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RESEARCH ARTICLE

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Efficacy of Qninalphos 25 EC against *Antigastra catalaunalis* and *Asphondylia sesami* of sesamum

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ABSTRACT : Experiment was conducted during *Kharif* 2015 -2016 at field of Department of Agricultural Entomology, Post Graduate Institute, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, to study efficacy of Qninalphos 25 EC against gall fly and capsule borer of Sesamum. Seasmum crop is attacked by number of insect pest throughout growing season. Leaf roller/capsule borer, *Antigastra catalaunalis* Dup. and sesamum gall fly is important, as it is regular in occurrence and thus a major pest. Quinalphos is contact and stomach poison having cholinesterase inhibiting action control many insect pests of the orders Lepidoptera, Coleoptera, Diptera and Hemiptera. As per behaviour of these pests it is essential to apply insecticide at proper growth stage of crop to avoid losses. Quinalphos 25 EC @ 2 ml / lit. of water applied at 15, 30 and 45 days after crop emergence therefore prove effective against leaf webber, gall fly and capsule borer.

KEY WORDS : Quinalphos 25 EC, Efficacy, Gall fly, Leaf webber, Capsule borer

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INTRODUCTION

Seasamum is reported to be damaged by 29 insect pests (Rai, 1976), however, due to the changed cropping pattern, the insect pest complex has swollen to about 65 including one mite species (Ahuja and Bakhetia, 1993).These pests damage the crop at different stages of growth. Among these, Sesamum shoot webber and capsule borer (*Antigastra catalaunalis*), Sesamum gall fly (*Asphandylia sesami*),and leaf hopper, *Orosius albicinctus* are more serious throughout country. The pest complex belongs to Hemiptera and Lepidoptera order. Pest management continues to be an important effort to deal with pests with the different insecticides and new approaches need to be made for fulfilling the existing research gaps. While selecting insecticide it is essential that it should be equally effective against all the damaging pest as the majority of farmers are not able to follow insecticides applications throughout the growth period of sesamum. Hence recommendation of single effective insecticide should serve the purpose.Plant protection measures are generally not adopted which

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Table A : Details of treatments

Sr. No.	Treatment	Details
1.	T_1	Quinalphos 25 EC @ 2ml / lit. of water, once at 15 days after crop emergence
2.	T_2	Quinalphos 25 EC @ 2ml / lit. of water, once at 50% flowering
3.	T_3	Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence and at 50% flowering
4.	T_4	Quinalphos 25 EC @ 2ml / lit. of water, at 15, 30 and 45 after crop emergence
5.	T_5	Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence and at 15 days after 50% flowering
6.	T_6	Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence, at 50% flowering and at 15 days after 50% flowering
7.	T_7	Control (no application).

ultimately result in the crop being less remunerative, therefore constituting a major constraint in successful production. Quinalphos is recommended insecticide acting as stomach and contact poison against insect pest of sesamum. An appropriate insecticide, minimum application is most going to achieve greater control of pests of sesamum.

EXPERIMENTAL METHODS

The present investigation was conducted to study efficacy of Qinalphos 25 EC against internal feeders of Sesamum at field of Department of Agricultural Entomology, Post Graduate Institute, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola in *Kharif* 2015-16. The experiment was laid out in 4.5x 3 m plot by applying Randomized Block Design with seven treatment (Table A) replicated thrice. Ten plants were randomly selected from each plot for recording observations of gall fly and capsule borer at weekly intreval after application of insecticide till harvest. Total number of larvae of leaf webber was recorded per plant.Observations were recorded on total number of buds, flowers, capsules (Total number of fruiting bodies) and total numbers of galls formed to calculate the per cent gall formation.Total number of healthy and damaged capsules due to capsule borer were recorded and per cent capsule damage was calculated.

