKE formulations @ 30 g/l followed by nano scale (Zn) NSKE formulations @ 50 g/l (1.62), quinalphos @ 2.0 ml/l (1.70) and nano scale (Zn) NSKE formulations @ 20 g/l (1.77) treatments. The treatments only silver nano particles @ 100 ppm (1.85) nano scale (Zn) NSKE formulations @ 10 g/l (1.94), without nano scale NSKE formulations @ 50 g/l (2.13) and nano scale (Zn) NSKE formulations @ 5 g/l (2.18) were on par with each other. The untreated control recorded highest number of larvae in webbed leaves (10.22) (Table 1.2).

Table 2: Effect of nano scale NSKE formulations on larval population of leaf miner, *A. modicella* during *kharif,* 2015

Treatment	Pre treatment	**Mean number of larvae of *A. modicella***						
		Post treatment			**Pre treatment (35 days after first spray)**	**Post treatment**		
		5 days	**10 days**	**15 days**		**5 days**	**10 days**	**15 days**
T1 : Nano scale (Zn) NSKE formulations @ 5 g/l	6.27	3.26 (2.06)	1.90 (1.70)	2.10 (1.76)	6.12	3.21 (2.05)	2.18 (1.78)	2.44 (1.86)
T2 : Nano scale (Zn) NSKE formulations@ 10 g/l	5.71	2.96 (1.99)	1.65 (1.62)	1.82 (1.68)	6.15	3.03 (2.01)	1.94 (1.71)	2.17 (1.78)
T3 : Nano scale (Zn) NSKE formulations@ 20 g/l	5.63	2.86 (1.96)	1.54 (1.59)	1.61 (1.62)	7.54	2.17 (1.78)	1.77 (1.66)	1.91 (1.71)
T4 : Nano scale (Zn) NSKE formulations @ 30 g/l	5.42	2.62 (1.90)	1.42 (1.55)	1.35 (1.53)	6.09	1.59 (1.61)	1.50 (1.58)	1.80 (1.67)
T5 : Nano scale (Zn) NSKE formulations @ 50 g/l	5.48	2.70 (1.92)	1.47 (1.57)	1.59 (1.61)	7.15	1.75 (1.66)	1.62 (1.62)	1.73 (1.65)
T6 : Without nano scale NSKE formulations @ 50 g/l	6.22	3.12 (2.03)	1.85 (1.68)	1.78 (1.67)	6.97	3.04 (2.01)	2.13 (1.77)	2.14 (1.77)
T7 : Quinalphos @ 2.0 ml/l	5.61	2.79 (1.94)	1.51 (1.58)	1.52 (1.58)	6.87	2.06 (1.75)	1.70 (1.64)	1.78 (1.67)
T8: Only silver nano particles @ 100 ppm	5.38	2.92 (1.97)	1.61 (1.61)	1.84 (1.68)	7.25	2.27 (1.81)	1.85 (1.69)	1.87 (1.69)
T9 : Control	5.88	4.55 (2.35)	7.91 (2.98)	7.92 (2.99)	7.89	9.35 (3.22)	10.22 (3.35)	11.02 (3.47)
SED±		0.07	0.02	0.07		0.16	0.11	0.08
CD at 5%		0.02	0.01	0.15		0.34	0.24	0.17
CV %		0.03	0.01	3.69		6.06	4.89	3.17

2.4 Fifteen days after treatment

All the treatments showed slight increase of leaf miner larval population at fifteen days after spraying as compared to ten days after spraying except untreated control. The number of larvae present in webbed leaves were 1.73, 1.78, 1.80, 1.87, 1.91, 2.14, 2.17 and 2.44 for the treatments, *viz.*, nano scale (Zn) NSKE formulations @ 50 g/l, quinalphos @ 2.0 ml/l, nano scale NSKE formulations @ 30 g/l, only silver nano particles @ 100 ppm, nano scale (Zn) NSKE formulations @ 20 g/l, without nano scale NSKE formulations (50 g/l), nano scale (Zn) NSKE formulations @ 10 g/l nano scale (Zn) NSKE formulations @ 5 g/l respectively. Fifteen days after spay the treatment nano scale (Zn) NSKE formulations @ 50 g/l was best treatment. However, the maximum number of larvae of *A. modicella* (11.02) was recorded in untreated control (Table 1.2).

