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Evaluation of seed dressing chemicals for the management of sucking pests in summer groundnut

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Abstract
Field experiments were conducted during summer seasons of 2009-11 at the Main Oilseeds Research Station, Junagadh University of Agricultural, Junagadh to find out the effective and economical control measures for the management of jassids and thrips in groundnut. Results indicated that the significantly lowest population of jassids and the thrips was recorded in the treatment of imidacloprid 600 FS @ 4 ml/kg seed and thiamethoxam 70 WS @ 2 g/kg seed, respectively. The highest pod yield was recorded from imidacloprid 600 FS @ 4 ml/kg seed (1962 kg/ha), imidacloprid 600 FS @ 2 ml/kg seed (1947 kg/ha), thiamethoxam 70 WS @ 2 g/kg seed (1917 kg/ha) and thiamethoxam 70 WS @ 1 g/kg seed (1897 kg/h). The highest cost benefit ratio (1: 8.76) was observed in imidacloprid 600 FS @ 2 ml/kg seed followed by imidacloprid 600 FS @ 4 ml/kg (1: 5.47), thiamethoxam 70 WS @ 1 g/kg seed (1:4.13) and thiamethoxam 70 WS @ 2 g/kg seed (1:2.60).

Keywords: *Scirtothrips* dorsalis, *empoasca kerri*, imidacloprid, thiamethoxam, groundnut

Introduction
Groundnut (*Arachis hypogaea* Linnaeus) is one of the most important oil seed crops grown in India and contributes about 30 per cent of the total domestic supply of oil. It is the 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 [6]. 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 nondrying oil, 40–50% fat, 20–50% protein and 10–20% carbohydrate [5]. Of the various oilseed crops, groundnut alone accounts 48% of the oilseeds area and 60% of total production in India [8]. Though India ranks first in area under groundnut cultivation, the productivity is quite low (1000 Kg/ha) compared to that of USA (3000 Kg/ha), China (2600 Kg/ha), Argentina (2100 Kg/ha) and Indonesia [1]. The reason for low productivity of groundnut is due to biotic and abiotic stresses during crop growth. Pests and diseases are the major biotic stresses for groundnut production.

Groundnut crop is attacked by about 90 species of insect pests. The sucking insect pest complex comprising thrips, *Scirtothrips dorsalis* Lind man and leaf hoppers, *Empoasca kerri* Pruthi are the major pests of importance on groundnut crop specially when raised under summer conditions and bunch varieties are severely infested [2]. Among the sucking pests attacking the groundnut crop, thrips species occur as a complex, starting from a vegetative stage till the harvest of the crop. Both nymphs and adults inhabit the leaf terminals and flowers and cause irregular streaks on the opened leaves, distortion and sometimes contamination of the foliage with fecal matter. Thrips mainly feed by lacerating and sucking the sap from leaves and are known to transmit groundnut bud necrosis virus. In the recent years incidence of thrips on groundnut crop is increasing and known to cause yield loss to the tune of 14 to 40 percent [3]. Leafhoppers suck the sap from the leaves and petioles and mainly it prefers the first three terminal leaves and feeding symptoms induce yellowing of foliage that begins at the tip, known as hopper burn [4]. A heavy infestation, on young plants causes stunting and leaf tip turn yellow with a typical 'v-shape' marking. On close examination of infected plants, nymphs can be seen on the underside of infected plants. Objective of the study is to determine the effectiveness of the seed dressing chemicals in order to develop an effective, environmentally safe and sustainable pest management practice for jassids and thrips in groundnut crop.

Materials and Methods

With a view to find out the effective and economical insecticides against sucking insect pests of groundnut, the field experiments were carried out during summer seasons of 2009-11 at the Main Oilseeds Research station, Junagadh on groundnut variety GG-6. Seven treatments were tested in randomized Block Design with four replications. Treatments viz. imidacloprid 600 FS @ 2 ml/kg seed, imidacloprid 600 FS @ 4 ml/kg seed, thiamethoxam 70 WS @ 1 g/kg seed, thiamethoxam 70 WS @ 2 g/kg seed, acetamiprid 20 SP @ 2 g/kg seed, carbosulfan 25 DS @ 5 g/kg seed and control were tested against jassids and thrips in the summer groundnut crop. Respective seed treatment of insecticides was given to the seed at the time of sowing. The crop was sown at the spacing of 30 cm x 10 cm having gross and net plot size was 5.00 × 2.4 m and 4.0 x 1.8 m, respectively. All the agronomical practices were followed as per the recommendations. Observations of thrips and jassid population were recorded at 15 days after germination at an interval of 7 days and continued up to 35 days after germination. The groundnut crop was harvested at proper time. The pod and haulm yield for each treatment was recorded separately from the net plot area and was computed as converted into kilogram per hectare.