EXPERIMENTAL RESULTS AND ANALYSIS

The results obtained from the present investigation as well as relevant discussion have been summarized under the following heads :

Efficacy of Quinalphos 25 EC against leaf webber :

After being exposed to insecticidal treatments at different growth stages of crop, larval population of leaf webber was recorded and presented in Table 1. Data revealed that there is significant difference between treatments and untreated control.

22 days after emergence :

Spraying Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence, at 50 per cent flowering and at 15 days after 50 per cent flowering (T_6) recorded minimum larval incidence of leaf webber 0.10 larvae/ plant and was at par with Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence and at 15 days after 50 per cent flowering (T_5), Quinalphos 25 EC @ 2ml / lit. of water, once at 15 days after crop emergence (T_1), Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence and at 50 per cent flowering (T_3) and Quinalphos 25 EC @ 2ml / lit. of water, at 15, 30 and 45 days after crop emergence (T_4) was recorded 0.13, 0.13, 0.20 and 0.33 larvae/plant of leaf webber, respectively and were found at par with each other and significantly superior over untreated control.

29 days after emergence :

Among the various treatments Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence and at 50% flowering (T_3) recorded minimum larval population of leaf webber 0.13 larvae / plant and was at par with Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence, at 50% flowering and at 15 days after 50% flowering (T_6), Quinalphos 25 EC @ 2ml / lit. of water, once at 15 days after crop emergence (T_1), Quinalphos 25 EC @ 2ml / lit. of water, at 15, 30 and 45 days after crop emergence (T_4) and Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence and at 15 days after 50 per cent flowering (T_5) was recorded 0.17, 0.20, 0.23 and 0.23 larval population of leaf webber, respectively and were found

at par with each other and larvae/plant superior over untreated control.

36 days after emergence :

Among the various treatments Quinalphos 25 EC @ 2ml / lit. of water, at 15, 30 and 45 days after crop emergence (T_4) recorded minimum incidence of leaf webber 0.20 larvae / plant and was at par with with Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence, at 50% flowering and at 15 days after 50% flowering (T_6), Quinalphos 25 EC @ 2ml / lit. of water, once at 15 days after crop emergence (T_1) and Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence and at 15 days after 50% flowering (T_5) was recorded 0.23, 0.27 and 0.30 larvae / plant, respectively and superior over untreated control.

43 days after emergence:

Quinalphos 25 EC @ 2ml / lit. of water, at 15, 30 and 45 days after crop emergence (T_4) recorded minimum incidence of leaf webber 0.40 larvae / plant and was at par with with Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence, at 50% flowering and at 15 days after 50% flowering (T_6), Quinalphos 25 EC @ 2ml / lit. of water, once at 15 days after crop emergence (T_1), recorded minimum population of leaf webber was 0.43 larvae / plant, 0.43 larvae/plant, respectively.the treatments Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence and at 15 days after 50% flowering (T_5) 1.53 larvae/plant was at par with Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence and at 50% flowering (T_3) 1.47 larvae/plant and Quinalphos 25 EC @ 2ml / lit. of water, once at 50% flowering (T_2) 2.70 larvae /plant was at par with untreated control.

50 days after emergence :

Spraying of Quinalphos 25 EC @ 2ml / lit. of water, at 15, 30 and 45 days after crop emergence (T_4) recorded minimum larval incidence of leaf webber 0.27 larvae/ plant and was at par with Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence, at 50% flowering and at 15 days after 50% flowering (T_6) 0.50 larvae/ plant. the treatments Quinalphos 25 EC @ 2ml / lit. of water, once at 15 days after crop emergence (T_1) 1.35 larvae / plant at par with Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence and at 15 days after 50% flowering (T_5) and Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence and at 50% flowering (T_3) was recorded 1.97 and 2.00, larvae/ plant, respectively and were found at par with each other and superior over untreated control.

