BIOEFFICACY OF THIAMETHOXAM 75% SG AS SOIL DRENCHING AGAINST TERMITES AND WHITE GRUBS IN GROUNDNUT

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ABSTRACT

The experiment was conducted at Agronomy Instructional farm, S. D. Agricultural University, Sardarkrushinagar in Randomized Block Design replicated thrice with ten treatments to test the bioefficacy of thiamethoxam 75% SG. The highest dose of thiamethoxam 75 % SG i.e. 113 g a.i. per ha proved to be the best treatment, as it had the lowest plant damage (5.74 %).The next effective treatment was thiamethoxam 75 % SG @ 94 g a.i. per ha (6.04 %). The pod damage by termite and white grub recorded at harvest was negligible, and as such it ranged between 1.19 to 3.37 per cent. The highest dose of thiamethoxam i.e.113 g a.i. per ha (1.03/m^2) successfully controlled the white grubs in soil with the lowest white grub population. The highest pod yield was recorded in the treatment of thiamethoxam 75% SG i.e. 113 g a.i. per ha (1752 kg /ha), followed by thiamethoxam @ 94 g a.i. per ha (1672 kg /ha). The treatment of thiamethoxam @ 113 g a.i. per ha resulted in the highest per cent increase in the pod yield (34.46%).

KEY WORDS: *Groundnut, termites, thiamethoxam 75% SG, white grubs*

INTRODUCTION

Soil arthropod pests pose serious problems for ground nut growers. White grub and termite are major bottlenecks that limit the cultivation of groundnut in many regions of Gujarat. Both are hidden enemies of this crop and their attack starts during early stage of crop growth and may persists till pod formation stage. The presence of one grub per square meter may cause mortality of 80 to 100 per cent plants (Yadava, 1977). The termite is also another hidden enemy of this crop. It causes damage up to 39.40 per cent (Umeh *et al*., 1999). Now a days, large number of newer insecticidal formulations in form of ready mix or individual are available in market.

Thiamethoxam is a second generation neonicotinoid insecticide, possessing some unique chemical properties. It was discovered in the course of an optimisation program on neonicotinoids started in 1985. It was introduced in 1997 in New Zealand, then approved to use in almost all European countries and also registered in the USA and Australia. The compound can be synthesised in only a few steps and high yield from easily accessible starting materials. It interferes with a specific receptor site in the insect´s nervous system. Once insect come into contact with thiamethoxam, feeding is irreversibly stopped and insect damage halts. Insecticide having contact, stomach and systemic activity and

used for the control of aphids, whitefly, thrips, ricehoppers, ricebugs, mealybugs, white grubs, Colorado potato beetle, flea beetles, wireworms and ground beetles. Major target crops are leafy and fruity vegetables, potatoes, rice, cotton, citrus, tobacco and soya beans, cereals, sugar beet, peas, sunflowers etc. It is commonly used for modern integrated pest management programmes in many cropping systems. An attempt was, therefore, made to test the bioefficacy of thiamethoxam 75% SG against whitegrub and termite in groundnut crop.

MATERIAL AND METHODS

Field experiments were conducted at Agronomy Instructional Farm, C. P. College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar on groundnut cv. GG 2 in randomized block design during *kharif* 2009-10 and 2010-11. Four different doses of thiamethoxam 75% SG (Actara 75% SG) *i.e.* 60, 75, 94 and 113 g active ingredient per hectare (after diluting in 1000 liters of water), Phorate 10 G @1000 g. a. i. per ha and Carbofuran 3 G @1500 g a.i. per ha were applied at the time of sowing in seed dibbling hole followed by irrigation.

Methodology for Recording Observations:

(1) Observations on germination were recorded after ten days of sowing from each net plot. (2)Total number of plants and plants damaged by termite and white grubs in net plot area at 20, 40 and 60 days after germination (DAG) were recorded. (3)The total number of pods and pods damaged by termite and white grubs were counted from five randomly selected plants at harvest in each net plot. (4) Number of white grub larvae was counted by digging the soil up to 50 cm from 1 x 1 meter area in net plot at two spots in each plot. (5) Yield of pod was recorded from net plot at the time of harvest and converted in to ha basis. (6) Observations were recorded on natural enemy population *viz.*, coccinelids, green lace wing and spiders on five randomly selected plants per net plot at 40 and 60 days after germination.

