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EVALUATION OF BIO-EFFICACY AND PHYTOTOXICITY OF GAUCHO 600 FS (IMIDACLOPRID 600FS) AS SEED TREATMENT AGAINST TERMITE IN GROUNDNUT CROP

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ABSTRACT

The present investigation entitled" The evaluation of bio-efficacy and phytotoxicity of Gaucho 600FS (Imidacloprid 600FS) against termite. A total of six treatments comprised of imidacloprid 600FS (0.6 g a.i. kg seed, 0.9 g a.i. kg seed, 1.2 g a.i. kg seed and 2.4g a.i. kg seed), one is Chlorpyriphos 20 % EC (2.5 g a.i. kg seed) and last one is untreated control. All the chemical treated seed delay the germination as compare to untreated seed. Least termite damage was recorded in imidacloprid 600 FS @ 4.0 ml/kg, while maximum damage was recorded in untreated control after 60 DAS and at harvest. The maximum pod and straw yield was recorded in imidacloprid 600 FS @ 4.0 ml/kg which was at par with imidacloprid 600 FS @ 2.0 ml/kg while minimum in untreated control. The entire tested chemical at different doses imidacloprid 600 FS @ 4.0 ml/kg seed was superior over the rest in all the aspect, followed by imidacloprid 600 FS @ 2.0 ml/kg seed.

***Keywords*:** Bio efficacy, Seed Treatment, Imidacloprid 600fs, Chlorpyriphos, Pod and Straw Yield

Introduction

The Peanut (*Arachis hypogaea*), known world wide as groundnut belongs to family *Fabaceae*. Groundnut is called as the 'King' of oilseeds. It is one of the most important food and cash crops of our country, seeds are rich source of edible oils and contain 40 -50% fat, 20 - 50 % protein and 10 to 20 % carbohydrate. The seeds are nutritious and contain vitamin E, niacin, folacin, calcium, phosphorus, magnesium, zinc, iron, riboflavin, thiamine, potassium etc. Peanuts, peanut oil and peanut protein meals constitute an important segment of world trade in oilseeds and products. Peanut is the fifth most important oilseed in the world. After seed treatment, imidacloprid shows systemic and residual toxicity in several crop plants and interferes with transmission of stimuli or impulses in the nervous system of insect herbivores and gives an excellent control against a wide range of sucking insect pests (Zhang *et al*., 2011).

Hence, the present field experiment on bio-efficacy of various doses of imidacloprid 600FS on groundnut as seed treatment for the Management of termite in groundnut was taken u during two consecutive seasons i.e., kharif 2016-17 and 2017-18.

Material and Method

A field experiment was conducted during the two consecutive kharif seasons of the year 2016-2017 and 2017-2018 at Regional Research Station, SDAU, Kothara Sardarkrushinagar Dantiwada Agricultural University, and Sardarkrushinagar. In a randomized block design to assess the bio efficacy and phytotoxicity of imidacloprid 600FS on groundnut termite. Chemical was supplied by Bayer Crop Science Limited, Mumbai under the trade name of Gaucho 600FS. A total of six treatments comprised of imidacloprid 600FS (0.6 g a.i. kg seed, 0.9 g a.i. kg seed, 1.2 g a.i. kg seed and 2.4g a.i. kg seed), Chlorpyriphos 20 % EC (2.5 g a.i. kg seed) and untreated control.

Four replication and six treatment combinations were allocated randomly in different plots by using the random numbers. The treatments were replicated four times in Randomized Block design (R.B.D).Observations recorded along with the procedure adopted during the course of investigation. Five plants were selected at random from the net plot of each treatment and tagged to record the observations. Groundnut seed treat with four dose of Gaucho 600 FS & one dose Chlorpyriphos 20 % EC and one is untreated seed of groundnut crop sowing in field of experimental sites of station. Groundnut seeds in polythene bag thoroughly with standard total slurry volume 8 ml/kg seed (chemical + water) & dry in shade before sowing.