57 days after emergence :

Among the various treatments Quinalphos 25 EC @ 2ml / lit. of water, at 15, 30 and 45 days after crop emergence (T_4) recorded minimum larval incidence of leaf webber 0.23 larvae/plant and superior over rest of the treatment was at par with Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence, at 50% flowering and at 15 days after 50% flowering (T_6) and Quinalphos 25 EC @ 2ml / lit. of water, once at 50% flowering (T_2) was recorded 0.37 and 0.43 larvae / plant, respectively. Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence and at 15 days after 50% flowering (T_5) 2.13 larvae / plant at par with Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence and at 50% flowering (T_3) (2.30 larvae / plant) and superior over untreated control.

64 days after emergence :

The treatments Quinalphos 25 EC @ 2ml / lit. of water, at 15, 30 and 45 days after crop emergence (T_4) recorded minimum larval incidence of leaf webber 0.20 larvae/plant and was at par with Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence and at 50% flowering (T_3), Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence, at 50% flowering and at 15 days after 50% flowering (T_6), Quinalphos 25 EC @ 2ml / lit. of water, once at 50% flowering (T_2) and Quinalphos 25 EC @ 2ml / lit. of water, once at 15 days after crop emergence (T_1) was recorded 0.23, 0.33, 0.37 and 0.47 larvae / plant, respectively and were found at par with each other and significantly superior over untreated control.

71 days after emergence :

Among the various treatments Quinalphos 25 EC @ 2ml / lit. of water, at 15, 30 and 45 days after crop emergence (T_4) recorded minimum larval incidence of leaf webber 0.17 larvae/plant and was at par with Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence and at 50% flowering (T_3), Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop

emergence, at 50% flowering and at 15 days after 50% flowering (T_6), Quinalphos 25 EC @ 2ml / lit. of water, once at 50% flowering (T_2), Quinalphos 25 EC @ 2ml / lit. of water, once at 15 days after crop emergence (T_1) and Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence and at 15 days after 50% flowering (T_5) was recorded 0.20, 0.23, 0.33, 0.37 and 0.50 larvae / plant, respectively and were found at par with each other and significantly superior over untreated control.

78 days after emergence :

Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence, at 50% flowering and at 15 days after 50% flowering (T_6) recorded minimum larval incidence of leaf webber 0.13 larvae/plant and was at par with Quinalphos 25 EC @ 2ml / lit. of water, at 15, 30 and 45 days after crop emergence (T_4), Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence and at 50% flowering (T_3), Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence and at 15 days after 50% flowering (T_5), Quinalphos 25 EC @ 2ml / lit. of water, once at 50% flowering (T_2) and Quinalphos 25 EC @ 2ml / lit. of water, once at 15 days after crop emergence (T_1) was recorded 0.13, 0.17, 0.23, 0.30 and 0.33 larvae / plant, respectively and were found at par with each other and superior over untreated control.

Mean data (Table 1) revealed that, application of Quinalphos 25 EC @ 2ml / lit. of water, at 15, 30 and 45 days after crop emergence (T_4) recorded minimum larval incidence of leaf webber 0.24 larvae/plant and was at par with Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence, at 50% flowering and at 15 days after 50% flowering (T_6) recorded 0.28 larvae/plant. Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence and at 15 days after 50% flowering (T_5) (0.88 larvae/plant) was at par with (T_3) Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence and at 50% flowering recorded 0.91 larvae/ plant and significantly superior over untreated control.

Data recorded from untreated plot indicate that incidence of leaf webber started from 14 DAE and increase thereafter in subsequent week.Whereas it was reduced to lower level comparitively at initial stage of crop in plots treated with Quinalphos 25 EC @ 2ml / lit. at 15 days after crop emergence.

