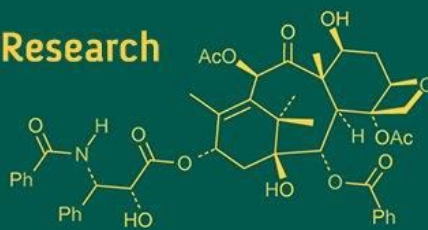


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Population dynamics of insect pests of groundnut, and management of leaf minor (*Aproaerema modicella* Deventer) on groundnut by different insecticide

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Abstract

The field trial was conducted at the rainfed Agriculture farm Narayan Bagh, Department of Entomology, Institute of Agricultural Sciences, Bundelkhand University, Jhansi (Uttar Pradesh) during the *kharif* season July to October 2023-2024 investigation entitled "Population dynamics of insect pests of groundnut, and management of leaf minor *Aproaerema modicella* (Deventer) on groundnut by different insecticide" the experiment was laid in Randomized block design with nine treatments replicated thrice along with a control plot to check the management of selected insecticide against leaf minor *Aproaerema modicella*. According to the population results, the leaf minor *Aproaerema modicella*. started in the 30th standard week (the third week of July) with an average of 1.23 larvae per plant and gradually increased and peaked at 7.41 larvae per plant in the 33rd standard week (the fourth week of August). aphids, *Aphis gossypii* crop began in the 30th standard week (the first week of August) with an average of 1.30 aphids per plant and gradually increased it peaked at 7.14 aphids per plant during the 37th standard week (the second week of September). The tobacco caterpillar, began in the 30th standard week (the first week of August) with an average of 0.70 caterpillar per plant and gradually increased they peaked at 2.10 caterpillar per plant in the 32nd standard week (the third week of September). jassid, was first observed in the 30th standard week (the second week of August), with an average of 2.13 jassid per plant. And gradually increased it peaked at 8.22 jassid per plant during the 36th standard week (the second week of September).

Keywords: Groundnut, population, *leaf miner*, insecticide

Introduction

Groundnut, also known as *Arachis hypogaea* L., is the sixth most significant oilseed crop globally. It belongs to the genus *Arachis* within the subtribe *Stylosanthinae* of the tribe *Aeschynomene* in the family *Leguminosae*. This self-pollinating, tropical annual legume can experience some cross-pollination in areas with high bee activity. Cultivated groundnut is categorized into two subspecies: *hypogaea* and *fastigiata*, each with two botanical varieties (var. *Hypogaea* and var. *aequatoriana*). These varieties exhibit distinct differences in plant, pod, and seed characteristics. However, most commercially grown varieties are grouped under the *hypogaea* (commonly known as *Virginia* or *runner*), *fastigiata* (*Valencia*), and *vulgaris* (Spanish) botanical varieties (Ntare *et al.*, 2008) ^[1].

Groundnut is a key oilseed crop in India, ranking first globally in terms of area and second in production with 10.2 million tons, behind China (17.9 million tons), followed by Nigeria (4.2 million tons), the United States (2.8 million tons), and Sudan (2.8 million tons) in 2021. In India, *kharif* groundnut covered 4.514 million hectares in 2022, a decrease from 4.864 million hectares in 2021, with production estimated at 10.11 million tons, compared to 10.24 million tons in 2021 (agricoop.nic.in, 2021-22). Major producing states include Gujarat, Rajasthan, Andhra Pradesh, Madhya Pradesh, and Karnataka, which together account for about 77 percent of the country's groundnut production. In *Kharif* 2022, Andhra Pradesh's groundnut cultivation area was 0.537 million hectares, representing only 12 percent of the total groundnut area in India (agricoop.nic.in, 2021-22 and des.ap.gov.in, 2022) ^[2, 3].

Groundnut (*Arachis hypogaea* L.) is a major oilseed crop in India and a key oilseed crop in tropical and subtropical regions globally. The seeds are rich in edible oil (43-45%) and protein (25-28%) and also provide essential vitamins such as B, E, and K.