RESULTS AND DISCUSSIONS

Plant Mortality due to Termite and White grub

The pooled results on plant mortality (Table 1 and Figure 1) revealed non-significant differences among treatments indicated consistency of efficacy of various treatments at 20 and 40 days after germination. The plant mortality in various treatments ranged between 1.18 per cent (Thiamethoxam @ 94 g a.i. /ha) and 4.69 per cent (untreated control) at 20 days after germination, whereas it was ranged between 1.99 per cent (Thiamethoxam @ 94 g a.i. /ha) to 4.86 per cent (untreated control) at 20 days after germination. The plant mortality on pooled basis due to termite and white grub (Table 1 and Figure 1) revealed that all the treatments were significantly superior over untreated control (5.80 %) at 60 days after germination. The lowest plant mortality was observed in the treatment of thiamethoxam 75% SG @ 113 g a.i. per ha (1.90 %), however, it was at par with its two lower doses i.e. 94 g (2.31 %) and 75 g a.i. per ha (2.71 %). Carbofuran 3 % G @ 1500 g a.i. per ha (3.51 %) and phorate 10 G @1000 g a.i. per ha (3.49 %) also remained at par with thiamethoxam @ 94 g a.i. per ha and 75 g a.i. per ha in efficacy against termite and white grub at 60 days after germination.

The pooled results of two years (Table 1) on cumulative plant mortality due to termite and white grub revealed that all the treatments were significantly superior over untreated control (15.30 %). The minimum plant mortality was recorded in the highest dose of thiamethoxam i.e. 113 g a.i. per ha (5.74 %). However, it was at par with thiamethoxam @ 94 g a.i. per ha (6.04 %). Further, thiamethoxam @ 75 g a.i. per ha (7.32 %) was

also found to be at par with its higher dose i.e. 94 g a.i. per ha in efficacy. The lowest dose of thiamethoxam @ 60 g a.i./ha (10.62 %) was significantly superior over carbofuran 3 % G @ 1500 g a.i. per ha (11.94 %) and phorate 10 G @1000 g a.i. per ha (11.78%) in efficacy. Similarly findings were also reported by Suthar (1994), Patel *et al.,* (1995) and Patel and Patel (2000).

Termite and White grub Damage to Pods:

Pooled results revealed that the differences among treatments in pod damage by termite and white grub at harvest were non-significant (Table 2 and Figure 1). The damage was negligible, and as such it varied between 1.19 per cent (Thiamethoxam @ 113 and 94 g a.i. /ha) to 3.37 per cent (untreated control).

White grub Population at Harvest:

The pooled results (Table 2) of white grub population at harvest revealed that all the treatments recorded significantly lower population of white grubs in soil than untreated control (6.00 /m^2) and the lowest dose of thiamethoxam 75% SG @ 60 g a.i. per ha (3.38 /m^2). The lowest white grub population was recorded in the treatment of the highest dose of thiamethoxam i.e.113 g a.i. per ha (1.03/m^2) and it was at par with all other treatments. Thus, the results obtained in present study corroborate the finding of earlier workers (Suthar, 1994 and Patel and Patel, 2000).

Pod Yield:

Perusal of the pooled data on pod yield (Table 2) revealed that all the treatments remained significantly superior over untreated control (1303 kg /ha) except thiamethoxam @ 60 g a.i. per ha (1417 kg /ha). The highest yield was recorded in the treatment of thiamethoxam 75% SG i.e. 113 g a.i. per ha (1752 kg/ha) and it was at par with thiamethoxam @ 94 g a.i. per ha (1672 kg /ha). The treatment of thiamethoxam @ 94 g a.i. per ha also remained at par with thiamethoxam 75% SG @ 75 g a.i. per ha (1584 kg /ha) and phorate 10 G @1000 g a.i. per ha (1232 kg /ha). Further, pooled results also revealed that the highest per cent increase in pod yield (34.46 %) over untreated control was recorded in the treatment of thiamethoxam @ 113 g a.i. per ha followed by of thiamethoxam @ 94 g a.i. per ha (28.32%).The minimum increase in yield was observed in the treatment of thiamethoxam @ 60 g a.i. per ha (8.75 %). Similar finding were also reported in past by several scientists (Suthar, 1994 and Patel and Patel, 2000 and Reddy, 2000)

