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Effect of Seed Treatment Chemicals on Pod Damage in Groundnut

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Abstract

Field experiments have been formulated to minimise the groundnut pod damage by seed treatments and soil drenching. The pooled data revealed that Seed treatment with clothionidin 50 WDG @ 2 g kg^{-1} recorded 12.24% pod damage during peg formation stage. During maturity stage, seed treatment with imidacloprid 600 FS @ 2 ml kg^{-1} + soil drenching with chlorpyriphos 20 EC @ 8 ml per 10 L of water at 60 DAS recorded 15.11% pod damage and the imidacloprid seed treatment with soil drenching of imidacloprid 17.8 SL, chlorpyriphos 20 EC and imidacloprid 40% + fipronil 40% (80 WG) were on par with each other. Highest pod yield (1,475 kg ha^{-1}) and haulm (2,958 kg ha^{-1}) with 17.22 ICBR was observed in imidacloprid seed treatment with soil drenching of imidacloprid 17.8 SL. Untreated control recorded 23.97% pod damage with 971 kg pod and 1,975 kg haulm.

Keywords: Groundnut, Imidacloprid, Pod damage, Seed treatment

Introduction

Groundnut (*Arachis hypogea* Linnaeus) is an important oilseed crop grown in India during *kharif*, *rabi* and summer seasons. Gujarat, Andhra Pradesh, Tamil Nadu, Rajasthan, Karnataka and Maharashtra are the major groundnut growing states of India and together account for about 90% of the national area under groundnut. The average productivity of groundnut in India is very low with 1,750 kg ha^{-1} when compared to average world productivity of 2,149 kg ha^{-1} (Indiragandhi *et al*., 2018). Several constraints attributed for the low productivity of groundnut. Insect pests are one of the major limiting factors for groundnut production. Nearly 500 species of insect pests are attacking groundnut crop. Soil dwelling insects, white grubs, termites, wireworms, and earwigs are responsible for pod damage (Dutta *et al.,* 2020). Managing soil dwelling insects is very difficult and insecticides are alternative options. Seed treatment is an integral part of integrated pest management which is relatively safer to the environment (Nault *et al.,* 2004). This experiment has been formulated to manage the soil dwelling insects by seed treatments and soil drenching.

Materials and Methods

Experiments were laid out at Regional Research Station, Vridhachalam to manage the pod borer insects in groundnut during *kharif* 2020 and *kharif* 2021. The following treatments were imposed T_1: Seed treatment with (imidacloprid 18.5% + hexaconazole 1.5%) @ 2 g kg^{-1} seeds, T_2: Seed treatment with imidacloprid 600 FS @ 2 ml kg^{-1}, T_3: Seed treatment with clothianidin 50 WDG @ 2 g kg^{-1}, T_4: Seed treatment with imidacloprid 600 FS @ 2 ml kg^{-1} + Soil drenching with imidacloprid 17.8 SL @ 3 ml per 10 L of water after 60 DAS, T_5: Seed treatment with imidacloprid 600 FS @ 2 ml kg^{-1} + Soil drenching with chlorpyriphos 20 EC @ 8 ml per 10 L of water of water after 60 DAS, T_6: Seed treatment with imidacloprid 600 FS @ 2 ml kg^{-1} + (imidacloprid 40% + fipronil 40% (80 WG)) 5 g per 10 L of water after 60 DAS, T_7: Untreated control. Germination percent in each treatment was calculated. Randomly five plants were selected and counted healthy, damaged pods and percent pod damage was calculated during peg formation (50 DAS) and maturity stage (prior to harvest). Yield and incremental cost benefit ratio was calculated and data were statistically analysed by AGRESS package.

Results and Discussion

Kharif 2020

Among the different treatments, T_3: Seed treatment with

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clothianidin 50 WDG @ 2 g kg^{-1} recorded minimum pod damage (9.95%) on peg formation stage followed by T_1: Seed treatment with imidacloprid 18.5% + hexaconazole 1.5% @ 2 g kg^{-1} of seed (12.53%). T_4: Seed treatment with imidacloprid 600 FS @ 2 ml kg^{-1} + Soil drenching with imidacloprid 17.8 SL @ 3 ml per 10 L of water after 60 DAS recorded 13.69% pod damage while in the control it was recorded 19.22% damage. During pod maturity stage, T_4: Seed treatment with imidacloprid 600 FS @ 2 ml kg^{-1} + Soil drenching with imidacloprid 17.8 SL @ 3 ml per 10 L of water after 60 DAS recorded minimum pod damage (17.37%) followed by T_5: Seed treatment with imidacloprid 600 FS @ 2 ml kg^{-1} + Soil drenching with chlorpyriphos 20 EC @ 8 ml per 10 L of water after 60 DAS recorded 17.93% pod damage (Table 1). The untreated control recorded 23.15% pod damage. Maximum of pod yield 1,450 kg ha^{-1} was recorded in T_4 similar trend has also been observed for haulm yield also (2,917 kg ha^{-1}). Maximum of ICBR 1:16.18 was registered in T_4 followed by T_5 which recorded 1:12.93 (Table 1).

