ISSN: 2456–5474 RNI No.UPBIL/2016/68367 Vol.-6* Issue-4* May- 2021
Innovation The Research Concept

Bioefficacy of Different Dosages of Clothianidin 50WDG against Major Insect Pests of Groundnut and Phytotoxicity Evaluation

Paper Submission: 15/05/2021, Date of Acceptance: 24/05/2021, Date of Publication: 25/05/2021

K.C. Kumawat
Professor
Dept. of Entomology,
SKN College of Agriculture,
Jobner, Rajasthan, India

S.K. Khinchi
Assistant Professor,
Dept. of Entomology,
SKN College of Agriculture,
Jobner, Rajasthan, India

Akhter Hussain
Associate Professor,
Dept. of Entomology,
SKN College of Agriculture,
Jobner, Rajasthan, India

Abstract

Out of five dosages of clothianidin 50WDG evaluated as post sowing soil drenching, the highest reduction in whitegrub, Holotrichia consanguinea Blanchard infestation (91.35%) was observed in clothianidin 50WDG (250 g ai/ ha) which was found at par with phorate 10CG (97.17% reduction) followed by quinalphos 25EC (88.48% reduction).These treatments were followed by clothianidin 50WDG 150 g ai/ha which was at par with quinalphos 25EC but differed significantly from clothianidin 50WDG (250 g ai/ ha) and phorate 10CG. The per cent survival of plants was maximum in the plots treated with phorate 10CG (Check), clothianidin 50WDG 250 g ai/ha and quinalphos 25EC (Check) (99.34, 97.91 and 97.20%, respectively) which were found at par each other. The highest reduction in aphid, *Aphis craccivora* Koch*;* jassid, *Empoasca kerri* Pruthi*;* thrips, *Caliothrips indicus* Bagnal and *Scirtothrips dorsalis* Hood*;* and leaf miner, *Stomopteryx nertaria* Meyrick damage was recorded in phorate 10CG and clothianidin 50WDG 250 g ai/ha after three days of application which differed significantly over other treatments. This was followed by clothianidin 150 and 125 g ai/ha. No phytotoxicity has been recorded in the different dosages of clothianidin 50WDG (75, 100, 125, 150 and 250 g ai/ ha) in the groundnut crop. The maximum pod yield was registered in phorate 10CG (16.05 q/ha), clothianidin 50WDG 250 g ai/ ha (15.82 q/ ha) and clothianidin 50WDG 150 g ai/ ha (15.25 q/ ha), these three treatments were found at par each other. No phytotoxicity has been recorded in the different dosages of clothianidin 50WDG (75, 100, 125, 150 and 250 g ai/ ha) in the groundnut crop.

Keywords: Clothianidin 50WDG, Phorate 10CG, Quinalphos 25EC, Bioefficacy, Phytotoxicity.

Introduction

Groundnut, *Arachis hypogaea* L. is an important oilseed crop grown throughout India. The productivity is adversely affected by insect pests and diseases. The whitegrub, Holotrichia consanguinea Blanchard; groundnut aphid, Aphis craccivora Koch; jassid, Empoasca kerri Pruthi; thrips, Caliothrips indicus Bagnal and Scirtothrips dorsalis Hood; and leaf miner, Stomopteryx nertaria Meyrick are some of the major insect pests creating bottleneck in higher productivity of groundnut crop (Bajia et al., 2016).The whitegrub is an extremely dangerous species which has expanded rapidly in all parts of groundnut growing areas of the country. It is a pest of economic significance with a broad host range, with prominent pest reports on crops including all the *Kharif* crops. The crop is infested by a number of sucking insect pests, like aphids, jassids and thrips. The leaf miner is also a serious threat in higher productivity of groundnut crop. The groundnut aphid injects a powerful toxin into the plants while feeding and produces a considerable amount of honeydew on which sooty mould grows. The black sooty mould reduces photosynthesis and makes leaves unpalatable for livestock. The damage symptoms include yellowing, wilting and dieback. In general, the legumes may be seriously damaged either by direct insect feeding or by transmission of virus diseases (rossette and peanut strip virus). The jassids (both the nymphal and adult stages) suck the cell sap from young leaves,

