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Chemical alternatives for management of defoliating pests of groundnut

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Abstract
A field trial was conducted to evaluate different chemical insecticides against major defoliating pests of groundnut (*Spodoptera litura, Trichoplusiani* and *Helicoverpa armigera*) at the Oilseeds Research Station, Latur in randomized block design with thirteen treatments and three replications. The treatments comprised of insecticides rynaxypyr 20 SC (100 ml/ha), thiodicarb 75 DF (1000 g/ha), spinosad 45 SC (175 ml/ha),flubendiamide 480 SC (150 ml/ha), acephate 75SP (1000 g/ha), fipronil (100 g/ha), acetamiprid 20 SP (100 g/ha), thiamethoxam 25 WG (200 g/ha) emamectin benzoate (5 WSG 100g/ha), profenophos 50 EC (1000 ml/ha), quinolphos 25 EC (1000 ml/ha), chlorpyrifos 20 EC (1000 ml/ha) and control (water Spray). Results suggest signinificant difference among the treatment and amongst treatment, emamectin benzoate (5 WSG 100g/ha) and spinosad 45 SC @175 ml/ha were found significantly superior for control of defoliator and was at par with treatment of rynaxypr 20 SC (100 ml/ha). The highest pod yield was recorded by the treatment of emamectin benzoate (i.e.3801kg/ha) followed by the treatment of Spinosad, Rynaxypyr (3655 and3610kg/ha) and were at par with each other.

Keywords: Groundnut, defoliating pests and spray

Introduction
Groundnut, *Arachis hypogaea* L. is an important oilseed crop, so it is rightly called as the 'king of oilseeds', wonder nut and poor men's cashew nut. It's famous Indian name is 'Mongphali'. It is an important cash and food crop in many parts of the tropics, particularly in semi-arid areas. India is the second largest producer of groundnut after China. Groundnut kernel as a whole is highly nutritious as it is rich in edible oil and in proteins. It is poor man's almond because it is very cheap as compared to almond and other nuts and at the same time, has comparative food value. It is an excellent combination of calories and essential amino acids in an average Indian diet. In India it is grown mostly during *kharif* under rainfed conditions and it occupied about 4.6 mha with a production of 6.7 mt in 2015-16 with a productivity of 14.65 q/ha (Anon, 2015) [1]. The average yield levels of groundnut in India are lower than the potential yields as well as the world average yields. Innumerable challenges from biotic and abiotic stresses such as insect attack, pathogen infection, temperature fluctuations and drought are some of the reasons for this low productivity. Among these, incidence of insect pests is more important, More than 100 species of insects and mites are known to attack groundnut (Amin, 1988 and Nandagopal, 1992) [2, 10]. A comprehensive list of insect and non-insect pests of groundnut was given by Nandagopal and Prasad (2004) [11]. Among all insect pests lepidopteran defoliators i.e. *Helicoverpa armigera* (Hubner) and *Spodoptera litura* (Fabricius) were most serious problem in groundnut crop. Infestation of *S. litura* at flowering stage can result in 20 per cent yield loss and severe outbreak cause 30 to 40 per cent yield loss in groundnut (Kulkarni, 1989) [8]. Crop failures due to *S. litura* were reported despite of intensive pest management practices (Wightman and Ranga Rao, 1993) [17]. *H. armigera* also causes 40 to 50 per cent damage (Srivastava, 1970) [15].
Dependence on conventional insecticides for managing the insect pests has led to environmental and economic ill-health in addition to being ineffective as the pests have developed resistance. Therefore search for safer insecticides and ecologically sound methods to manage insect pests is important.
As a response, researchers and extension systems have been trying to evaluate and transfer what are called safer, less persistent insecticides which can be useful at minimum levels. On this line as there is not much information available on in the case of groundnut, in present study attempt was made to evaluate, analyse and determine the best insecticides for

Management of defoliating pests of groundnut which can also be recommended as part of IPM practices in groundnut pest management.

