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CONTROL OF STEMBORER [*Nupserha* sp. near *vexator* (Pascoe)], A NEW PEST OF SUNFLOWER (*Helianthus annuus* L.), BY CONVENTIONAL INSECTICIDES

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SUMMARY

Sunflower (*Helianthus annuus* L.) is an important oilseed crop. Several pest are known to attack sunflower crop. Sunflower cultivation in Marathwada region (M.S., India) has recently been threatened by a new pest, the stem borer *Nupserha* sp. near *vexator* (Pascoe). The stem borer appeared on sunflowers at Latur (M.S.) for the first time in India in 1993. Severe incidence of the stem borer was recorded in Marathwada region since 1998 which led to poor grain filling and ultimately yield loss to the extent of 30%. This situation led prompted us to test several conventional insecticides with the objective of finding a chemical that effectively controls the stem borer. A field study was carried out at Oilseeds Research Station, Latur (M.S.), during *Kharif* 2004-06. Six conventional insecticides were tested along with the untreated control. Application of quinalphos was found to be most effective and economic in controlling the stem borer, followed by chlorpyriphos and endosulfan.

Key words: sunflower, stem borer, incidence, control, treatment

INTRODUCTION

Sunflower (*Helianthus annuus* L.) is the fourth most important oilseed crop in the world, after soybean, groundnut and rapeseed. During 2004-05 in India, sunflowers occupied an area of 2.162 million ha, with a production of 1.224 million tons and an average yield of 566 kg/ha (Anonymous[2], 2006). Sunflower has gradually replaced many crops due to its economic advantages. Recently, the sunflower cultivation in Marathwada region (Maharashtra State, India), has been threatened by a new pest, identified as the stem borer. The stem borer appeared on sunflowers at Latur (Marathwada) for the first time in India in 1993 and was identified in 1999. Its scientific name is *Nupserha* sp. near *vexator* (Pascoe). It is a coleopterous grub

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that belongs to the family *Cerambycidae*, *Lamiinae*. A severe incidence of the stem borer was recorded (30-70%) in farmers' fields during a survey of *kharif* sunflower in Latur District (Anonymous, 1998). The stem borer incidence in farmers' fields in July-sown crop was 42-55% while 20-25% incidence was recorded in August-sown sunflowers during a pest survey in Marathwada region (Anonymous, 2001). Maximum incidence (25%) was recorded at Ambulga village, Latur District (Anonymous, 2004). Stem borer incidence ranging from 10-25% was observed in most locations in Latur District (Anonymous[1], 2006). The grub is wide at the anterior end and it tapers towards the posterior end. The whitish creamy eggs are laid singly in leaf axils. The newly hatched grub enters the stem 3-3.5" above the collar region. The entrance hole can be seen at the bottom of the stem. The grub bores upwards through the internal pith tissue and pupates. Later on, the grub escapes into the soil making an exit hole at stem bottom or remains in the stem through the resting stage. Affected stems break easily if pressed. Infested plants lodge during the grain formation stage, which leads to poor grain filling and ultimately results in the yield loss up to 17.5% (Anonymous, 2005), although a loss of 31.0% was also reported (Anonymous[1], 2006). This situation moved us to conduct this experiment on chemical control of the stem borer.

Table 1: Evaluation of certain insecticides against stem borer in sunflower (three-year pooled data, 2004-2006)