mostly from lower surface. The first symptom is whitening of leaves. Yellow patches then appear especially near tips of leaves. Under severe infestation, the leaf tips become necrotic in a typical 'v' shape giving a crop scorched appearance known as hopper burn. The infestation is high in August-September. Groundnut thrips appears to feed preferentially on new growth, and infested plants usually develop characteristic wrinkled leaves with distinctive brown scarring along the veins of leaves and the buds. Feeding damage can cause stunted plants, reduce the sale value of crops produced and in sufficient numbers, kill plants already aggravated by environmental stress. The pest is also responsible for transmission of viral diseases.

The insect pests are known to develop resistance to pesticides quickly. This is thought to be a consequence of the short time span and large capacity of their reproductive cycle. In addition, they have an extremely wide host range, providing population reservoirs even after the most thorough pesticide application. Product rotation is integral to resistance prevention programmes. The present study aimed to evaluate the bioefficacy of a newer insecticide, clothianidin 50WDG for standardization of dosage against whitegrub, *Holotrichia consanguinea* Blanchard; aphid, thrips, jassid and leaf miner infesting groundnut. Further, this insecticide was aimed to be evaluated as soil drenching.

Material and Methods

The present investigation was conducted at the Agronomy farm of S. K. N. College of Agriculture, Jobner, during two consecutive *Kharif*, seasons of 2017 and 2018 in simple Randomized Block Design (RBD) with three replications keeping plot size of 4.5x3.0 m^2 and crop geometry of 30x15 cm. The crop (variety, RG-382) was sown on 1st July, and 2nd July in Ist and IInd year, respectively. Recommended dose of fertilizers, *viz*., 30 kg Nitrogen, 60 kg Phosphorus were applied. Half dosage of N and full dose of P and K was applied as basal dressing, whereas, half dose of N was applied as top dressing after 35 days of sowing. Five dosages of clothianidin 50 WP, *viz*., 75, 100, 125, 150 and 250 g ai/ ha and single dosages of quinalphos 25EC (350 g ai/ ha as check) and phorate 10CG (2500 g ai/ha as check) were applied as soil drenching 30 days after sowing. An untreated check was maintained for comparison. The whitegrub infestation was recorded at weekly interval and cumulative infestation was worked out at end of season. Reduction in the infestation was worked out by taking into account the infestation in treated plots and infestation in the untreated control.

The populations of aphid, thrips and jassid were recorded from 30 leaves (one each from top, middle and bottom) on ten randomly selected plants. The pre-treatment populations were recorded one day before treatment and the post-treatment populations were recorded 3, 7, and 15 days after application of the treatments. The per cent reduction in population was calculated. The leaf miner incidence was recorded visually by observing the leaf mines present on the leaves as soon as the infestation started and continued at fortnightly interval till maturity of the crop.

The observations so recorded were accumulated at end of the season and reduction in infestation was recorded in different treatments. The per cent data were converted into angular values and subjected to analysis of variance.

A 10 point phytotoxicity grade/ scale was used in assessing the phytotoxicity as a result of drenching application of insecticides. The pod yield was recorded at harvesting and the data were converted per hectare on the basis of plot yield obtained in different treated and untreated plots.

Results and Discussion

Bioefficacy of Clothianidin 50WDG against whitegrub, *H. consanguinea*

As high as 91.35 per cent reduction in whitegrub infestation was observed in clothianidin 50WDG (250 g ai/ ha) which was found at par with phorate 10CG (97.17% reduction) followed by quinalphos 25EC (88.48% reduction) as evident in table-1. Clothianidin 50WDG 150 g ai/ha was found at par with quinalphos 25EC but differed significantly from clothianidin 50WDG (250 g ai/ ha) and phorate 10CG. All the treatments differed significantly over untreated control.