Table 1 : Details of treatments evaluated against termite of groundnut at Kothara Kachchh

Sr. No.	Treatment	Dosage / kg of seed		Application Time & Method
		a.i (g)	Forml. (ml)	
1	Untreated Control	-	-	Prepare the slurry in a way that chemical + water makes a total -1 volume of 8ml kg of seeds. Treat groundnut seeds in a polythene bag and dry in Shade before sowing.
2	Gaucho 600 FS (Imidacloprid 600 FS)	0.6	1.0	
3	Gaucho 600 FS (Imidacloprid 600 FS)	0.9	1.5	
4	Gaucho 600 FS (Imidacloprid 600 FS)	1.2	2.0	
5	Gaucho 600 FS (Imidacloprid 600 FS)	2.4	4.0	
6	Chlorpyriphos 20% EC	2.5	12.5	

Observation Methodology

The observations carried out during the experiment were as below,

Germination per cent at 10 and 20 days after sowing. Observations on Termite damage or affected plants per plot at 10, 20, 30, 40, 50, 60 days after sowing and at the time of harvest. Observations on phyto toxicity symptoms, if any may be recorded and reported as per standard method (only for treatment no. 1, 4 and 5). Plot-wise yield of groundnut was recorded at harvest and these plot yield data were converted per hectare basis. These data were analyzed for its statistical interpretation with necessary data transformation so as to compare the bioefficacy of different treatments.

Results

Results presented on germination per cent, per cent damage by termite, yield of Groundnut indicated that insecticidal treatments significantly superior as compared to untreated control treatment in two year kharif season.

First year (2016-17)

1. Germination per cent at 10 and 20 days after sowing.

(A) 10 Days after sowing:

The result on germination per cent at 10 DAS revealed that there was a highly significant difference among the treatments. The maximum germination (71.46%) was observed in untreated control followed by imidacloprid 600 FS @ 1.0 ml/kg (59.88%), while the minimum germination (47.17%) was observed in imidacloprid 600 FS @ 4.0 ml/kg which was at par with imidacloprid 600 FS @ 2.0 ml/kg (49.42%) and chlorpyriphos 20% EC @ 12.5 ml/kg (50.92%) in (Table-2).

(B) 20 Days after sowing:

The result on germination per cent at 20 DAS revealed that there was a significant difference among the treatments. The maximum germination (89.33%) was observed in untreated control while minimum in chlorpyriphos 20% EC @ 12.5 ml/kg (75.17%) which was at par with imidacloprid 600 FS @ 1.0 ml/kg (78.50%), imidacloprid 600 FS @ 1.5 ml/kg(77.67%), imidacloprid 600 FS @ 2.0 ml/kg(76.50%) and imidacloprid 600 FS @ 4.0 ml/kg(76.00%) in (Table-2).

2. Observations on termite damage or affected plants per plot at 10, 20, 30, 40, 50, 60 days after sowing and at the time of harvest.

Plant damage by termite was first seen untreated control (0.56%) and imidacloprid 600 FS @ 1.0 ml/kg (0.21%) at 20 DAS. In imidacloprid 600 FS @ 1.5 ml/kg (1.93%) and chlorpyriphos 20% EC @ 12.5 ml/kg (0.22%) termite damage was observed at 30 DAS, in imidacloprid 600 FS @ 2.0 ml/kg it was observed at 40 DAS(1.74%), while in imidacloprid 600 FS @ 4.0 ml/kg it was appeared at 60 DAS(1.10%). As in all the treatments termite damage was observed at 60 DAS, so the data at 60 DAS and at harvest were subjected to analysis. Termite damage at 60 DAS, highly significant difference was observed among all the treatments. The untreated control was significantly affected by termite (12.69%) as compared to all other treatments, while the minimum plant damage was observed in imidacloprid 600 FS @ 4.0 ml/kg (1.10%).

Termite damage at harvest, highly significant difference was observed among all the treatments. The untreated control was significantly affected by termite (31.30%) as compared to all other treatments, while the minimum plant damage was observed in imidacloprid 600 FS @ 4.0 ml/kg (9.79%) in (Table-3).

3. Pod yield of Groundnut kg/ha basis at harvest.

Data on pod yield was taken and subjected to analysis, which revealed significant difference over the treatments. Maximum pod yield was in imidacloprid 600 FS @ 4.0 ml/kg (1756 kg/ha) which was at par with imidacloprid 600 FS @ 2.0 ml/kg (1568 kg/ha). The minimum was observed in untreated control (1307 kg/ha) which was at par with imidacloprid 600 FS @ 1.0 ml/kg (1417 kg/ha), imidacloprid 600 FS @ 1.5 ml/kg (1467 kg/ha) and chlorpyriphos 20% EC @ 12.5 ml/kg (1496 kg/ha) in (Table-4).