Table 1: Effect of seed treatment chemicals on ground nut pod damage (*kharif* 2020)

T. No.	Treatment Details	Germination (%)	Pod Damage (%)		Yield (kg ha^{-1})		ICBR
			Pegging stage	Maturity stage	Pod	Haulm	
T_1	Seed treatment with imidacloprid 17.8% SL + hexaconazole 1.5% @ 2 g kg^{-1}	81.67 (64.65)	12.53 (20.73)	18.63 (25.57)	1050	2150	2.89
T_2	Seed treatment with imidacloprid 600 FS @ 2 ml kg^{-1}	83.33 (65.90)	13.10 (21.22)	19.33 (26.08)	1100	2233	4.46
T_3	Seed treatment with clothianidin 50 WDG @ 2 g kg^{-1}	80.00 (63.44)	9.95 (18.39)	20.81 (27.14)	1083	2150	1.44
T_4	Seed treatment with imidacloprid 600 FS @ 2 ml kg^{-1} + Soil drenching with imidacloprid 17.8 SL @ 3 ml per 10 L of water at 60 DAS	83.33 (65.90)	13.69 (21.72)	17.37 (24.63)	1450	2917	16.18
T_5	Seed treatment with imidacloprid 600 FS @ 2 ml kg^{-1} + Soil drenching with chlorpyriphos 20 EC @ 8 ml per 10 L of water at 60 DAS	83.33 (65.90)	13.05 (21.18)	17.93 (25.05)	1383	2750	12.93
T_6	Seed treatment with imidacloprid 600 FS @ 2 ml kg^{-1} + [(imidacloprid 40% + fipronil 40%) 80 WG] 5 g per 10 L of water at 60 DAS	81.67 (64.65)	13.37 (21.45)	19.50 (26.21)	1200	2433	4.86
T_7	Untreated control	80.00 (63.44)	19.22 (26.00)	23.15 (28.76)	983	1950	-
	C.D.	0.0211	0.0598	0.0231	0.0009	0.0007	-
	SE(d)	0.0097	0.0275	0.0106	0.0004	0.0003	-

Kharif 2021

During peg formation stage, pod damage was ranged between 12.79-18.36%. Among the different treatments, T_5: Seed treatment with imidacloprid 600 FS @ 2 ml kg^{-1} + Soil drenching with chlorpyriphos 20 EC @ 8 ml per 10 L of water after 60 DAS recorded 10.10% pod damage followed by T_4: Seed treatment with imidacloprid 600 FS @ 2 ml kg^{-1} + Soil drenching with imidacloprid 17.8 SL @ 3 ml per 10 L of water after 60 DAS recorded 10.20% pod damage while in the control it was recorded 24.60% damage.

During pod maturity stage, T_6: Seed treatment with imidacloprid 600 FS @ 2 ml kg^{-1} + Soil drenching with imidacloprid 40% + fipronil 40% (80 WG) 5 g per 10 L of water recorded 11.50% pod damage followed by T_5: Seed treatment with imidacloprid 600 FS @ 2 ml kg^{-1} + Soil drenching with chlorpyriphos 20 EC @ 8 ml per 10 L of water recorded 12.30% pod damage. Maximum of pod yield 1,500 kg ha^{-1} was recorded in T_4 similar trend has also been observed for haulm yield also (3,000 kg ha^{-1}). The untreated control recorded 24.80% pod damage. Maximum of ICBR 1:18.27 was registered in T_4 followed by T_5 which recorded 1:13.40 (Table 2).

The pooled data revealed that T_3: Seed treatment with clothionidin 50 WDG @ 2 g kg^{-1} recorded 12.24% pod damage during peg formation stage. During maturity stage T_5: Seed treatment with imidacloprid 600 FS @ 2 ml kg^{-1} + Soil drenching with chlorpyriphos 20 EC @ 8 ml per 10 L of water at 60 DAS recorded 15.11% pod damage and the imidacloprid seed treatment with soil drenching of imidacloprid 17.8 SL, chlorpyriphos 20 EC and imidacloprid 40% + fipronil 40% (80 WG) are on par with each other. Highest pod yield (1,475 kg ha^{-1}) and haulm (2,958 kg ha^{-1}) with 17.22 ICBR was observed in imidacloprid seed treatment with soil drenching of imidacloprid 17.8 SL. Untreated control recorded 23.97% pod damage with 971 kg pod and 1,975 kg haulm (Table 3). Findings of Bhut *et al.* (2021), lowest plant mortality and number of grubs observed in clothianidin 50 WDG @ 2 g kg^{-1} and imidacloprid 40% + fipronil 40 WG @ 3 g kg^{-1} are in line with present results.