The per cent survival of plants was maximum in the plots treated with phorate 10CG, clothianidin 50WDG 250 g ai/ha and quinalphos 25EC (99.34, 97.91 and 97.20% survival of plants, respectively) which were found at par each other (Table-1). These treatments were followed by clothianidin 50WDG 150 g ai/ha. A low survival of 75.72 per cent was recorded in the untreated control. Vittum (2013) suggested that clothianidin and thiamethoxam have longer residual activity than does imidacloprid. Mane and Mohite (2014) found clothianidin 50WDG @ 250 g ha^{-1} drenching as effective treatment against whitegrub which corroborate the present findings. Patel *et al.* (2018) found clothianidin 50WDG (ST) @ 250 gm per ha as most effective treatment against whitegrub in groundnut and maximum yield was achieved.

Reduction in Aphid, Thrips and Jassid Populations

Aphid, *A. craccivora*

The highest reduction in aphid population was recorded in phorate 10CG and clothianidin 50WDG 250 g ai/ha (96.4 and 96.1%, respectively) after three days of application which differed significantly over other treatments. This was followed by clothianidin 150 and 125 g ai/ha. Satisfactory results have been obtained in these treatments with regards to management of aphid after fifteen days of application too (Table-2). Zhang *et al.* (2016) concluded that wheat seed treatments with imidacloprid and clothianidin were effective against wheat aphids throughout the winter wheat growing season and reduced the yield loss under field conditions.

Jassid, *E. kerri*

The maximum reduction in population of jassid was evident after three days of application of the treatments (Table-3). It was maximum in the treatment phorate 10CG and clothianidin 250 g ai/ha (96.9 and 96.25%, respectively), the duo were non significant each other. These treatments were

followed by clothianidin 50WDG 150 g ai/ ha (88.3% reduction). Results are satisfactory after fifteen days of application of these treatments as far as management of jassid is concerned.

Thrips, *C. indicus* and *S. dorsalis*

Maximum reduction in thrips population was observed after three days of application of treatments (Table-4). The reduction was maximum in the plots treated with phorate 10CG (97.6%) and clothianidin 50WDG 250 g ai/ ha (96.95%) which were found at par each other (Table-6). These treatments were followed by clothianidin 50WDG 150 g ai/ ha (91.65%). These treatments also performed well after fifteen days of application. Other treatments ranked in the lower order. Ding *et al.* (2018) concluded that thiamethoxam, clothianidin, and imidacloprid seed treatments effectively controlled thrips on corn under field conditions.

Reduction in the Leaf Miner, *S. nertaria* Damage

Maximum reduction in leaf miner damage was observed after three days of application of treatments (Table-5). The reduction was maximum in the plots treated with phorate 10CG (96.0%) and clothianidin 50WDG (95.7%) which were found at par each other. These treatments were followed by clothianidin 50WDG 150 g ai/ ha (91.4%). These treatments also performed well after fifteen days of application. Other treatments ranked in the lower order.

Pod yield of Groundnut

The pod yield was recorded plot-wise and converted per hectare (Table-6). The pod yield observed in different dosages of clothianidin 50WDG ranged from 11.27- 15.82 q/ ha *vis*-à-*vis* 9.58 q/ ha in the untreated control. It was minimum in the plots treated with clothianidin 50WDG 75 g ai/ha (11.27 q/ ha) which was found at par with clothianidin 50WDG 100 g ai/ha (12.81 q/ ha). These treatments were followed by clothianidin 50WDG 125 g ai/ ha (13.76 q/ ha) which was found at par with quinalphos 25EC (14.32 q/ ha). The maximum pod yield was registered in phorate 10CG (16.05 q/ha), clothianidin 50WDG 250 g ai/ ha (15.82 q/ ha) and clothianidin 50WDG 150 g ai/ ha (15.25 q/ ha), these three treatments were found at par each other.

No phytotoxicity has been recorded in the different dosages of clothianidin 50WDG (125 and 250 g ai/ ha) in the groundnut crop.