Effect of insecticide application schedule on infestation of gall fly :

Damage of gall fly in terms of galls per plant was recorded from 50 days after crop emergence at weekly

Table 1 : Effect of insecticide application schedule on incidence of leaf webber

Sr. No.	Treatments	Larvae/plant									
		22 DAE	29 DAE	36 DAE	43 DAE	50 DAE	57 DAE	64 DAE	71 DAE	78 DAE	Mean
1.	T_1-Quinalphos 25 EC @ 2ml / lit. of water, once at 15 days after crop emergence.	0.13 (0.79)	0.20 (0.44)	0.27 (0.51)	0.43 (0.66)	1.33 (1.35)	1.20 (1.09)	0.47 (0.98)	0.37 (0.93)	0.33 (0.91)	0.53 (0.72)
2.	T_2-Quinalphos 25 EC @ 2ml / lit. of water, once at 50% flowering.	1.47 (1.39)	2.10 (1.45)	2.40 (1.55)	2.70 (1.64)	2.97 (1.84)	0.43 (0.66)	0.37 (0.92)	0.33 (0.91)	0.30 (0.89	1.45 (1.20)
3.	T_3-Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence and at 50% flowering.	0.20 (0.84)	0.13 (0.36)	1.53 (1.24)	1.47 (1.21)	2.00 (1.58)	2.30 (1.52)	0.23 (0.84)	0.20 (0.84)	0.17 (0.82)	0.91 (0.96)
4.	T_4-Quinalphos 25 EC @ 2ml / lit. of water, at 15, 30 and 45 days after crop emergence.	0.33 (0.91)	0.23 (0.48)	0.20 (0.45)	0.40 (0.63)	0.27 (0.88)	0.23 (0.47)	0.20 (0.83)	0.17 (0.81)	0.13 (0.80)	0.24 (0.49)
5.	T_5-Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence and at 15 days after 50% flowering.	0.13 (0.79)	0.23 (0.48)	0.30 (0.55)	1.53 (1.18)	1.97 (1.57)	2.13 (1.42)	0.90 (1.18)	0.50 (1.00)	0.23 (0.86)	0.88 (0.93)
6.	T_6-Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence, at 50% flowering and at 15 days after 50% flowering.	0.10 (0.77)	0.17 (0.40)	0.23 (0.48)	0.43 (0.66)	0.50 (1.00)	0.37 (0.60)	0.33 (0.91)	0.23 (0.86)	0.13 (0.70)	0.28 (0.53)
7.	T_7-Control (no application)	1.60 (1.44)	2.17 (1.47)	2.50 (1.55)	2.77 (1.66)	3..00 (1.84)	3.17 (1.78)	3.47 (1.99)	3.67 (2.01)	4.03 (2.12)	2.93 (1.71)
	'F' test	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig
	S.E. $\pm$	0.07	0.05	0.09	0.11	0.11	0.10	0.07	0.10	0.07	0.03
	C.D. (P=0.05)	0.22	0.15	0.28	0.34	0.33	0.30	0.20	0.30	0.21	0.10
	CV (%)	12.20	11.63	17.32	17.62	12.73	15.44	10.44	15.93	11.54	5.73

*Figures in the parentheses are corresponding square root transformed values. DAE- Days after emergence.

interval (Table 2).

50 days after emergence :

Among the various treatments Quinalphos 25 EC @ 2ml / lit. of water, at 15, 30 and 45 days after crop emergence (T_4) recorded minimum per cent infestation of Gall fly 1.40 and was at par with Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence, at 50% flowering and at 15 days after 50% flowering (T_6) 1.94 per cent galls and the next treatment Quinalphos 25 EC @ 2ml / lit. of water, once at 50% flowering (T_2) recorded 3.57 per cent galls was at par with Quinalphos 25 EC @ 2ml / lit. of water, once at 15 days after crop emergence (T_1) and Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence and at 15 days after 50% flowering (T_5) was recorded 4.46 and 4.80 per cent incidence of Galls, respectively and were found at par with each other and superior over untreated control.