CONCLUSION

The highest dose of thiamethoxam 75 % SG *i.e.* 113 g a.i. per ha proved to be the best treatment, as it had the lowest plant mortality (5.74 %), white grubs population in the soil (1.03/m^2) with highest yield (1752 kg /ha) and maximum per cent increase in yield (34.46 %). However, the next dose of thiamethoxam @ 75% SG *i.e.* 94 g a.i. per ha was also found to be as effective as the highest dose in statistical analysis and it remained at par in all above parameters *viz.*,plant mortality (6.04 %), white grubs population (1.78/m^2), pod yield (1672 kg /ha) and recorded 28.32 per cent increase in yield. Thus, thiamethoxam @ 75% SG *i.e.* 94 g a.i. per ha is the effective control measure for soil inhibiting pest like termite and white grubs.

REFERENCES

Patel, B. D. and Patel G. M. (2000) Efficacy of new insecticidal formulations as seed treatment against white grub in groundnut. *GAU Res. J.*, 25(2): 27-33.

Patel, G. M., Patel, J. I., Patel, P. K., Patel, B. R., Patel, R. L., Patel, R. K., Patel, P. J. and Chaudhary, S. N. (1995). Chemical control of whitegrub, *Holotrichia consanguinea* Blanch. in groundnut through seed treatment and soil application. *Pest Manage. Economic Zoo.*, 3(1):13-16.

Reddy, M. L. (2000). Chemical control of root grub (*Holotrichia consanguinea*) on groundnut. *J. Res. ANGRAU,* 28(1&2): 82-83.

Suthar, N. B. (1994). Efficacy of some chemical and neem based insecticides as seed treatment and soil application for controlling whitegrub (*Holotrichia consanguinea* Blanch.) in groundnut. M.Sc (Agri.) thesis (unpublished) submitted to Gujarat Agricultural University, Sardarkrushinagar.

Umeh, V. C., Waliyar, F., Traore, S. and Gwurube, E. (1999). Soil pests of groundnut in West Africa species diversity, damage and estimation of yield losses. *Insect Science and its Application*, 19(2/3): 131-140.

Yadava, C. P. S., Saxena, R.C., Mishra, R. K. and Dadheech, L. N. (1977). Population management of whitegrub, *Holotrichia consanguinea* Blanch. in an agro-ecosystem. *Indian J. Ent.*, 39(3): 205-210.

Table 1: Efficacy of thiamethoxam 75% SG against white grub and termite and plant mortality due to termite and white grub

Sr. No.	Treatments	Plant mortality due to termite and white grub (%)											
		20 DAS			40 DAS			60 DAS			Cumulative Damage		
		2009	2010	Pooled	2009	2010	Pooled	2009	2010	Pooled	2009	2010	Pooled
1	Untreated check	12.72 (4.84)*	12.30 (4.53)	12.51 (4.69)	13.91 (5.77)	11.59 (4.03)	12.75 (4.86)	15.99 (7.58)	11.88 (4.23)	13.94 (5.80)	25.09 (17.98)	20.98 (12.81)	23.03 (15.30)
2	Thiamethoxam 75% SG 60 g a.i. /ha	9.33 (2.62)	11.41 (3.91)	10.36 (3.23)	11.89 (4.24)	9.44 (2.69)	10.66 (3.42)	13.32 (5.30)	9.09 (2.49)	11.20 (3.77)	20.43 (12.18)	17.63 (9.17)	19.02 (10.62)
3	Thiamethoxam 75% SG 75 g a.i. /ha	6.53 (1.29)	10.06 (3.05)	8.30 (2.08)	8.57 (2.22)	9.18 (2.54)	8.87 (2.37)	10.46 (3.29)	8.53 (2.20)	9.49 (2.71)	15.13 (6.81)	16.26 (7.83)	15.70 (7.32)
4	Thiamethoxam 75% SG 94 g a.i. /ha	4.39 (5.85)	8.10 (1.98)	6.25 (1.18)	7.60 (1.74)	9.68 (2.82)	8.64 (2.25)	9.40 (2.66)	8.13 (1.99)	8.76 (2.31)	13.30 (5.29)	15.16 (6.83)	14.23 (6.04)
5	Thiamethoxam 75% SG 113 g a.i. /ha	4.21 (5.38)	9.93 (2.97)	7.07 (1.51)	6.86 (1.42)	9.36 (2.64)	8.11 (1.99)	8.83 (2.35)	7.05 (1.50)	7.94 (1.90)	12.22 (4.48)	15.53 (7.16)	13.87 (5.74)
6	Phorate 10 G 1000 g a.i. /ha	8.75 (2.31)	11.84 (4.20)	10.29 (3.19)	10.74 (3.47)	13.36 (5.26)	12.05 (4.35)	12.74 (4.86)	8.84 (2.36)	10.78 (3.49)	19.84 (11.51)	20.33 (12.07)	20.08 (11.78)
7	Carbofuran 3% G 1500 g a.i. /ha	8.89 (2.38)	12.74 (4.86)	10.81 (3.51)	11.59 (4.03)	12.74 (4.86)	12.16 (4.43)	13.06 (5.10)	8.36 (2.11)	10.81 (3.51)	20.18 (11.90)	20.25 (11.97)	20.22 (11.94)
S. Em. ±		0.87	0.86	0.945	0.71	0.55	1.081	0.52	0.50	0.687	0.73	0.57	1.303
CD at 5% t		2.69	2.65	NS	2.18	1.69	NS	1.60	1.54	2.37	2.25	1.75	0.655
Y x T		-	-	0.866	-	-	0.633	-	-	0.510	-	-	4.50
CV%		19.27	13.66	16.00	12.08	8.80	10.48	7.52	9.75	8.47	7.02	5.47	6.29