Conclusion

The highest reduction in whitegub, H. consanguinea was observed in clothianidin 50WDG (250g ai/ha) which was found at par with phorate 10CG. The per cent survival of plants was maximum in the plots treated with phorate 10 CG, clothianidin 50 WDG and quinalphas 25EC which were found at par each other. The phorate 10 CG and clothianidin also afforded satisfactory control of aphid, jassid, thrips and leaf miner. The Maximum pod yield was registered in Phorate 10 CG , Clothianidin 50WDG 250 g ai/ ha and 150 g ai/ ha. No Phytotoxic effect was observed due to different dosages of clothianidin (75, 100, 125,150 and 250 g ai/ ha) in the groundnut crop.

References

1. *Ding J, Li H, Zhang Z, Lin J, Liu F, Mu W.J (2018). Thiamethoxam, clothianidin, and imidacloprid seed treatments effectively control thrips on corn under field conditions. Insect Science, 18(6):19*
2. *Patel TM, Baraiya KP and Chudasama KA (2018). Study on different insecticide application methods against white grub, H. consanguinea. International Journal of Chemical Studies, 2018; 6(3): 2880-2883.*
3. *Zhang P., Xuefeng Zhang , Yunhe Zhao, Yan Wei, Wei Mu, Feng Liu (2016). Effects of imidacloprid and clothianidin seed treatments on wheat aphids and their natural enemies on winter wheat. Pest Management Science, 72(6): 1141-9.*
4. *Mane P. and Mohite P., 2014 Efficacy of newer molecules of insecticides against white grub in sugarcane. Asian Journal of Bioscience, 9(2):173-177*
5. *Vittum P. (2013). https://ag.umass.edu/turf/fact-sheets/current-insecticide-approaches-for-white-grub-control.*
6. *Bajia R, Singh SK, Bairwa B and Padwal KG (2016). Major insect pests of groundnut (Arachis hypogaea L.), nature of damage and their ecofriendly management. Marumegh, 1(1):.1 -6*

Table 1 Bioefficacy of Clothianidin 50WDG at varying Dosage Levels against Whitegrub, *Holotrichia consanguinea*

	Treatments	Dosage/ha		Infestation (%)			Reduction (%)			Survival (%)		
		(g a.i.)	Formu.(g)	2017	2018	Mean	2017	2018	Mean	2017	2018	Mean
T_1	Clothianidin 50WDG	75	150	16.83	19.41	17.87	26.54	24.36	25.45	83.17	80.59	81.88
				(24.22)	(26.14)	(25.00)	(31.01)	(29.57)	(30.30)	(65.78)	(63.86)	(64.81)
T_2	Clothianidin	100	200	15.66	18.90	17.28	31.65	26.34	29.00	84.34	81.10	82.72
				(23.31)	(25.77)	(24.56)	(34.23)	(30.88)	(32.58)	(66.69)	(64.23)	(65.44)
T_3	Clothianidin 50WDG	125	250	10.33	12.40	11.37	54.91	51.68	53.29	89.67	87.60	88.64
				(18.75)	(20.62)	(19.70)	(47.82)	(45.96)	(46.89)	(71.25)	(69.38)	(70.30)
T_4	Clothianidin 50WDG	150	300	4.17	6.12	5.15	81.80	76.15	78.97	95.83	93.88	94.86
				(11.78)	(14.32)	(13.11)	(64.75)	(60.77)	(62.71)	(78.22)	(75.68)	(76.89)
T_5	Quinalphos 25EC (Check)	350	1400	2.50	3.11	2.81	89.09	87.88	88.48	97.50	96.89	97.20
				(9.10)	(10.16)	(9.64)	(70.71)	(69.63)	(70.16)	(80.90)	(79.84)	(80.36)