Results and discussion

Pooled data presented in Table 1 indicated that significantly low population of jassids was recorded in all the treatments over control. However, significantly the lowest population of jassids (0.57 jassids/3 leaves/plant) was recorded in the treatment of imidacloprid 600 FS @ 4 ml/kg seed. imidacloprid 600 FS @ 2 ml/kg seed, thiamethoxam 70 WS @ 2 g/kg seed, thiamethoxam 70 WS @ 1 g/kg seed, carbosulfan 25 DS @ 5 g/kg seed and acetamiprid 20 SP @ 2 g/kg seed were the next best treatments in reduction of jassids population. Maximum jassids population (1.99 jassids/3 leaves/plant) was recorded in control.

Table 1: Influence of seed dressing insecticides on sucking pests and yield in groundnut (pooled)

Sr. No	Treatment	No. of jassids/ 3 leaves/ plant				No. of thrips/ 3 leaves/ plant		
		2009	2010	2011	Pooled	2009	2011	Pooled
1	Imidacloprid 600 FS @ 2 ml/kg seed	1.05* (0.61)	1.05 (0.60)	1.23 (1.02)	1.11 (0.74)	0.87 (0.25)	1.43 (1.54)	1.15 (0.82)
2	Imidacloprid 600 FS @ 4 ml/kg seed	0.99 (0.47)	0.99 (0.48)	1.13 (0.78)	1.04 (0.57)	0.84 (0.20)	1.39 (1.44)	1.12 (0.74)
3	Thiamethoxam 70 WS @ 1 g/kg seed	1.36 (1.35)	1.25 (1.07)	1.44 (1.57)	1.35 (1.33)	0.80 (0.14)	1.35 (1.33)	1.08 (0.66)
4	Thiamethoxam 70 WS @ 2 g/kg seed	1.26 (1.09)	1.18 (0.90)	1.37 (1.37)	1.27 (1.11)	0.78 (0.11)	1.29 (1.16)	1.04 (0.57)
5	Acetamiprid 20 SP @ 2 g/kg seed	1.50 (1.75)	1.42 (1.51)	1.63 (2.16)	1.52 (1.80)	1.05 (0.61)	1.71 (2.41)	1.38 (1.40)
6	Carbosulfan 25 DS @ 5 g/kg seed	1.45 (1.59)	1.37 (1.39)	1.58 (2.01)	1.47 (1.66)	1.01 (0.51)	1.64 (2.20)	1.32 (1.25)
7	Control	1.60 (2.06)	1.46 (1.64)	1.67 (2.30)	1.58 (1.99)	1.09 (0.69)	1.73 (2.50)	1.41 (1.49)
SEm ±		0.03	0.03	0.03	0.02	0.03	0.04	0.02
C.D. at 5%		0.10	0.09	0.08	0.05	0.08	0.10	0.06
C.V.%		5.13	4.94	3.77	4.60	5.84	4.69	5.17

Square root transformed value the data in parenthesis are retransformed value

In case of thrips, significantly low population was recorded in all the treatments except acetamiprid 20 SP @ 2 g/kg seed over control. However, significantly the lowest population of thrips (0.57 thrips/3 leaves/plant) was recorded in the treatment thiamethoxam 70 WS @ 2 g/kg seed and it was statistically at par with seed treatment of thiamethoxam 70 WS @ 1 g/kg seed. Imidacloprid 600 FS @ 4 ml/kg seed, imidacloprid 600 FS @ 2 ml/kg seed and carbosulfan 25 DS @ 5 g/kg seed were the next best treatments in reduction of thrips population. Maximum thrips population (1.49 thrips/3 leaves/plant) was recorded in control. Thiamethoxam 0.005 per cent proved effective against jassid and thrips in groundnut [7]. The treatment of imidacloprid @ 26.7 g a.i. /ha proved most effective in controlling jassid and thrips [9].