No.	Treatment	% of stem borer incidence			Total	Pooled mean	% SB incidence reduction
		2004-05	2005-06	2006-07			
1	Endosulfan @0.07%	11.7 (20.02)	11.3 (19.64)	5.1 (13.00)	28.1 (52.66)	9.4 (17.55)	71.5
2	Monocrotophos @0.05%	13.5 (21.54)	23.0 (28.52)	14.7 (22.55)	51.2 (72.61)	17.1 (24.20)	48.0
3	Acephate @0.075%	21.0 (27.26)	38.3 (38.25)	17.8 (24.89)	77.1 (90.40)	25.7 (30.13)	22.0
4	Dichlorvos @0.075%	21.5 (27.74)	36.0 (36.83)	17.9 (25.03)	75.4 (89.60)	25.1 (29.87)	24.0
5	Quinalphos @0.05%	8.4 (16.74)	7.3 (15.66)	3.9 (11.28)	19.6 (43.68)	6.5 (14.56)	80.3
6	Chlorpyriphos @0.05%	9.7 (17.88)	8.7 (17.05)	9.0 (17.45)	27.4 (52.38)	9.1 (17.46)	72.4
7	Untreated-Control	22.9 (28.60)	47.3 (43.47)	28.8 (32.44)	99.0 (104.51)	33.0 (34.84)	-
	SEm ±					2.09	
	CD (P=0.05)					6.45	

Numbers in parenthesis are angular transformed values

MATERIAL AND METHODS

The field experiment was conducted during *kharif* (July-August sowing) 2004-06 at Oilseeds Research Station, Latur, (M.S.) India. Six conventional insecticides were tested (Table 1) along with the untreated control in a randomized block design with three replications and the experimental unit size of 5.0 × 4.5 m. The sunflower

cultivar used in the experiment was Morden. All recommended agronomic practices were followed. Control of stem borer is difficult because the insect spends most of its life inside plant stems, where it is protected from standard chemical control (Sloderbeck *et al.,* 1996). Therefore only the exposed stages of the pest, *i.e.*, eggs, newly hatched larvae and adults, were targeted by spraying at 25 and 40 days after emergence with a foot sprayer. Observations were made at the time of harvest by cutting the stem at collar region. The incidence of stem borer was calculated on the basis of damaged plant percentage in experimental plots. The net plot (3.0 × 3.9 m) yield of the crop was recorded separately. The data generated during three years were subjected to statistical analysis and cost benefit ratio was also worked out for each treatment.

RESULTS AND DISCUSSION

Three-year pooled results presented in Table 1 show that the stem borer incidence varied significantly within the treatments. The application of quinalphos 0.05% was found to be significantly superior in reducing the stem borer incidence to the extent of 80.3%. Similarly effective were also chlorpyriphos 0.05%, which provided 72.4% reduction, and endosulfan 0.07%, for which 71.5% reduction in stem borer incidence was recorded. The treatment with monocrotophos 0.05% also proved to be effective, with 48% reduction in pest incidence. Although the application of acephate 0.075% and dichlorvos 0.075% had significantly reduced the pest incidence in relation to the control, they proved to be less effective than the previous chemicals, as they recorded lowest reductions in the incidence of stem borer, 22 and 24%, respectively. The highest pest incidence recorded in the untreated control was 33%. The incidence of stem borer (*N. vexator*) in sunflower was significantly reduced in the chemical module comprising diamethoate, quinalphos and endosulfan (Anonymous, 2001). The treatment with quinalphos 0.05% was found to be most effective and economic for the control of the stem borer in sunflower (Anonymous[1], 2006). The lambda cyhalothrin and permethrin were found to be more toxic than carbaryl for soybean stem borer, as reported by Michell *et al.* (2000). Quinalphos 0.03% proved to be highly toxic to eggs and grubs of the girdle beetle in soybean, causing 93.3% mortality in grubs (Singh, 1986). Efficacy of quinalphos against the girdle beetle in soybean was reported by Keshbhat *et al.* (2004) who also recorded the highest yield in this treatment. Thus the present findings are in conformity with the earlier studies. Table 2 shows that significant variation within treatment was also evident in seed yield response. The highest seed yield (889 kg/ha) was registered with the application of quinalphos 0.05%, which was 24% higher and significant in relation to the control. This treatment was on par with chlorpyriphos 0.075% (847 kg/ha) and endosulfan 0.07% (839 kg/ha) which recorded yield increases of 18 and 17%, respectively, both of which were significant in relation to the control. The rest of the treatments stood on par with the untreated

control. It was also shown in Table 3 that the highest cost benefit ratio (ICBR) was registered with the application of quinalphos 0.05% (1:2.3) followed by chlorpyriphos 0.05% (1:2.2) and endosulfan 0.07% 1:2.2. The lowest ICBR was recorded in the untreated control, 1:1.8.