4. Straw yield of Groundnut kg/ha basis at harvest.

Observation on straw yield was taken and subjected to analysis, which revealed significant difference over the treatments. Maximum straw yield was in imidacloprid 600 FS @ 4.0 ml/kg (3213 kg/ha) which was at par with imidacloprid 600 FS @ 2.0 ml/kg (2861 kg/ha). The minimum was observed in untreated control (2407 kg/ha) which was at par with imidacloprid 600 FS @ 1.0 ml/kg (2565 kg/ha), imidacloprid 600 FS @ 1.5 ml/kg (2676 kg/ha) and chlorpyriphos 20% EC @ 12.5 ml/kg (2713 kg/ha) in (Table-5).

Second year (2017-18)

1. Germination per cent at 10 and 20 days after sowing.

(A) 10 Days after sowing:

The result on germination per cent at 10 DAS revealed that there was a highly significant difference among the treatments. The maximum germination (73.50%) was observed in untreated control followed by imidacloprid 600 FS @ 1.0 ml/kg (61.00%), while the minimum germination (49.00%) was observed in imidacloprid 600 FS @ 4.0 ml/kg which was at par with imidacloprid 600 FS @ 2.0 ml/kg

(50.83%) and chlorpyriphos 20% EC @ 12.5 ml/kg (51.17%) in (Table-6).

(B) 20 Days after sowing:

The result on germination per cent at 20 DAS revealed that there was a significant difference among the treatments. The maximum germination (88.17%) was observed in untreated control while minimum in chlorpyriphos 20% EC @ 12.5 ml/kg (79.33%) which was at par with imidacloprid 600 FS @ 1.0 ml/kg (82.67%), imidacloprid 600 FS @ 1.5 ml/kg (81.67%) ,imidacloprid 600 FS @ 2.0 ml/kg (81.00%) and imidacloprid 600 FS @ 4.0 ml/kg (80.00%) in (Table-6).

2. Observations on termite damage or affected plants per plot at 10, 20, 30, 40, 50, 60 days after sowing and at the time of harvest.

Plant damage by termite was first seen in untreated control (0.38%) at 20 DAS. In imidacloprid 600 FS @ 1.0 ml/kg (1.21), imidacloprid 600 FS @ 1.5 ml/kg (1.63%) and chlorpyriphos 20% EC @ 12.5 ml/kg (1.05%) termite damage was observed at 30 DAS, in imidacloprid 600 FS @ 2.0 ml/kg it was observed at 40 DAS (1.44%), while in imidacloprid 600 FS @ 4.0 ml/kg it was appeared at 60 DAS (1.46%). As in all the treatments termite damage was observed at 60 DAS, so the data at 60 DAS and at harvest were subjected to analysis. Termite damage at 60 DAS, highly significant difference was observed among all the treatments. The untreated control was significantly affected by termite (14.18%) as compared to all other treatments, while the minimum plant damage was observed in imidacloprid 600 FS @ 4.0 ml/kg (1.46%).

Termite damage at harvest, highly significant difference was observed among all the treatments. The untreated control was significantly affected by termite (35.82%) as compared to all other treatments, while the minimum plant damage was observed in imidacloprid 600 FS @ 4.0 ml/kg (17.25%) in (Table-7)

3. Pod yield of Groundnut kg/ha basis at harvest.

Data on pod yield was taken and subjected to analysis, which revealed highly significant difference over the treatments. Maximum pod yield was in imidacloprid 600 FS @ 4.0 ml/kg (2241 kg/ha) which was at par with imidacloprid 600 FS @ 2.0 ml/kg (2028 kg/ha). The minimum was observed in untreated control (1593 kg/ha) which was at par with imidacloprid 600 FS @ 1.0 ml/kg (1639 kg/ha), imidacloprid 600 FS @ 1.5 ml/kg (1750 kg/ha) and chlorpyriphos 20% EC @ 12.5 ml/kg (1861 kg/ha) in (Table-8).

4. Straw yield of Groundnut kg/ha basis at harvest.

Observation on straw yield was taken and subjected to analysis, which revealed significant difference over the treatments. Maximum straw yield was in imidacloprid 600 FS @ 4.0 ml/kg (4185 kg/ha) which was at par with imidacloprid 600 FS @ 2.0 ml/kg (3861 kg/ha). The minimum was observed in untreated control (3000 kg/ha) which was at par with imidacloprid 600 FS @ 1.0 ml/kg (3093 kg/ha), imidacloprid 600 FS @ 1.5 ml/kg (3347 kg/ha) and chlorpyriphos 20% EC @ 12.5 ml/kg (3509 kg/ha) in (Table-9).