57 days after emergence :

The treatments Quinalphos 25 EC @ 2ml / lit. of water, at 15, 30 and 45 days after crop emergence (T_4) recorded significantly minimum infestation of Gall fly 1.40 per cent galls and superior over rest of the treatment and was at par with Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence, at 50% flowering and at 15 days after 50% flowering (T_6) 1.94 per cent and followed by Quinalphos 25 EC @ 2ml / lit. of water, once at 50% flowering (T_2) recorded 3.64 per cent was at par with Quinalphos 25 EC @ 2ml / lit. of water, once at 15 days after crop emergence (T_1) and Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence and at 15 days after 50% flowering (T_5) was recorded 4.47 and 4.76 per cent infestation of Galls, respectively and were found at par with each other and significantly superior over untreated control.

64 days after emergence :

Among the various treatments Quinalphos 25 EC @ 2ml / lit. of water, at 15, 30 and 45 days after crop emergence (T_4) recorded minimum infestation of Gall fly 1.40 per cent and superior over rest of the treatment was at par with Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence, at 50% flowering and at 15 days after 50% flowering (T_6) 1.94 per cent and the next treatment Quinalphos 25 EC @ 2ml / lit. of water, once at 50% flowering (T_2) 3.72 per cent was at par with Quinalphos 25 EC @ 2ml / lit. of water, once at 15 days after crop emergence (T_1) and Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence and at 15 days after 50% flowering (T_5) was recorded 4.73 and 4.76 per cent infestation of Galls, respectively

Table 2 : Effect of insecticide application schedule on infestation of gall fly

Sr. No.	Treatments	Per cent galls						
		50 DAE	57 DAE	64 DAE	71 DAE	78 DAE	85 DAE	Mean
1.	T_1-Quinalphos 25 EC @ 2ml / lit. of water, once at 15 days after crop emergence.	4.46 (2.11)	4.47 (2.11)	4.73 (2.17)	4.82 (2.19)	4.82 (2.19)	4.82 (2.19)	4.69 (2.16)
2.	T_2-Quinalphos 25 EC @ 2ml / lit. of water, once at 50% flowering.	3.57 (1.88)	3.64 (1.91)	3.72 (1.91)	3.72 (1.91)	3.72 (1.91	3.72 (1.91)	3.68 (1.91)
3.	T_3-Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence and at 50% flowering.	5.68 (2.37)	5.68 (2.37)	5.68 (2.37)	5.68 (2.37)	5.68 (2.37)	5.68 (2.37)	5.68 (2.37)
4.	T_4-Quinalphos 25 EC @ 2ml / lit. of water, at 15, 30 and 45 days after crop emergence.	1.40 (1.18)	1.40 (1.18)	1.40 (1.18)	1.40 (1.18)	1.40 (1.18)	1.40 (1.18)	1.40 (1.18)
5.	T_5-Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence and at 15 days after 50% flowering.	4.80 (2.19)	4.76 (2.18)	4.76 (2.18)	4.86 (2.20)	4.86 (2.20)	4.86 (2.20)	4.82 (2.19)
6.	T_6-Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence, at 50% flowering and at 15 days after 50% flowering.	1.94 (1.36)	1.94 (1.36)	1.94 (1.36)	1.94 (1.36)	1.94 (1.36)	1.94 (1.36)	1.94 (1.36)
7.	T_7-Control (no application)	7.32 (2.70)	7.32 (2.70)	8.06 (2.83)	8.73 (2.95)	9.20 (3.03)	9.20 (3.03)	8.31 (2.88)
	'F' test	Sig	Sig	Sig	Sig	Sig	Sig	Sig
	S.E. $\pm$	0.12	0.12	0.15	0.14	0.14	0.14	0.11
	C.D. (P=0.05)	0.38	0.37	0.45	0.43	0.42	0.42	0.35
	CV (%)	10.70	10.53	12.71	11.85	11.57	11.57	9.79

*Figures in the parentheses are corresponding square root transformed values. DAE- Days after emergence

and were found at par with each other and superior over untreated control.