T_6	Phorate 10CG	2500	25000	1.00	0.33	0.67	95.64	98.71	97.17	99.00	99.67	99.34
				(5.74)	(3.29)	(4.68)	(77.94)	(83.49)	(80.32)	(84.26)	(86.71)	(85.32)
T_7	Untreated control	-	-	22.91	25.66	24.29	0.00	0.00	0.00	77.09	74.34	75.72
				(28.60)	(30.43)	(29.25)	(0.00)	(0.00)	(0.00)	(61.40)	(59.57)	(60.48)
T_8	Clothianidin 50WDG	250	500	2.08	2.11	2.10	90.92	91.78	91.35	97.92	97.89	97.91
				(8.29)	(8.35)	(8.32)	(72.46)	(73.34)	(72.89)	(81.71)	(81.65)	(81.68)
	S.Em.±	-	-	1.59	1.86	1.70	3.00	3.55	3.10	2.33	2.01	2.14
	CD (p=0.05)	-	-	4.33	5.40	4.94	6.91	10.40	9.23	6.50	5.91	6.22

Figures in the parentheses are angular values.

Table 2 Bioefficacy of Clothianidin 50WDG at Varying Dosage Levels against Aphid, *Aphis craccivora*

	Treatments	Dosage/ha		3 Days after application			7 Days after application			15 Days after application		
		(g a.i.)	Formu.(g)	2017	2018	Mean	2017	2018	Mean	2017	2018	Mean
T_1	Clothianidin 50WDG	75	150	58.1	61.9	60	57.6	58.1	57.85	53.9	51.6	52.75
				(49.66)	(51.88)	(50.77)	(49.37)	(49.66)	(49.52)	(47.24)	(45.92)	(46.58)
T_2	Clothianidin 50WDG	100	200	68.2	71.7	69.95	67.4	63.1	65.25	64.3	64.2	64.25
				(55.67)	(57.86)	(56.76)	(55.18)	(52.59)	(53.88)	(53.31)	(53.25)	(53.28)
T_3	Clothianidin 50WDG	125	250	79	83.6	81.3	76.5	73.2	74.85	72.1	70.1	71.1
				(62.73)	(66.11)	(64.38)	(61.00)	(58.82)	(59.90)	(58.12)	(56.85)	(57.48)
T_4	Clothianidin 50WDG	150	300	89.8	90.2	90	85.4	80.1	82.75	77.4	74	75.7
				(71.37)	(71.76)	(71.57)	(67.54)	(63.51)	(65.46)	(61.61)	(59.34)	(60.47)
T_5	Quinalphos 25EC (Check)	350	1400	58.9	61.5	60.2	49.9	46.1	48	47.3	44.5	45.9
				(50.13)	(51.65)	(50.89)	(44.94)	(42.76)	(43.85)	(43.45)	(41.84)	(42.65)
T_6	Phorate 10CG (Check)	2500	25000	95.6	97.2	96.4	94.3	92.1	93.2	91.1	90.2	90.65
				(77.89)	(80.37)	(79.06)	(76.19)	(73.68)	(74.88)	(72.64)	(71.76)	(72.20)
T_7	Untreated control	-	-	0	0	0	0	0	0	0	0	0
				(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
T_8	Clothianidin 50WDG	250	500	94.8	97.4	96.1	92.1	90.3	91.2	89	90	89.5
				(76.82)	(80.72)	(78.61)	(73.68)	(71.85)	(72.74)	(70.63)	(71.57)	(71.09)
	S.Em.±			2.33	2.04	2.14	2.00	2.31	2.15	2.11	1.90	2.04
	CD (p=0.05)			6.56	6.00	6.30	5.30	6.50	6.21	6.20	5.47	5.67

Figures in the parentheses are angular values.

Table 3 Bioefficacy of Clothianidin 50WDG at Varying Dosage Levels against Jassid