Discussion

The maximum pod and straw yield was recorded in imidacloprid 600 FS @ 4.0 ml/kg which was at par with imidacloprid 600 FS @ 2.0 ml/kg while minimum in untreated control. Therefore it can be suggested to the farmers for Among the entire tested chemical at different doses imidacloprid 600 FS @ 4.0 ml/kg seed was superior over the rest in all the aspect, followed by imidacloprid 600 FS @ 2.0 ml/kg seed. All the chemical treated seed delay the germination as compare to untreated seed. Least termite damage was recorded in imidacloprid 600 FS @ 4.0 ml/kg, while maximum damage was recorded in untreated control after 60 DAS and at harvest.

1. <u>First Season Year: 2016-17</u>

Table 2: Germination per cent at 10 and 20 Days after Sowing (DAS)

Sr. No.	Treatments	Dosage/ kg of seed		Germination per cent	
		a.i. (g)	Forml (ml)	10 DAS	20 DAS
1	Untreated Control	-	-	***57.76(71.46)**	***71.37(89.33)**
2	Gaucho 600 FS (Imidacloprid 600 FS)	0.6	1.0	50.72(59.88)	62.52(78.50)
3	Gaucho 600 FS (Imidacloprid 600 FS)	0.9	1.5	47.71(54.71)	61.87(77.67)
4	Gaucho 600 FS (Imidacloprid 600 FS)	1.2	2.0	44.67(49.42)	61.12(76.50)
5	Gaucho 600 FS (Imidacloprid 600 FS)	2.4	4.0	**43.37(47.17)**	60.84(76.00)
6	Chlorpyriphos 20 % EC	2.5	12.5	45.53(50.92)	**60.27(75.17)**
S.Em.±				1.37	2.22
CD at 0.05				4.12	6.69

* Arcsine per cent transformed value Figures in parenthesis are original value

Table 3: Per cent plant damage by Termite (% to germination 20 DAS)

Sr. No.	Treatments	Dosage/ kg of seed		Per cent plant damage						
		a.i. (g)	Forml (ml)	10 DAS	20 DAS	30 DAS	40 DAS	50 DAS	60 DAS	At Harv.
1	Untreated Control	-	-	0	*4.29 (0.56)	*7.85 (1.87)	*9.95 (2.99)	*13.68 (5.60)	***20.87 (12.69)**	***33.99 (31.30)**
2	Gaucho 600 FS (Imidacloprid600 FS)	0.6	1.0	0	2.64 (0.21)	6.48 (1.27)	9.18 (2.55)	13.85 (5.73)	18.01 (9.56)	29.16 (23.75)
3	Gaucho 600 FS (Imidacloprid600 FS)	0.9	1.5	0	0	7.99 (1.93)	10.68 (3.43)	11.96 (4.29)	15.44 (7.09)	28.78 (23.18)
4	Gaucho 600 FS (Imidacloprid600 FS)	1.2	2.0	0	0	0	7.59 (1.74)	9.31 (2.61)	14.57 (6.33)	25.87 (19.09)
5	Gaucho 600 FS (Imidacloprid600 FS)	2.4	4.0	0	0	0	0	0	**6.01 (1.10)**	**18.15 (9.79)**
6	Chlorpyriphos20%EC	2.5	12.5	0	0	2.70 (0.22)	5.40 (0.89)	10.86 (3.55)	15.20 (6.88)	24.47 (17.19)
S.Em.±				-	-	-	-	-	0.25	0.85
CD at 0.05				-	-	-	-	-	0.75	2.55

* Arcsine per cent transformed value Figures in parenthesis are original value

Table 4 and 5 : Pod yield and straw yield of groundnut (Kg/ha)

Sr. No.	**Treatments**	**Dosage/ kg of seed**		**Pod yield (kg/ha)**	**Straw yield (kg/ha)**
		a.i. (g)	**Forml (ml)**		
1	Untreated Control	-	-	**1307**	**2407**
2	Gaucho 600 FS(Imidacloprid 600 FS)	0.6	1.0	1417	2565
3	Gaucho 600 FS(Imidacloprid 600 FS)	0.9	1.5	1467	2676
4	Gaucho 600 FS(Imidacloprid 600 FS)	1.2	2.0	1568	2861
5	Gaucho 600 FS(Imidacloprid 600 FS)	2.4	4.0	**1756**	**3213**
6	Chlorpyriphos 20% EC 2.5 a.i.	2.5	12.5	1496	2713
S.Em.±				80.61	133.44
CD at 0.05				243	402