Material and Methods

A Field experiment was carried out at Research Farm of Oilseeds Research, Station, Latur to evaluate the efficacy of newer insecticides against groundnut defoliators (*Spodoptera litura, Trichoplusia ni* and *Helicoverpa armigera*) during *Kharif* 2012. For this purpose, groundnut variety LGN-1 was raised in plots of size 4.2 x 5.00 m^2 with a spacing of 30 x 10 cm^2 with recommended agronomic practices except for insect-pest management. The experiment was laid out in a randomized block design (RBD) with thirteen treatments including untreated control replicated three times. The insecticidal treatments included rynaxypyr 20 SC (100 ml/ha), thiodicarb 75 DF (1000 g/ha), spinosad 45 SC (175 ml/ha),flubendiamide 480 SC (150 ml/ha), acephate 75SP (1000 g/ha), fipronil (100 g/ha), acetamiprid 20 SP (100 g/ha), thiamethoxam 25 WG (200 g/ha) emamectin benzoate (5 WSG 100g/ha), profenophos 50 EC (1000 ml/ha), quinolphos 25 EC (1000 ml/ha) and chlorpyrifos 20 EC (1000 ml/ha). One spray was imposed using knapsack sprayer (500 l/ha) during vegetative stage against defoliators. Observations on defoliators larvae were recorded from ten randomly selected plants from each replication at one day before, 1, 7 and 15 days after spraying (DAS) and the mean larvae per plant was worked out. The yield was recorded on the net plot area basis which was converted to kg/ha for statistical interpretations. The data on numbers were transformed into square root values and subjected to statistical analysis using OP stat statistical software. Following ANOVA, differences between datasets were determined using least significant difference at P = 0.05 in all instances.

Result and Discussion

Efficacy of insecticides against defoliators infesting groundnut

The pre-treatment population of defoliators was uniform in all the experimental plots, since the average population of defoliators was statistically non- significant. The average pre-treatment population was 6.50 to 7. 20 larvae on each plant justifying that there was need to protect the groundnut crop from defoliator's infestation (Table 1 and Fig.1).

The post treatment observations recorded (Table1) indicated that all the insecticidal treatments were significantly superior over untreated control in reducing defoliator's population. Among these treatments, the plants treated with emamectin benzoate (5 WSG 100g/ha) and spinosad 45 SC @175 ml/ha recorded lowest defoliators population (0.07 larvae /plant), which were significantly superior. It was followed by and rynaxypr 20 SC @100 ml/ha (0. 13 larvae /plant), profenophos 50 EC (1000 ml/ha) (2.47 larvae /plant), thiodicarb 80 DF @1000 ml/ha (2.80 larvae /plant), flubendiamide 480 SC @150 ml/ha (3. 20 larvae /plant) and chlorpyrifos 20 EC (1000 ml/ha) (3.40 larvae /plant) which was followed by thiamethoxam 25 WG (200 g/ha) (3. 47 larvae /plant), acephate 75SP (1000 g/ha) (3.73 larvae /plant), quinolphos 25 EC (1000 ml/ha) (5.07 larvae /plant), fipronil (100 g/ha) (5. 13 larvae /plant)and acetamiprid 20 SP (100 g/ha) (5. 27 larvae /plant) respectively. The untreated control treatment recorded significantly higher number of larvae i.e. 6. 47 larvae /plant.

Yield performance of treatments

The data on yield of groundnut is presented in (Table 1 and Fig 2). It was seen from the data that all the insecticides treated plots recorded significantly higher groundnut yield than the untreated control (2407 kg/ha). The average marketable pod yield among different treatments ranged from 2407 to 3801 kg/ha. The highest yield was recorded in plots treated with emamectin benzoate (3801 kg/ha). The next best treatment in respect of pod yield was spinosad 45 SC (3655 kg/ha) and rynaxypr 20 SC (3610 kg/ha). The remaining treatments in respect of yield of groundnut produced were profenophos 50 EC (3268 kg/ha), quinolphos 25 EC (3054 kg/ha), > chlorpyrifos 20 EC (3001 kg/ha), thiodicarb 80 DF (2722 kg/ha) > thiamethoxam 25 WG (200 g/ha) (2665 kg/ha)> flubendiamide 480 SC (2632 kg/ha) > acephate 75SP (2572 kg/ha) > acetamiprid 20 SP (100 g/ha) (2480 kg/ha) and fipronil (2430 kg/ha), respectively.

Similar results were also obtained by Biradar and Hegde (2016) who reported that after three and seven days of spray, leaf miner population and per cent leaf damage by *Spodoptera litura* was significantly lowest in Module I compared to other modules due to spraying of spinosad 45 SC @ 0.25 ml/l and thiodicarb 75 WP @ 1 g/l, against leafminer and *S. litura*.