After oil extraction, groundnut cake becomes a high-protein animal feed, while the haulm offers quality fodder. Additionally, the cake is used as feed for cattle and poultry and serves as a valuable organic manure with a high nitrogen content (Gadad *et al.*, 2014) [4].

Groundnut ranks first among oilseeds for its high oil recovery rate of 40%. Approximately 40 to 50 percent of the pod output is used for oil production, while the remainder is utilized as seed and feed. Groundnut is also a valuable source of niacin. In India, around 115 insect pest species have been identified as causing damage to groundnut at various growth stages and during storage. Of these, only 10 insects—leaf miner, white grub, leaf hopper, thrips, aphids, tobacco caterpillar, gram caterpillar, red hairy caterpillar, stem borer, and termite—are known to cause significant yield loss. Silicon constitutes 27.8 percent of the Earth's crust, making it the second most abundant element after oxygen (46.1%) (Haynes, 2014; Keeping *et al.*, 2014; Pinto *et al.*, 2014; Vasanthi *et al.*, 2014) [5, 6, 7, 8].

Groundnut is affected by numerous insect pests, with the leaf miner, *Aproaerema modicella* (Deventer) (Gelechiidae: Lepidoptera), being a notable one. This oligophagous pest targets leguminous plants and is particularly problematic in groundnut crops during the rainy and post-rainy seasons in India. It is regarded as one of the most significant pests in the country, especially in rainfed areas. Infestations of *A. modicella* are most damaging when they attack the growing points of young plants, resulting in reduced growth and a 35 to 44% decrease in pod yield (Pazhanisamy & Hariprasad, 2013) [9].

Materials and Methods

The present investigation entitled “Population dynamics of insect pests of groundnut, and management of leaf minor (*Aproaerema modicella* Deventer) on groundnut by different insecticide” was carried out at the Experiment, rainfed Agriculture farm Narayan Bagh, Department of Entomology, Institute of Agricultural Sciences, Bundelkhand University, Jhansi, (Uttar Pradesh) during *kharif* season of 2023-24. The experimental design was laid in Randomized Block Design using GAUG-10 variety sown with 9 Treatment, each replicated thrice. The plot size was 12 x 7.5 m² with the plotting size 1.0 x 1.80 m² (6.30 m). The treatment included - Imidacloprid 17.8 SL 0.5ml/L, Spinosad 45% SC 2 ml/L of water, Emamectin benzoate 5% SG 0.5 gm/L, Indoxacarb 15.8% EC 0.8 ml/L, Profenophos 30% EC 2 ml/L, Flubendiamide 36% SL 1 ml/L,

Cypermethrin 25% EC 0.5 ml/L, Dimethoate 25% EC 1.3 ml/L and a Water control. Application of the 3 - rounds of insecticidal treatments were applied at 15-15 days interval. The numbers of infestation were counted on 5 randomly selected plants in each plot. The pre treatment count was made a day before the spray whereas, the post-treatment counts were made on 3rd, 7th and 14th day after each spray. The percent Infestation over control against Shoot and fruit borer was calculated by considering the mean of three observations recorded at 3rd, 7th, and 14th day after spray.

Results and Discussion

Among all the treatments, - Spinosad 45 SC 0.8ml was found to be most effective in managing the Leaf minor on Groundnut. The values obtained in the first, second and third spray were 3.72%, 3.21% and 2.45%. These results are supported by Nath and Saini (2018) [10] and Khan and Gupta (2014) [11]. Indoxacarb 15.8EC 0.5 ml was also found to be very effective in reducing the Larval population of Leaf Minor on Groundnut. The same results were observed by Sreehari and Yadav (2016) [12] and Vijaykumar and Kumar (2011) [13], who reported that application of Indoxacarb 15.8EC reduced the larval infestation and recorded the lowest damage. Where the observations of first, second and third sprays obtained were 6.54%, 7.69% and 9.47% infestation over untreated plot. The next best treatment was found to be Flubendiamide 36SL in which the efficacy values of first, second and third spray were 4.72%, 4.01% and 3.32% respectively, this results were supported by Mandal and Kumar (2016) [14, 22] and Nielsen and Schmidt (2017). The efficacy of Profenophos 30EC on leaf minor on Groundnut in first, second and third spray are 5.20%, 4.45% and 3.56% respectively. These results are as per the findings of Mandal and Kumar (2012) [16] and Kumar and Singh (2013) [13]. The next best treatment was found to be Emamectin benzoate 5 SG in which the efficacy values of first, second and third spray were 5.68%, 4.66% and 3.97% respectively to the similar findings of Khan and Ali (2013) [18] and Sinha and Bhardwaj (2017) [19]. The least effective treatments were found to be Dimethoate 25 EC, Imidacloprid 17.8 SL and Cypermethrin in which efficacy values of first, second and third sprays were (5.84%) (5.30%) (4.40%), (5.79%) (6.03%) (4.80%) and (5.96%) (5.96%) (4.98) respectively. The results obtained were as similar to Kumar and Kumar (2012) [20], Srinivasan and Rajendran (2015) [21], Mandal and Gupta (2016) [14, 22], Singh and Sharma (2013) [23] and Jain and Kumar (2017) [24].