	Treatments	Dosage/ha		3 Days after application			7 Days after application			15 Days after application		
		(ga.i.)	Formu.(g)	2017	2018	Mean	2017	2018	Mean	2017	2018	Mean
T_1	Clothianidin 50WDG	75	150	52.1	64.9	58.5	57.9	57.1	57.5	50.1	52.6	51.35
				(46.20)	(53.67)	(49.89)	(49.55)	(49.08)	(49.31)	(45.06)	(46.49)	(45.77)
T_2	Clothianidin 50WDG	100	200	62.3	71.5	66.9	67.8	63.7	65.75	60.2	64.6	62.4
				(52.12)	(57.73)	(54.88)	(55.43)	(52.95)	(54.18)	(50.89)	(53.49)	(52.18)
T_3	Clothianidin 50WDG	125	250	75.6	82.1	78.85	79	73.9	76.45	70.2	71.2	70.7
				(60.40)	(64.97)	(62.62)	(62.73)	(59.28)	(60.97)	(56.91)	(57.54)	(57.23)
T_4	Clothianidin 50WDG	150	300	86	90.6	88.3	87.4	79.1	83.25	80.8	73.6	77.2
				(68.03)	(72.15)	(70.00)	(69.21)	(62.80)	(65.84)	(64.01)	(59.08)	(61.48)
T_5	Quinalphos	350	1400	60.7	62.4	61.55	57.5	46.3	51.9	51	45.3	48.15

	25EC (Check)			(51.18)	(52.18)	(51.68)	(49.31)	(42.88)	(46.09)	(45.57)	(42.30)	(43.94)
T_6	Phorate 10CG (Check)	2500	25000	96 (78.46)	97.8 (81.47)	96.9 (79.86)	94.1 (75.94)	92.8 (74.44)	93.45 (75.17)	82.6 (65.35)	90.1 (71.66)	86.35 (68.32)
T_7	Untreated control	-	-	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
T_8	Clothianidin 50WDG	250	500	95.7 (78.03)	96.8 (79.70)	96.25 (78.83)	95.9 (78.32)	89.3 (70.91)	92.6 (74.21)	82 (64.90)	88.1 (69.82)	85.05 (67.25)
	S.Em.±	-	-	2.04	1.98	1.99	1.67	1.50	1.55	1.60	1.66	1.61
	CD (p=0.05)	-	-	5.98	5.71	5.72	4.80	4.41	4.51	4.72	4.83	4.75

Figures in the parentheses are angular values.

Table 4 Bioefficacy of Clothianidin 50WDG at Varying Dosage Levels against Thrips

	Treatments	Dosage/ha		3 Days after application			7 Days after application			15 Days after application		
		(g a.i.)	Formu.(g)	2017	2018	Mean	2017	2018	Mean	2017	2018	Mean
T_1	Clothianidin 50WDG	75	150	55.5 (48.16)	62 (51.94)	58.75 (50.04)	56.2 (48.56)	57.6 (49.37)	56.9 (48.97)	52.2 (46.26)	53.2 (46.83)	52.7 (46.55)
T_2	Clothianidin 50WDG	100	200	65.5 (54.03)	70.2 (56.91)	67.85 (55.46)	68 (55.55)	64.2 (53.25)	66.1 (54.39)	62.9 (52.48)	62.9 (52.48)	62.9 (52.48)
T_3	Clothianidin 50WDG	125	250	80.2 (63.58)	80.1 (63.51)	80.15 (63.54)	80.1 (63.51)	74.6 (59.74)	77.35 (61.58)	71.2 (57.54)	72.5 (58.37)	71.85 (57.96)
T_4	Clothianidin 50WDG	150	300	92.1 (73.68)	91.2 (72.74)	91.65 (73.20)	87.2 (69.04)	81.2 (64.30)	84.2 (66.58)	81.7 (64.67)	74.9 (59.93)	78.3 (62.24)
T_5	Quinalphos 25EC (Check)	350	1400	65.2 (53.85)	64.1 (53.19)	64.65 (53.52)	60.7 (51.18)	47.5 (43.57)	54.1 (47.35)	52 (46.15)	46.6 (43.05)	49.3 (44.60)
T_6	Phorate 10CG (Check)	2500	25000	97.2 (80.37)	98 (81.87)	97.6 (81.09)	95.3 (77.48)	93.8 (75.58)	94.55 (76.50)	83.6 (66.11)	92.2 (73.78)	87.9 (69.64)
T_7	Untreated control	-	-	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
T_8	Clothianidin 50WDG	250	500	96.7 (79.53)	97.2 (80.37)	96.95 (79.94)	96.9 (79.86)	90.6 (72.15)	93.75 (75.52)	82.9 (65.57)	90.2 (71.76)	86.55 (68.49)
	S.Em.±			1.66	1.98	1.72	1.88	1.99	1.90	1.40	1.68	1.48
	CD (p=0.05)			4.81	5.70	5.03	5.40	5.69	5.51	4.09	4.83	4.21

Figures in the parentheses are angular values.