Second Season Year: 2017-18

Table 6: Germination per cent at 10 and 20 Days after Sowing (DAS)

Sr. No.	**Treatments**	**Dosage/ kg of seed**		**Germination per cent**	
		a.i. (g)	**Forml (ml)**	**10DAS**	**20DAS**
1	Untreated Control	-	-	***59.08(73.50)**	***70.05(88.17)**
2	Gaucho 600 FS (Imidacloprid 600 FS)	0.6	1.0	51.37(61.00)	65.48(82.67)
3	Gaucho 600 FS (Imidacloprid 600 FS)	0.9	1.5	49.32(57.50)	64.76(81.67)
4	Gaucho 600 FS (Imidacloprid 600 FS)	1.2	2.0	45.48(50.83)	64.25(81.00)
5	Gaucho 600 FS (Imidacloprid 600 FS)	2.4	4.0	**44.43(49.00)**	63.54(80.00)
6	Chlorpyriphos 20 % EC	2.5	12.5	45.67(51.17)	**63.01(79.33)**
S.Em.±				1.00	1.44
CD at 0.05				3.03	4.34

* Arcsine per cent transformed value Figures in parenthesis are original value

Table 7 : Per cent plant damage by Termite (% to germination 20 DAS)

Sr. No.	Treatments	Dosage/ kg of seed		Per cent plant damage						
		a.i. (g)	Forml (ml)	10 DAS	20 DAS	30 DAS	40 DAS	50 DAS	60 DAS	At Harv.
1	Untreated Control	-	-	0	*3.53 (0.38)	*8.66 (2.27)	*10.92 (3.59)	*13.30 (5.29)	***22.12 (14.18)**	***34.28 (35.82)**
2	Gaucho 600 FS (Imidacloprid600 FS)	0.6	1.0	0	0	6.31 (1.21)	9.67 (2.82)	13.24 (5.24)	18.13 (9.68)	24.66 (29.71)
3	Gaucho 600 FS (Imidacloprid600 FS)	0.9	1.5	0	0	7.34 (1.63)	11.05 (3.67)	12.51 (4.69)	16.15 (7.76)	23.09 (28.68)
4	Gaucho 600 FS (Imidacloprid600 FS)	1.2	2.0	0	0	0	6.89 (1.44)	8.25 (2.06)	12.82 (4.94)	19.32 (26.04)
5	Gaucho 600 FS (Imidacloprid600 FS)	2.4	4.0	0	0	0	0	0	**6.92 (1.46)**	**9.34 (17.75)**
6	Chlorpyriphos20%EC	2.5	12.5	0	0	3.72 (1.05)	5.88 (1.05)	10.23 (3.15)	15.74 (7.35)	17.69 (24.84)
S. Em.±				-	-	-	-	-	0.46	1.41
CD at 0.05				-	-	-	-	-	1.38	4.24

* Arcsine per cent transformed value Figures in parenthesis are original value

Table 8 and 9 : Pod Yield and Straw Yield of groundnut (Kg/ha)

Sr. No.	**Treatments**	**Dosage/ kg of seed**		**Pod yield (kg/ha)**	**Straw yield (kg/ha)**
		a.i. (g)	**Forml (ml)**		
1	Untreated Control	-	-	**1593**	**3000**
2	Gaucho 600 FS(Imidacloprid 600 FS)	0.6	1.0	1639	3093
3	Gaucho 600 FS(Imidacloprid 600 FS)	0.9	1.5	1750	3343
4	Gaucho 600 FS(Imidacloprid 600 FS)	1.2	2.0	2028	3861
5	Gaucho 600 FS(Imidacloprid 600 FS)	2.4	4.0	**2241**	**4185**
6	Chlorpyriphos 20% EC 2.5 a.i.	2.5	12.5	1861	3509
S.Em.±				114.19	214.07
CD at 0.05				344	645

Treatment wise crop condition

Tr. 1 Untreated control

Tr. 2 Imidacloprid 600 FS @ 1.0 ml/kg

Tr. 3 Imidacloprid 600 FS @ 1.5 ml/kg

Tr. 4 Imidacloprid 600 FS @ 2.0 ml/kg

Tr. 5 Imidacloprid 600 FS @ 4.0 ml/kg

Tr. 6 Chlorpyriphos 20% EC @ 12.5 ml/kg

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