** Figures in parenthesis are arc sin $\sqrt{\text{Per cent}}$ transformed values, while those outside are retransformed values.*

DAS: Days After Germination

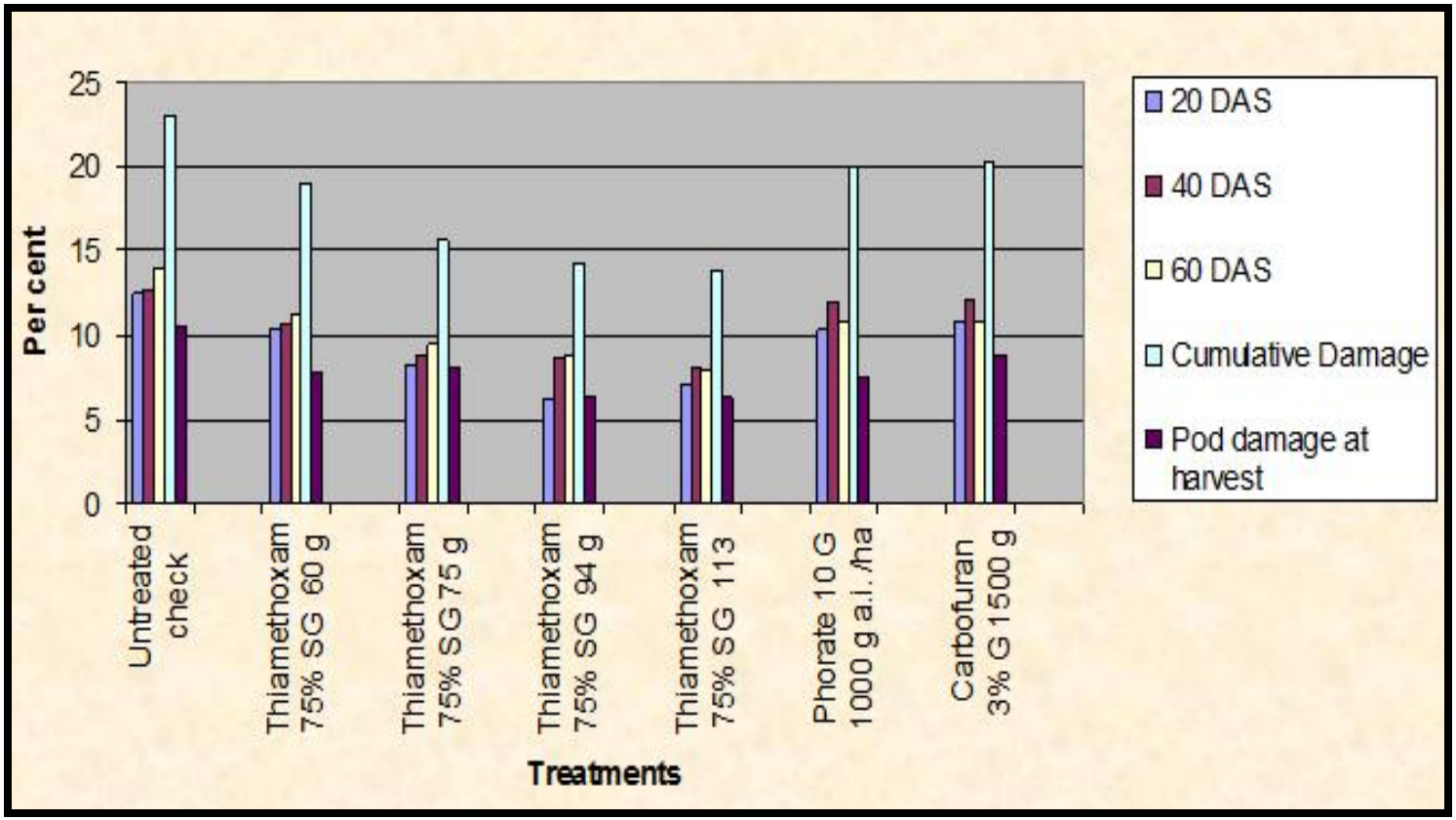
Table 2. Pod damage due to termite and white grub at harvest, white grub population, pods yield and increase in yield over control.