Table 5 Bioefficacy of Clothianidin 50WDG at Varying Dosage Levels against Leaf Miner

	Treatments	Dosage/ha		3 Days after application			7 Days after application			15 Days after application		
		(g a.i.)	Formu.(g)	2017	2018	Mean	2017	2018	Mean	2017	2018	Mean
T_1	Clothianidin 50WDG	75	150	50.2 (45.11)	59 (50.18)	54.6 (47.64)	55.6 (48.22)	57.3 (49.20)	56.45 (48.71)	50.9 (45.52)	52.9 (46.66)	51.9 (46.09)
T_2	Clothianidin 50WDG	100	200	60.9	68.2	64.55	67.8	63.2	65.5	63.5	63.9	63.7

				(51.30)	(55.67)	(53.46)	(55.43)	(52.65)	(54.03)	(52.83)	(53.07)	(52.95)
T_3	Clothianidin 50WDG	125	250	78.4	79.4	78.9	79.4	73.7	76.55	71.6	71.2	71.4
				(62.31)	(63.01)	(62.65)	(63.01)	(59.15)	(61.04)	(57.80)	(57.54)	(57.67)
T_4	Clothianidin 50WDG	150	300	90.5	92.3	91.4	86.9	80.3	83.6	82.8	75.4	79.1
				(72.05)	(73.89)	(72.95)	(68.78)	(63.65)	(66.11)	(65.50)	(60.27)	(62.80)
T_5	Quinalphos 25EC (Check)	350	1400	61.3	65.2	63.25	59.2	48.9	54.05	53	47.4	50.2
				(51.53)	(53.85)	(52.68)	(50.30)	(44.37)	(47.32)	(46.72)	(43.51)	(45.11)
T_6	Phorate 10CG (Check)	2500	25000	95	97	96	94.4	92.4	93.4	84.2	93.2	88.7
				(77.08)	(80.03)	(78.46)	(76.31)	(74.00)	(75.11)	(66.58)	(74.88)	(70.36)
T_7	Untreated control	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
T_8	Clothianidin 50WDG	250	500	94.5	96.9	95.7	96.9	94.5	95.7	83.4	91.5	87.45
				(76.44)	(79.86)	(78.03)	(79.86)	(76.44)	(78.03)	(65.96)	(73.05)	(69.25)
	S.Em.±			1.30	1.54	1.35	1.44	1.56	1.46	1.66	1.75	1.68
	CD (p=0.05)			3.33	4.48	3.37	4.20	4.44	4.42	4.82	5.11	4.81

Figures in the parentheses are angular values.

Table-6 Pod yield of groundnut as influenced by management of whitegrub and other insect pests through drenching of clothianidin 50WDG

S.No.	Treatments	Dosage/ ha		Pod yield (q/ ha)		
		(g a.i.)	Formulation (g)	2017	2018	Pooled mean
1.	Clothianidin 50WDG	75	150	10.97	11.56	11.27
2.	Clothianidin 50WDG	100	200	12.53	13.08	12.81
3.	Clothianidin 50WDG	125	250	13.51	14.00	13.76
4.	Clothianidin 50WDG	150	300	14.99	15.50	15.25
5.	Quinalphos 25EC (Check)	350	1400	14.04	14.60	14.32
6.	Phorate 10CG (Check)	2500	25000	15.79	16.31	16.05
7.	Untreated control	-	-	9.30	9.85	9.58
8.	Clothianidin 50WDG	250	500	15.54	16.10	15.82
	S.Em.±	-	-	0.52	0.61	0.55
	CD (p=0.05)	-	-	1.45	1.70	1.48