The experiment conducted on management of groundnut leaf miner *A. modicella* with nano scale NSKE formulations during *kharif*, 2015 and this results were briefly discussed and presented below. Among all the treatments nano scale (Zn) coated NSKE formulation @ 30 g/l was effective in reduction of leaf mines and the damage ranged from 1.31 to 4.47 per cent followed by nano scale (Zn) coated NSKE formulations @ 50 g/l treatment (1.41 to 4.53 %), quinalphos @ 2.0 mi/l (1.48 to 4.76%), nano scale (Zn) coated NSKE formulations @ 20 g/l (1.53 to 4.85%) and only silver nanoparticles (1.64 to 4.91%) (Table 4.17) Similarly nano scale (Zn) coated NSKE formulation @ 30 g/l was found to be most effective in reduction of webbed leaves (1.43 to 3.32%) followed by nano scale (Zn) coated NSKE formulations @ 50 g/l (1.49 to 3.43%), quinalphos @ 2.0 mi/l (1.52 to 3.60%), nano scale (Zn) coated NSKE formulations @ 20 g/l (1.83 to 3.76%) and only silver nanoparticles recorded 1.64 to 4.91% (Table 4.17) compared to control in which highest damage (10.83%) was recorded (Table 1.2).

While in reduction of leaf miner larval population similar trend was found and recorded the nano scale (Zn) coated NSKE formulation @ 30 g/l as most effective treatment in reduction of number of larval populations (1.35 to 2.62%) followed by nano scale (Zn) coated NSKE formulations @ 50 g/l (1.47 to 2.70%), quinalphos @ 2.0 mi/l (1.52 to 2.79%), nano scale (Zn) coated NSKE formulations @ 20 g/l (1.54 to 2.86%), and only silver nanoparticles was recorded 1.61 to 2.92% (Table 4.19)

The available literature on nano scale NSKE coated formulations for the management of insect pests on agricultural crops was very less. However, the synthesis of zinc and silver nanoparticles was developed by green synthesis method using aqueous leaf extracts are prepared and used for the management of few insects is available and discussed where ever necessary. The synthesis of Zn oxide nano particles was also supported by Nagajyothi *et al*. (2011) [5] reported that the biosynthesis method employing plant extracts have drawn attention as simple and viable alternative to chemical procedures a physical method. Bio reduction of silver ions to yield metal nano particles using living plant geranium leaf, neem leaf are more useful and cost reduction.

Similar view was expressed by Irvani Zolfaghari (2013) [5] who reported that green synthesis nano structured silver nanoparticles using *Pinus eldrica* bark extract provides environmentally friendly option, as compare to currently available chemical and/ or physical methods. The green synthesis of silver nanoparticles using *Azadirchta indica* (neem) extracts at room temperature was studied by Namratha and Mounika (2013) [7].

Noorjahan *et al*. (2015) [8] reported that use of plant materials has been considered a green route and a reliable method for the synthesis of nanoparticles owing to its environmental friendly nature. Synthesize the zinc oxide nanoparticles using aqueous neem (*Azadirchta indica*) leaf extracts was prepared. The results of the SEM studies of the green synthesized ZnO nano particle showed the formulation of spindle shaped nanoparticles and Zinc oxide nano flakes. The results obtained on leaf miner management during *kharif*, 2015 was corroborated with Patil *et al.* (2003) who reported NSKE as an effective treatment against leaf miner. NSKE and neem oil did not suppress leaf miner even after 3 days up to fifteen days both first and second round of spray possible to show antifeedant property and mining into deeper in to epidermal layer of leaf.

Sharma *et al*. (2010) [11] conducted an experiment on efficacy of neem leaves, neem green seed coat, yellow seed coat and neem seed kernel extract (NSKE) at different concentrations (0.005, 0.01, 0.025, 0.05, 0.1, 0.25, 0.5 and 1.0%) against adults of red cotton bug, among them 1.0 per cent NSKE showed highest adult stage mortality (75.00%), least mortality (5.00%) was observed using of yellow neem seed coat and least survival of egg (12.25%) was observed at the concentration of 0.005 per cent of neem green seed coat.