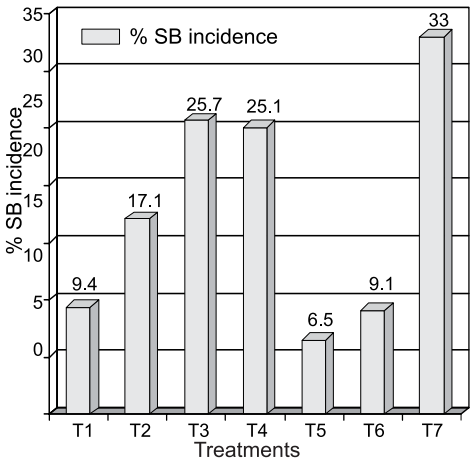

Figure 1: Performance of various treatments against stem borer

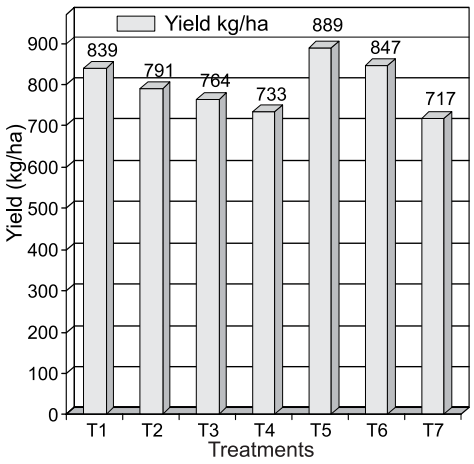

Figure 2: Yield response to various treatments

Table 2: Yield response to various treatments (three-year pooled data, 2004-2006)

No.	Treatment	Yield, kg/plot			Weighed mean	Yield kg/ha
		2004-05	2005-06	2006-07		
1	Endosulfan @0.07%	0.752	1.516	1.551	0.982	839
2	Monocrotophos @0.05%	0.723	1.419	1.369	0.925	791
3	Acephate @0.075%	0.710	1.376	1.222	0.894	764
4	Dichlorvos @0.075%	0.693	1.236	1.283	0.858	733
5	Quinalphos @0.05%	0.792	1.642	1.586	1.040	889
6	Chlorpyriphos @0.05%	0.774	1.533	1.439	0.991	847
7	Untreated-Control	0.674	1.252	1.179	0.839	717
	SEm ±				0.028	24.0
	CD (P=0.05)				0.088	75.0

Hectare factor=854.70

CONCLUSION

Of the insecticides tested, the application of quinalphos 0.05% 25 and 40 days after emergence proved to be effective and economical for the control of the stem borer *Nupserha* sp. near *vexator* (Pascoe) in sunflower, followed by chlorpyriphos 0.05% and endosulfan 0.07%.

Figure 3: Grubs of the stem borer, Nupserha sp near vexator (Pascoe), in sunflower

Figure 4: Grub feeds on internal pith tissue making a tunnel

Figure 5: Severe sunflower stem damage by stem borer

Figure 6: Finally, the grub makes an exit hole at the bottom and escapes into the soil for pupation

Table 3: Cost benefit ratio of certain insecticides against stem borer (based on three-year pooled yield 04-06)