Table 1: Data of observations taken before and after first, second and third application of treatments to management of groundnut leaf minor

Tr. No.	Name of Treatments	Dose (gm/ml/L)	DBS	3 rd DAS	7 th DAS	14 th DAS	Mean	3 rd DAS	7 th DAS	14 th DAS	Mean	3 rd DAS	7 th DAS	14 th DAS	Mean	Over all Mean	Yield (q/ha)	C:B ratio
T ₁	Imidacloprid 17.8 SL	0.5 ml	7.03	5.59	5.5	6.29	5.79	6.11	5.71	6.28	6.03	5.4	4.45	4.56	4.8	5.54	12.57	1:0.75
T ₂	Spinosad 45 SC	0.8 ml	5.84	4.28	3.22	3.67	3.72	3.55	2.93	3.16	3.21	3.02	2.09	2.23	2.45	3.12	20.88	1:1.84
T ₃	Emamectin benzoate 5 SG	0.5 gm	7.61	6.33	5.12	5.6	5.68	5.17	4.29	4.53	4.66	4.36	3.61	3.94	3.97	4.77	15.83	1:1.16
T ₄	Indoxacarb 15.8EC	0.5 ml	6.5	5.22	3.94	4.17	4.45	3.95	3.2	3.59	3.58	3.31	2.29	2.47	2.69	3.57	18.65	1:1.48
T ₅	Profenophos 30EC	2 ml	7.02	6.0	4.59	5.0	5.2	4.93	4.04	4.37	4.45	4.14	3.2	3.35	3.56	4.40	16.54	1:1.27
T ₆	Flubendiamide 36SL	1 ml	6.79	5.37	4.25	4.54	4.72	4.18	3.77	4.06	4.01	4.09	3.0	2.85	3.32	4.01	17.93	1:1.04
T ₇	Cypermethrin 25 EC	0.5 ml	7.9	6.81	5.54	5.54	5.96	6.05	5.82	6.01	5.96	6.43	4.23	4.28	4.98	5.63	13.28	1:0.84
T ₈	Dimethoate 25 EC	1.3 ml	6.83	6.42	5.31	5.8	5.84	5.58	5.11	5.22	5.30	5.11	4.01	4.07	4.4	5.18	14.52	1:1.02
T ₉	Control	-	5.71	6.16	6.59	6.88	6.54	7.38	7.67	8.01	7.69	9.12	9.47	9.83	9.47	7.9	9.21	1:0.39

*Figures in parentheses are arc sin transformation value, DBS - Day before spray, DAS – Day after spray, C:B ratio – Cost benefit ratio.

Conclusion

From the present study, the results showed that Spinosad 45% SC and Indoxacarb 15.8EC are most effective treatments against leaf minor on groundnut (*Aproaerema modicella* Deventer) which produced maximum yield and recorded highest Cost-Benefit ratio compared to other treatments. While Flubendiamide 36% SL, Profenophos 30EC and Emamectin benzoate 5% SG, showed average results. Such as Dimethoate 25 EC, Imidacloprid 17.8 SL and Cypermethrin 25 EC found to be least effective in managing *Aproaerema modicella*.

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