Sahayaraj and Paulraj (1998) conducted studies on three plant extracts *viz.*, *Azadirchta indica*, *Pongamia glabra* and *Calotropis giganta* and their relative toxicity, all the three plant products were toxic to groundnut leaf miner larvae.

Pawar *et al*. (2013) [9] reported the efficacy of two insecticides and NSKE against the serpentine leaf miner revealed that among the insecticides abamectin significantly reduced the maggot population (70.94%) followed by cartap hydrochloride (68.24%) and NSKE (64.01%).

The results are supported by Muthaiah and Hussain (1991) [4] who reported that mortality of groundnut leaf miner larvae was investigated at 3 days after first and second round of application of different insecticides revealed that quinalphos highly toxic to control of *A. modicella* the larval mortality ranged from 19.47 to 64.10 per cent and 31.33 to 72.09 one day after first and second round of application, respectively

Umesh and Krishna Naik (1996) [13] tested different insecticides against groundnut leaf miner with quinalphos, monocrotophos, methomyl, phosphamidon, chlorpyriphos, cypermethrin, acephate, carbaryl and malathion among them quinalphos treatments recorded significant higher larval mortality of 18.09 to 56.38 per cent.

References

1. Anonymous. Proceedings. VII Annual *rabi*-Summer Groundnut Workshop, Mahatma Phule Agricultural Univivesity, Rahuri, Ahmednagar. 1986, 4-5.
2. Ayyar TVR. Handbook of Economic Entomology for South India, Government Press, Madras. 1963, 516.
3. Irvani S, Zolfaghari B. Green synthesis of silver nanoparticles using *Pinus eldarica* bark extracts. Hinawi Publishing Corporation Biomed Research International. 2013, 1-6.
4. Muthaiah C, Hussain HSJ. Bio efficacy of insecticides against groundnut pests. *Groundnut News*. 1991; 3(1):6.
5. Nagajyothi PC, Prasad TNVKV, Sreekanth TVM, Kap Duk Lee. Biofabrication of nanoparticles using leaf extracts of *Saururus chinensis*. Digest Journal of Nanomaterials and Biostructures. 2011; 6(1):121-133.
6. Nair MRGK. Insect and Mites of Crops in India, ICAR publishers New Delhi. 1975, 408.
7. Namratha N, Monika PV. Synthesis of silver nanoparticles using Azadirchta indica (Neem) extract and usage in water purification. Asian Journal of Pharmaceutical Technology and Innovation. 2013; 3(4):170-174.
8. Noorjahan CM, Shahina SKJ, Deepika T, Rafiq S. Green synthesis and characterization of Zinc Oxide nanoparticles from neem (*Azadirachta indica*). International Journal of Scientific Engineering and Technology Research. 2015; 4(30):5751-5753.
9. Pawar DB, Patil SK. Efficiency of insecticides and NSKE against American serpentine leaf miner, *Liriomyza trifolii* Burgees on cucumber (*Cucumis sativa* L.). Pest Management in Horticultural Ecosystems. 2013; 19(2):251-253.
10. Reddy. The Groundnut, *ICAR Publication*, New Delhi. 1988, 572.
11. Sharma T, Qamar A, Khan AM. Evolution of neem (*Azadirachta indica*) extracts against the eggs and adults of *Dysdercus cingulatus* (Fabricius). World Applied Science Journal. 2010; 9(4):398-402.
12. Sahayaraj K, Anjali A. Impact of monocrotophos and neem oil mixtures on defoliator management in groundnut. Journal Central European Agriculture. 2005; 7(2):307-312.
13. Umesh N, Krishna Naik L. Evaluation of insecticides for the control of leaf miner *Aproaerema modicella* Deventer (Gelechiidae: Lepidoptera) on soybean. Karnataka Journals of Agricultural Sciences. 1996; 9(4):622-628.