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Bio-efficacy Studies of Quinalphos 25% EC against Insect Pests of Red Gram

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A B S T R A C T

The investigation on, "Bio Efficacy of Quinalphos 25 % EC Against Insect Pests of Red Gram" was conducted at Instructional Farm and Department of Entomology, Rajasthan College of Agriculture, Udaipur during *kharif* 2016 and 2017. The red gram variety "ICPL-87" was sown to record the different insect pests population and bioefficacy of quinalphos 25 EC against the pod borer and pod fly population. Among the different treatments quinalphos 25 EC had the lowest pest population in both the years. The treatment with quinalphos 25 EC @ 750 g a.i./ ha had the lowest pod borer population (2.08 larvae/ plant) after 10 days of spraying. Similarly, it had lowest pod fly damage (4.99 %). The same trend was observed during both the year 2016 & 2017.

Introduction

Pulse is an integral part of human diet and fulfills the protein requirement of majority of the Indian population besides providing energy. They also supply certain essential amino - acids minerals and vitamins which are crucial for normal health. Nature has also endowed the pulses with a unique mechanism of nitrogen fixation which helps in sustaining soil fertility. The pigeonpea crop is grown as an annual crop in India and as a perennial in many other countries where the pods are harvested at regular intervals. About 90 percent of the world's pigeonpea is produced in India. Pigeonpea is the second important pulse crop of the country occupying 14.5 percent of the area and contributes 15.5 percent of the total pulse production. It is predominantly cultivated in Maharashtra, Uttar Pradesh, Madhya Pradesh, Karnataka, Gujarat and Andhra Pradesh. These states contribute about 86.8 percent of the area and 84.4 percent of the production (Panda, 2005). Biotic and abiotic factors are responsible for low yields of the crop. Among the biotic factors insect pests constitute one of the major factors affecting both production and yield stability of the crop. More than 200 insect pests and other arthropods are known to be

associated with this crop (La I, 1981). The damage in the vegetative stage of the crop is of occasional importance but the damage, which occurs in the reproductive phase, affects the production and yield (Thakur, 1989). They are mainly pod infesting species i.e. gram pod borer, *Helicoverpa armigera* (Hub.) 1 (Lepidoptera: Noctuidae); pigeonpea pod fly, *Melanagromyza obtusa* (Malloch) (Diptera: Agromyzidae); pigeonpea pod bug, *Cavigralla gibbosa* Spin. (Hemiptera: Coreidae); pigeonpea plume moth, *Exelastis atomosa* W. (Lepidoptera: Pterophoridae) and pulse beetle, *Callosobruchus sp*. which are more or less uniformly distributed in Madhya Pradesh. The pest complex cause adequate economic damage leading to very low yield levels of 500 - 800 kg/ ha as against the potential yields of 1800 to 2000 kg/ ha (La *et al.,* 1997). The pigeonpea pod borer, *Helicoverpa armigera* is the foremost among the insect pests of pigeonpea that causes serious damage to the crop (Pawar and Shalla, 1975; Singh and Singh 1978; Sithanantham *et al.,* 1987; Singh and Singh, 1991; Sanap *et al.,* 1995; Prasad, 1997; Bhubaneshwari and Balasuranathan, 2002; Sunil Kumar *et al.,* 2003; Akhilesh Kumar, 2004). The larva damages the buds, flowers, pods and developing seeds (Sithanantham *et al.,* 1987). In recent years, management of *H. armigera* has become difficult due to development of resistance is all the major insecticide classes available to Indian farmers (MeCafferry *et al.,* 1989 and Armes *et al.,* 1992), Hence, there is an urgent need to develop alternative control methods, which should be made available to the pigeonpea cultivators. In this context, studies on bioefficacy of Quinalphos 25% EC will be highly remarkable in the management of different insect pests of Red gram.