71 days after emergence :

The treatments Quinalphos 25 EC @ 2ml / lit. of water, at 15, 30 and 45 days after crop emergence (T_4) recorded minimum infestation of Gall fly 1.40 per cent and superior over rest of the treatment and was at par with Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence, at 50% flowering and at 15 days after 50% flowering (T_6) (1.94 %) and the next treatment Quinalphos 25 EC @ 2ml / lit. of water, once at 50% flowering (T_2) 3.72 per cent was at par with Quinalphos 25 EC @ 2ml / lit. of water, once at 15 days after crop emergence (T_1) and Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence and at 15 days after 50% flowering (T_5) was recorded 4.82 and 4.86 per cent infestation of Galls, respectively and were found at par with each other and superior over untreated control.

78 days after emergence :

Among the various treatments Quinalphos 25 EC @ 2ml / lit. of water, at 15, 30 and 45 days after crop emergence (T_4) recorded minimum infestation of Gall fly 1.40 per cent and superior over rest of the treatment and was at par with Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence, at 50% flowering and at 15 days after 50% flowering (T_6) 1.94 per cent and the next treatment Quinalphos 25 EC @ 2ml / lit. of water, once at 50% flowering (T_2) 3.72 per cent was at par with Quinalphos 25 EC @ 2ml / lit. of water, once at 15 days after crop emergence (T_1) and Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence and at 15 days after 50% flowering (T_5) was recorded 4.82 and 4.86 per cent infestation of Galls, respectively and were found at par with each other and superior over untreated control.

85 days after emergence :

The treatments Quinalphos 25 EC @ 2ml / lit. of water, at 15, 30 and 45 days after crop emergence (T_4) recorded significantly minimum infestation of Gall fly 1.40 per cent and superior over rest of the treatment was at par with Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence, at 50% flowering and at 15 days after 50% flowering (T_6) 1.94 per cent and the next treatment Quinalphos 25 EC @ 2ml / lit. of water, once at 50% flowering (T_2) 3.72 per cent was at par with Quinalphos 25 EC @ 2ml / lit. of water, once at 15 days after crop emergence (T_1) and Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence and at 15 days after 50% flowering (T_5) per was recorded 4.82 and 4.86 cent infestation of Galls, respectively and were found at par with each other and superior over

Table 3 : Effect of insecticide application schedule on infestation of capsule borer

Sr. No.	Treatments	Per cent capsule damage				
		64 DAE	71 DAE	78 DAE	85 DAE	Mean
1.	T_1-Quinalphos 25 EC @ 2ml / lit. of water, once at 15 days after crop emergence.	2.11 (1.62)	10.82 (3.28)	11.00 (3.32)	11.56 (3.39)	8.87 (2.98)
2.	T_2-Quinalphos 25 EC @ 2ml / lit. of water, once at 50% flowering.	1.26 (1.33)	7.16 (2.67)	8.17 (2.84)	8.17 (2.84)	6.19 (2.48)
3.	T_3-Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence and at 50% flowering.	0.22 (0.85)	6.92 (2.62)	6.92 (2.62)	6.92 (2.62)	5.25 (2.28)
4.	T_4-Quinalphos 25 EC @ 2ml / lit. of water, at 15, 30 and 45 days after crop emergence.	3.27 (1.92)	3.27 (1.81)	4.53 (2.13)	4.80 (2.19)	3.97 (1.99)
5.	T_5-Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence and at 15 days after 50% flowering.	3.00 (1.87)	7.28 (2.67)	7.28 (2.67)	7.28 (2.67)	6.21 (2.48)
6.	T_6-Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence, at 50% flowering and at 15 days after 50% flowering.	1.70 (1.40)	2.27 (1.50)	3.35 (1.82)	4.00 (2.00)	2.83 (1.68)
7.	T_7-Control (no application)	5.90 (2.53)	11.84 (3.44)	11.42 (3.38)	13.17 (3.63)	10.58 (3.25)
	'F' test	Sig	Sig	Sig	Sig	Sig
	S.E. $\pm$	0.15	0.17	0.16	0.20	0.12
	C.D. (P=0.05)	0.47	0.51	0.51	0.62	0.37
	CV (%)	16.05	11.20	10.65	12.59	8.47

*Figures in the parentheses are corresponding square root transformed values. DAE- Days after emergence

untreated control.