Findings of Jakhar *et al*. (2020), imidacloprid 600 FS @ 6.5 ml kg^{-1} seed treatment was significantly superior over all

Table 2: Effect of seed treatment chemicals on ground nut pod damage (*kharif* 2021)

T. No.	Treatment Details	Germination (%)	Pod Damage (%)		Yield (kg ha^{-1})		ICBR
			Pegging stage	Maturity stage	Pod	Haulm	
T_1	Seed treatment with imidacloprid 17.8% SL + hexaconazole 1.5% @ 2 g kg^{-1}	80.00 (63.44)	14.21 (22.15)	18.10 (25.17)	1100	2200	5.86
T_2	Seed treatment with imidacloprid 600 FS @ 2 ml kg^{-1}	81.00 (64.65)	12.79 (21.92)	18.90 (25.76)	1200	2300	8.55
T_3	Seed treatment with clothianidin 50 WDG @ 2 g kg^{-1}	81.00 (64.65)	14.53 (22.41)	20.40 (26.85)	1100	2100	1.98
T_4	Seed treatment with imidacloprid 600 FS @ 2 ml kg^{-1} + Soil drenching with imidacloprid 17.8 SL @ 3 ml per 10 L of water at 60 DAS	82.00 (64.65)	13.94 (20.96)	13.50 (21.55)	1500	3000	18.27
T_5	Seed treatment with imidacloprid 600 FS @ 2 ml kg^{-1} + Soil drenching with chlorpyriphos 20 EC @ 8 ml per 10 L of water at 60 DAS	82.00 (64.65)	13.89 (21.88)	12.30 (20.53)	1400	2800	13.40
T_6	Seed treatment with imidacloprid 600 FS @ 2 ml kg^{-1} + [(imidacloprid 40% + fipronil 40%) 80 WG] 5 g per 10 L of water at 60 DAS	82.00 (64.65)	13.00 (21.13)	11.50 (19.82)	1300	2500	7.37
T_7	Untreated control	80.00 (63.44)	18.36 (25.37)	24.80 (29.86)	960	2000	-
	C.D.	0.0082	0.0345	0.0795	0.0023	0.0007	-
	SE(d)	0.0037	0.0158	0.0365	0.0010	0.0003	-

Table 3: Effect of seed treatment chemicals on ground nut pod damage (Pooled data)

T. No.	Treatment Details	Germination (%)	Pod Damage (%)		Yield (kg ha^{-1})		ICBR
			Pegging stage	Maturity stage	Pod	Haulm	
T_1	Seed treatment with imidacloprid 17.8% SL + hexaconazole 1.5% @ 2 g kg^{-1}	80.83 (64.04)	13.37 (21.44)	18.36 (25.37)	1075	2175	4.37
T_2	Seed treatment with imidacloprid 600 FS @ 2 ml kg^{-1}	82.16 (65.27)	12.95 (21.52)	19.11 (25.92)	1150	2266	6.50
T_3	Seed treatment with clothianidin 50 WDG @ 2 g kg^{-1}	80.50 (64.04)	12.24 (20.40)	20.60 (26.77)	1091	2125	1.71
T_4	Seed treatment with imidacloprid 600 FS @ 2 ml kg^{-1} + Soil drenching with imidacloprid 17.8 SL @ 3 ml per 10 L of water at 60 DAS	82.16 (65.27)	13.81 (21.34)	15.43 (23.09)	1475	2958	17.22
T_5	Seed treatment with imidacloprid 600 FS @ 2 ml kg^{-1} + Soil drenching with chlorpyriphos 20 EC @ 8 ml per 10 L of water at 60 DAS	82.66 (65.27)	13.47 (21.53)	15.11 (22.79)	1391	2775	13.16
T_6	Seed treatment with imidacloprid 600 FS @ 2 ml kg^{-1} + [(imidacloprid 40% + fipronil 40%) 80 WG] 5 g per 10 L of water at 60 DAS	81.83 (64.65)	13.18 (21.29)	15.50 (23.01)	1250	2466	6.11
T_7	Untreated control	80.00 (63.44)	18.79 (25.68)	23.97 (29.31)	971	1975	-
	C.D.	0.0146	0.0471	0.0513	0.0016	0.0007	-
	SE(d)	0.0067	0.0216	0.0235	0.0007	0.0003	-

other treatments with lowest plant mortality against white grub and highest pod yield followed by clothianidin 50 WDG @ 2.0 g kg^{-1} seed in agreement with the present findings. Dutta *et al*. (2020) found that imidacloprid 48 FS @ 2 ml kg^{-1} of seed was effective against white grubs in groundnut supports current observations.

Conclusion

Imidacloprid seed treatment and soil drenching of imidacloprid 17.8 SL, chlorpyriphos 20 EC and imidacloprid 40% + fipronil 40% (80 WG) at 60 DAS were on par with each other to reduce the pod damage during pod maturity stage. Imidacloprid seed treatment and soil drenching of imidacloprid or chlorpyriphos at 60 DAS can be adopted to reduce the groundnut pod damage.

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