Sr. No.	Treatments	Pod damage at harvest(%)			White grub population(m^2)			Pod Yield (kg/ha)			Increase in yield over control (%)		
		2009	2010	Pooled	2009	2010	Pooled	2009	2010	Pooled			
1	Untreated check	9.96** (2.99)	11.20 (3.77)	10.58 (3.37)	*3.07(8.92)	2.04 (3.66)	2.55 (6.00)	1343	1262	1303	-	-	-
2	Thiamethoxam 75% SG 60 g a.i. /ha	7.93 (1.90)	7.60 (1.75)	7.77 (1.82)	2.38(5.16)	1.56 (1.93)	1.97 (3.38)	1452	1383	1417	8.27	9.58	8.75
3	Thiamethoxam 75% SG 75 g a.i. /ha	8.16 (2.01)	8.21 (2.03)	8.18 (2.02)	1.74(2.52)	1.34 (1.29)	1.54 (1.27)	1662	1504	1584	23.79	19.18	21.57
4	Thiamethoxam 75% SG 94 g a.i. /ha	7.53 (1.71)	7.59 (1.74)	6.27 (1.19)	1.56(1.93)	1.46 (1.63)	1.51 (1.78)	1734	1610	1672	29.31	27.58	28.32
5	Thiamethoxam 75% SG 113 g a.i. /ha	6.90 (1.44)	7.72 (1.80)	6.28 (1.19)	1.27(1.11)	1.22 (1.98)	1.24 (1.03)	1808	1697	1752	34.82	34.46	34.46
6	Phorate 10 G 1000 g a.i. /ha	7.05 (1.50)	7.89 (1.88)	7.47 (1.69)	1.93(3.22)	1.77 (2.63)	1.85 (2.92)	1576	1469	1523	17.16	16.40	16.88
7	Carbofuran 3% G 1500 g a.i. /ha	7.57 (1.73)	10.41 (3.26)	8.90 (2.39)	2.15(4.12)	1.46 (1.63)	1.80 (2.74)	1584	1471	1492	12.75	16.56	14.50
S. Em. ±		0.41	0.72	0.87	0.20	0.39	0.195	89	59	50.38			
CD at 5% T		1.27	2.22	NS	0.61	0.13	0.67	282	193	148			
Y x T		-	-	0.588	-	-	0.166	-	-	NS			
CV%		9.05	15.63	12.83	17.09	14.05	16.16	10.02	7.17	8.81			

***Figures outside parenthesis are arc sin $\sqrt{Per\ cent}$ transformed values, while those inside are retransformed values.*

** Figures outside parenthesis are square root $\sqrt{X+0.5}$ transformed values, while those inside parenthesis are retransformed value*

Figure 1: Plant mortality due to termite and white grub (%) and pod damage (%) at harvest



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