Mean per cent galls (Table 3) revealed that, application of Quinalphos 25 EC @ 2ml / lit. of water at 15, 30 and 45 days after crop emergence (T_4) recorded significantly minimum infestation of Gall fly 1.40 per cent and was at par with Quinalphos 25 EC @ 2ml / lit. of water at 15 days after crop emergence, at 50% flowering and at 15 days after 50% flowering (T_6) 1.94 per cent and the next effective treatment was Quinalphos 25 EC @ 2ml / lit. of water, once at 50% flowering (T_2) 3.68 per cent was at par with Quinalphos 25 EC @ 2ml / lit. of water, once at 15 days after crop emergence (T_1), Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence and at 15 days after 50 % flowering (T_5) was recorded 4.69 and 4.82 per cent infested Galls and were found at par with each other and superior over untreated control.

Treatment comprising spraying of Quinalphos 25 EC @ 2 ml / lit. of water at 30 and 45 days after crop emergence protected the buds from the damage of gall fly, recording less number of fruiting bodies converted to galls as compared to other treatments.

Efficacy of Quinalphos 25 EC on infestation of Capsule borer :

Damage of Capsule borer was noticed from 64 days after emergence. Observation of per cent capsule infestation was recorded from 64 DAE at weekly interval (Table 3).

64 days after emergence :

Among the various treatments Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence and at 50% flowering (T_3) recorded minimum infestation of Capsule borer 0.22 per cent and superior over rest of the treatment.The next best treatment was Quinalphos 25 EC @ 2ml / lit. of water, once at 50% flowering (T_2) 1.26 per cent was at par with Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence, at 50% flowering and at 15 days after 50% flowering (T_6) and Quinalphos 25 EC @ 2ml / lit. of water, once at 15 days after crop emergence (T_1) was recorded 1.70 and 2.11 per cent infestation of Capsule borer, respectively and were found at par with each other and superior over untreated control. Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence and at 15 days after 50% flowering (T_5) recording 3.00 per cent capsule infeststion was at par with Quinalphos 25 EC @ 2ml / lit. of water, at 15, 30 and 45 days after crop emergence (T_4) with 3.27 per cent capsule infestation found at par with each other and superior over untreated control.

71 days after emergence :

The treatments Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence, at 50% flowering and at 15 days after 50% flowering (T_6) recorded minimum infestation of Capsule borer 2.27 per cent and superior over rest of the treatment was at par with Quinalphos 25 EC @ 2ml / lit. of water, at 15, 30 and 45 days after crop emergence (T_4) 3.27 per cent capsule infestation.The treatments Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence and at 50% flowering (T_3) 6.92 per cent was at par with Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence and at 15 days after 50% flowering (T_5) and Quinalphos 25 EC @ 2ml / lit. of water, once at 50% flowering (T_2) was recorded 7.28 and 7.16 per cent capsule infestation, respectively.

78 days after emergence :

Among the various treatments Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence, at 50% flowering and at 15 days after 50% flowering (T_6) recorded minimum infestation of Capsule borer 3.35 per cent and was at par with Quinalphos 25 EC @ 2ml / lit. of water, at 15, 30 and 45 days after crop emergence (T_4) 4.80 per cent capsule infestation. Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence and at 50% flowering (T_3) 2.62 per cent infestation was at par with Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence and at 15 days after 50% flowering (T_5), Quinalphos 25 EC @ 2ml / lit. of water, once at 50% flowering (T_2) was recorded 7.28 and 8.17 per cent infestation, respectively.