No.	Treatment	Yield, kg/ha	Gross monetary return (Rs./ha)	Qty.of insecticide, l/ha for 2 sprays	Price of insecticide Rs./l	Cost of insecticide Rs./ha for 2 sprays	Appl. cost Rs./ha for 2 sprays	Total cost of plant protection Rs./ha	Cost of cultivation Rs./ha	Total cost of cultivation Rs./ha	Net monetary return Rs./ha	ICBR
1	Endosulfan, 0.07%	839	15102	2.0	280	560	300	860	6000	6860	8242	01:02.2
2	Monocrotophos, 0.05%	791	14238	1.4	300	420	300	720	6000	6720	7518	01:02.1
3	Acephate, 0.08%	764	13752	1.0	460	460	300	760	6000	6760	6992	01:02.0
4	Dichlorvos, 0.08%	733	13194	1.0	450	450	300	750	6000	6750	6444	01:02.0
5	Quinalphos, 0.05%	889	16002	2.0	260	520	300	820	6000	6820	9182	01:02.3
6	Chlorpyriphos, 0.05%	847	15246	2.5	240	600	300	900	6000	6900	8346	01:02.2
7	Untreated-Control	717	12906	_	_	_	_	_	6000	6000	6906	01:01.8

Av. market price of sunflower Rs.1800/q

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CONTROL DEL BARRENADOR DEL TALLO [(*Nupserha* sp. near *vexator* (Pascoe)], UNA NUEVA PESTE DEL GIRASOL (*Helianthus annuus* L.), A TRAVÉS DE INSECTICIDAS CONVENCIONALES

RESUMEN

El girasol (*Helianthus annuus* L.) es un importante cultivo oleaginoso a nivel mundial. Se sabe que el cultivo de girasol es afectado por muchas pestes. Recientemente el cultivo de girasol en la región de Marathwada (M.S.), India se enfrentó a la amenaza de una nueva peste, el barrenador del tallo *Nupserha* sp. near *vexator* (Pascoe). El barrenador del tallo apareció por primera vez en India en 1993 en Latur (M.S.). A partir de 1998 se registraron severas incidencias del barrenador en la región de Marathwada lo que afectó el llenado de granos y generó pérdidas de hasta el 30% del rendimiento. Esta situación condujo a evaluar la eficacia de algunos insecticidas convencionales contra el barrenador del tallo. El estudio a campo se condujo en la Oilseeds Research Station, Latur, M.S., durante la estación *Kharif* de los años 2004-2006. Se evaluaron seis insecticidas convencionales además del control no tratado. Se encontró que el tratamiento más efectivo y económico fue el de aplicación de Quinalphos, seguido por Chlorpyriphos y Endosulfan.

TRAITEMENT DE L'INSECTE *Nupserha* sp. near vexator (Pascoe), NOUVEL INSECTE NUISIBLE AU TOURNESOL (*Helianthus annuus* L.) aU MOYEN D'INSECTICIDES CONVENTIONNELS

RÉSUMÉ

Le tournesol (*Helianthus annuus* L.) est la plante oléagineuse importante dans le monde. Il est connu pour être infesté par différents insectes nuisibles. Récemment la culture du tournesol dans la région de Marathwada (M.S., Inde) a été infectée par un nouvel insecte nuisible proche de *Nupserha vexator* (Pascoe). La foreuse de tige est apparue à (M.S.), pour la première fois en Inde, en 1993. Une incidence sévère de la foreuse de tige a été rapportée dans la région de Marathwada depuis 1998, ce qui a conduit à un faible remplissage des grains et finalement à une perte de rendement allant jusqu'à 30%. Cette situation a conduit à tester l'efficacité d'insecticides conventionnels pour évaluer l'efficacité de produits chimiques contre la foreuse de tige. L'expérimentation au champ a été menée à la Station de Recherche sur les Oléagineux de Latur (M.S.) au cours de la saison *Kharif* de 2004 à 06. Six insecticides conventionnels ont été testés en comparaison avec un témoin non traité. Pour le contrôle de la foreuse de tige, l'application de quinalphos a été trouvée à la fois la plus efficace et la plus économique, suivie par le chlorpyriphos et l'endosulfan.