Pooled data indicated that all the treatments except carbosulfan 25 DS @ 5 g/kg seed and acetamiprid 20 SP @ 2 g/kg seed gave significantly the highest pod and haulm yield over control. Among all the treatments, significantly the highest pod yield of 1962 kg/ha and haulm yield of 3066 kg/ha were recorded in the treatment of imidacloprid 600 FS @ 4 ml/kg seed and it was statistically at par with the treatment of imidacloprid 600 FS @ 2 ml/kg seed, thiamethoxam 70 WS @ 2 g/kg seed and thiamethoxam 70 WS @ 1 g/kg seed.

Considering the increase in the pod yield of groundnut over control (Table 2), it was the highest in imidacloprid 600 FS @ 4 ml/kg seed (191 kg/ha). The treatments of imidacloprid 600 FS @ 2 ml/kg seed (176 kg/ha), thiamethoxam 70 WS @ 2 g/kg seed (146 kg/ha) and thiamethoxam 70 WS @ 1 g/kg seed (126 kg/ha) were found next in order with respect of increase in pod yield over control. The remaining treatments viz. Carbosulfan 25 DS @ 5 g/kg seed and acetamiprid 20 SP @ 2 g/kg seed were found less than 22 kg/ha increase in yield over control.

It is evident from the data presented in Table 2 that the net realization of different treatments varied from 12 to 6887 Rs/ha. The treatment of imidacloprid 600 FS @ 2 ml/kg seed recorded maximum net realization i.e. 6887 Rs/ha, followed imidacloprid 600 FS @ 4 ml/kg seed (6872 Rs/ha), thiamethoxam 70 WS @ 1 g/kg seed (4314 Rs/ha) and thiamethoxam 70 WS @ 2 g/kg seed (4030 Rs/ha). Minimum net realization was observed in the treatment of carbosulfan 25 DS @ 5 g/kg seed (12 Rs/ha) and acetamiprid 20 SP @ 2 g/kg seed (-633 Rs/ha). The highest cost benefit ratio (1: 8.76) was also observed in imidacloprid 600 FS @ 2 ml/kg seed followed by imidacloprid 600 FS @ 4 ml/kg (1: 5.47), thiamethoxam 70 WS @ 1 g/kg seed (1:4.13), thiamethoxam 70 WS @ 2 g/kg seed (1:2.60).

Table 2: Statement showing economics of various treatments for controlling sucking pests of groundnut

Sr No	Treatment	Pod Yield (kg/ha)	Pod Yield increased over control	Haulm Yield (kg/ha)	Total expenditure (Rs.)	Grass income (Rs.)	Net return (Rs.)	I.C.B.R
1	Imidacloprid 600 FS @ 2 ml/kg seed	1947	176	3054	888	7775	6887	1 : 8.76
2	Imidacloprid 600 FS @ 4 ml/kg seed	1962	191	3066	1536	8408	6872	1 : 5.47
3	Thiamethoxam 70 WS @ 1 g/kg seed	1897	126	3028	1380	5694	4314	1 : 4.13
4	Thiamethoxam 70 WS @ 2 g/kg seed	1917	146	3047	2520	6550	4030	1 : 2.6
5	Acetamiprid 20 SP @ 2 g/kg seed	1776	5	2826	864	231	-633	1 : 0.27
6	Carbosulfan 25 DS @ 5 g/kg seed	1793	22	2840	936	948	12	1 : 1.01
7	Control	1771	-	2814	-	-		-
	SEm ±	24.1		36.2				
	C.D. at 5%	68.4		102.7				
	C.V.%	4.5		4.3				

Conclusion

Results from the present studies revealed that the significantly lowest population of jassids and the thrips was recorded in the treatment of imidacloprid 600 FS @ 4 ml/kg seed and thiamethoxam 70 WS @ 2 g/kg seed, respectively. But considering the effectiveness and economics of insecticides, seed treatment of imidacloprid 600 FS @ 2 ml/kg or thiamethoxam 70 WS @ 1 g/kg seed was found the most effective and economic in reducing the jassids and thrips population in summer groundnut.

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