Table 1: Evaluation of new molecules for the control of defoliators of groundnut

SN	Treatments	Defoliators / plants		Yield
		Before Spray	After Spray	Kg/Ha
1	Rynaxypyr 20 SC (100 ml/ha)	6.80 (2.70)	0.13 (0.80)	3610
2	Thiodicarb 75 DF (1000 g/ha)	7.10 (2.76)	2.87 (1.83)	2722
3	Spinosad 45 SC (175 ml/ha)	6.90 (2.72)	0.07 (0.75)	3655
4	Flubendiamide 39.35 SC (150 ml/ha)	6.90 (2.72)	3.20 (1.92)	2632
5	Acephate 75SP (1000 g/ha)	6.50 (2.65)	3.73 (2.06)	2572
6	Fipronil (100 g/ha)	6.90 (2.72)	5.13 (2.37)	2430
7	Acetamiprid 20 SP (100 g/ha)	6.85 (2.71)	5.27 (2.40)	2480
8	Thiamethoxam 25 WG (200 g/ha)	7.10 (2.76)	3.47 (1.99)	2665
9	Emamectin benzoate (5 WSG100g/ha)	6.50 (2.65)	0.07 (0.75)	3801
10	Profenophos 50 EC (1000 ml/ha)	6.60 (2.66)	2.47 (1.72)	3268
11	Quinolphos 25 EC (1000 ml/ha)	7.20 (2.77)	5.07 (2.36)	3054
12	Chlorpyrifos 20EC (1000 ml/ha)	7.20 (2.77)	3.40 (1.97)	3001
13	Untreated Control	7.20 (2.77)	6.47 (2.64)	2407
	S.E. +		0.06	135.49
	C.D. at 5%	NS	0.18	394.88
	C.V. %		6.15	7.97

Note: Figures in parentheses are square root transformed values. NS-Non significant

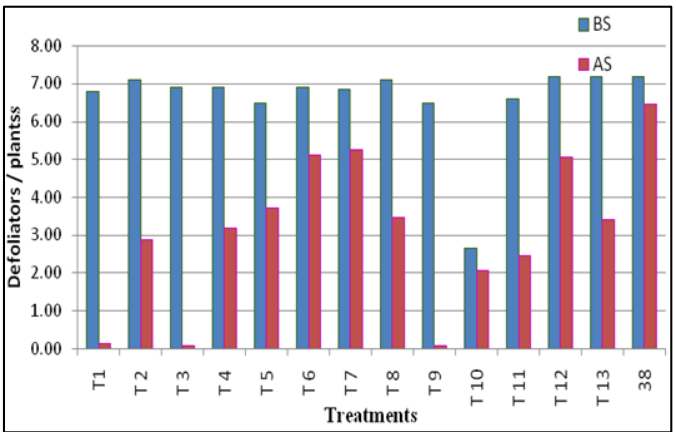

Fig 1: Treatment response for the management of defoliators on groundnut

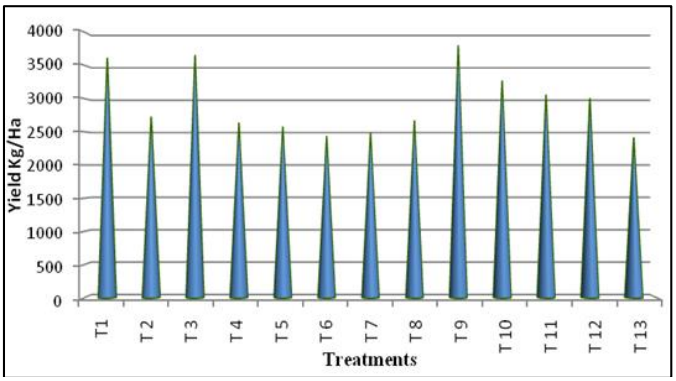

Fig 2: Treatment response for groundnut pod yield

Gadhiya *et al.* (2010) [6] who reported that among nine insecticides, chlorantraniliprole (0.006%), spinosad (0.018%) and emamectin benzoate (0.002%) were noticed higher effective and statistically at par with each other in protecting the groundnut crop from the infestation of *Spodoptera litura*, *Trichoplusia ni* and *Helicoverpa armigera.*

Chowdary *et al.* (2010) [5] also reported mentioned that chlorantraniliprole was superior in reducing groundnut defoliators population followed by spinosad, emamectin benzoate and flubendiamide.

Jayewar *et al.* (2018) [7] indicated that Spinosad 45 SC @175 ml/ha was found significantly superior for control of defoliators was followed by the treatment of Rynaxypr 20 SC @100 ml/ha and Novaluran 10EC @1000 ml/ha. The highest pod yield was recorded by Spinosad 45 SC @175 ml/ha *i.e.* 3931kg/ha and was followed by Rynaxypr 20 SC@100 ml/ha (3382 kg/ha). Mutkule *et al.* (2009) [9] proved the effectiveness of spinosad 0.018 per cent and emamectin benzoate 0.001 per cent against S. litura on groundnut.

Randhawa *et al.* (2009) [12] reported that Spinosad 48 SC Sound to be the most effective insecticide for the control *H.armigera* in berseem and this insecticide was closely followed by Indoxicarb 15 EC. The effectiveness of spinosad against H. armigera was proved by Sohail *et al.* (2004) [14] and Sidde Gowda *et al.* (2006) [13] on gram whereas Tamboli and Lolage (2008) [16] and Babariya *et al.* (2010) [3] on pigeon pea which was strongly supported to present finding

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