85 days after emergence :

The treatments Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence, at 50% flowering and at 15 days after 50% flowering (T_6) recorded minimum infestation of Capsule borer 4.00 per cent infestation and superior over rest of the treatment was at par with Quinalphos 25 EC @ 2ml / lit. of water, at 15, 30 and 45 days after crop emergence (T_4) 4.80 per cent infestation.The treatments Quinalphos 25 EC @ 2ml /

lit. of water, at 15 days after crop emergence and at 50 % flowering (T_3) 2.62 per cent infestation was at par with Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence and at 15 days after 50% flowering (T_5), Quinalphos 25 EC @ 2ml / lit. of water, once at 50% flowering (T_2) was recorded 7.28 and 8.17 per cent infestation of Capsule borer, respectively and superior over untreated control.

Mean results revealed that, application of Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence, at 50% flowering and at 15 days after 50% flowering (T_6) recorded minimum infestation of capsule borer 2.83 per cent and was at par with Quinalphos 25 EC @ 2ml / lit. of water, at 15, 30 and 45 days after crop emergence (T_4) 3.97 per cent. The treatments Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence and at 50% flowering (T_3) recorded 5.25 per cent infestation of capsule borer was at par with Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence and at 15 days after 50% flowering (T_5) and Quinalphos 25 EC @ 2ml / lit. of water, once at 50% flowering (T_2) recorded 6.21 and 6.19 per cent infestation of Capsule borer, respectively. Quinalphos 25 EC @ 2ml / lit. of water once at 15 days after crop emergence (T_1) recorded 8.87 per cent infestation of capsule borer and was at par with untreated control (Table 3).

Quinalphos 25 EC @ 2ml / lit. of water, at 15 days after crop emergence, at 50% flowering and at 15 days after 50% flowering (T_6) recorded minimum infestation of Capsule borer.

Application of Quinalphos 25 EC @ 2ml / lit. of water, at 15, 30 and 45 days after crop emergence (T_4) was effective against major insect pests of sesamum. Quinalphos control many insect pests of the orders Lepidoptera, Coleoptera, Diptera and Hemiptera. It is contact and stomach poison having cholinesterase inhibiting action. By penetrating the plant tissue through translaminar action it exhibits a systemic effect hence effective against sucking pest.Insecticide belonging to same group or having same mode of action, effective against insect pest of sesamum are discussed here. Rai *et al.* (2002) reported that the quinalphos 0.05 per cent significantly reduce the pod damage.For controlling leaf eating caterpillar, leaf rolling insect, leaf hopper and gall midge on sesamum, Quinalphos 25 EC, 1000 ml in 500 l was recommended for spraying (Anonymous, 2003).For management of sesamum gall fly, two sprayings of dimethoate 0.05 per cent were found most effective (Anonymous, 2003a). Sengar (2003) studied that, among the organophosphate group of insecticide, triazophos 40 EC, 0.04 % reported effective against *Antigastra catalaunalis*. Thakare *et al*. (2005) evaluated the efficacy of some botanicals in comparison with synthetic insecticides against sesamum gall fly.Out of eleven botanicals and synthetic insecticides evaluated for the management of sesamum gall fly, treatment dimethoate 0.05 per cent were found effective. Jadhao (2010) evaluated different insecticides for the control of sesamum leaf webber and capsule borer, *A. catalaunalis*. profenofos 50 EC (8.45 q/ha) followed by triazophos 40 EC (6.59 q/ha) was effective. Karuppaih (2014) reported that, the leaf webber and capsule borer is capable of causing significant yield losses and two sprays of quinolphos 0.05 per cent at 30 and 45 days after sowing control the pest effectively. Wazire and Patel (2015) concluded that, Profenofos 0.05 per cent, dichlorovos 0.05 per cent, acephate 0.075 per cent and trizophos 0.04 per cent were the effective and there was significant difference in reducing larval population and flower and capsule infestation over control.

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