Materials and Methods

The bio-efficacy of Quinalphos 25% EC at 325,350,375 and 750 g a.i./ha, Indoxacarb 14.5% SC at 60 g a.i./ha and Deltamethrin 2.8% EC at 12.5 g a.i./ha were evaluated against pod borer, pod fly, aphids, jassids, thrips and mites in red gram during Kharif 2016 and 2017. The experiment was conducted in randomized block design with seven treatments replicated three times at the instructional Farm, R.C.A., Udaipur. The red gram variety ICPL-87 was shown on 29th and 27th August, during Kharif 2016 and Kharif 2017. Each treatment was applied three times. The observation on the population of aphids, jassids, white fly thrips and mites were recorded on three top and two middle leaves per plant (5 leaves/plant) on five plants selected randomly while pod borer in 5 plants and per cent pod damage by pod borer and pod fly. The observation was recorded one day before and at one, three, five, seven and ten days after each spray and mean reduction in population was calculated at 1, 3, 5, 7 and 10 days after each sprays.

The pretreatment population of insect pests namely pod borer, pod fly, Aphids, Jassids, Whiteflies, Thrips, mites were recorded 24 hours before spray on randomly selected five plants in each replication.

Results and Discussion

Bio-efficacy

Effect of Quinalphos 25% EC against population of *H. armigera*

During *Kharif,* 2016 and 2017 the average population of *H. armigera* before sprays ranged from 6.74 to 7.37 and 6.13 to 6.76 per 5 plants (randomly selected), respectively. At 1, 3, 5, 7 and 10 days after all three spray, the larval population per 5 plants was found significantly lowest in the treatments of Quinalphos 25% EC. At final observation i.e. 10 days after third application, minimum *H. armigera* population per 5 plants was recorded

in the treatment of Quinalphos 25% EC @ 750 g a.i./ha (2.08) followed by Quinalphos 25% EC @ 375 g a.i./ha (3.18), which was at par with Quinalphos 25% EC @ 350 g a.i./ha (3.24), followed by Indoxacarb 14.5% SC (3.28), Quinalphos 25% EC @ 325 g a.i./ha (3.70) and Deltamethrin 2.8% EC (4.30) (Table 1). The maximum *H. armigera* larval count was recorded in untreated control i.e. 9.00. The similar trend was followed in 2017 (Table 2).

Effect of different doses of Quinalphos 25% EC on per cent pod damage by *H. armigera* and *M. obtusa* during 2016 and 2017

During *Kharif* 2016 and 2017, the per cent pod damage by *H. armigera* ranged between 4.99 to 10.96 per cent and 6.97 to 12.94 per cent respectively (Table 3). During *Kharif* 2016 the least per cent pod damage was found in the treatment comprising of Quinalphos 25% EC @ 750 g a.i./ha (4.99 per cent), followed by the treatment of Quinalphos25% EC @ 375 g a.i./ha with 6.91 per cent which was statistically at par with Quinalphos 25% EC @ 350 g a.i./ha with 7.20 per cent pod damage. The highest per cent pod damage by pod borer was found in the untreated control. The similar trend followed in 2017.

The per cent pod damage by *M. obtusa* ranged from 33.04 per cent to 40.39 per cent (2016) and 37.34 to 43.69 per cent (2017) (Table 4) among the treatments. The highest percent pod damage was in the untreated control. The treatment comprising of Quinalphos 25% EC @ 750 g a.i./ha (33.04 per cent) showed least per cent pod damage, followed by the treatment of Quinalphos 25% EC @ 375 g a.i./ha with 33.41 per cent pod damage and it was at par with Quinalphos 25% EC @ 350 g a.i./ha with 33.83 per cent pod damage. The same trend followed in 2017.

Table.1a Treatment Details: Seven treatments (including control)

S. No.	Treatments	Dosage	
		g. a.i./ha	ml/ha
1.	Quinalphos 25% EC	325	1300
2.	Quinalphos 25% EC	350	1400
3.	Quinalphos 25% EC	375	1500
4.	Quinalphos 25% EC	750	3000
5.	Indoxacarb 14.5% SC	60	400
6.	Deltamethrin 2.8% EC	12.5	500
7.	Untreated control	-	-

Table.1b Number and date of spray: Three

S. No.	Spray	***Kharif* 2016**	***Kharif* 2017**
1.	First	29 September 2016	**22 October 2017**
2.	Second	20 October 2016	**01 November 2017**
3.	**Third**	**07 November 2016**	**11 November 2017**

Table.1 Bio-efficacy of Quinalphos 25% EC against *H. armigera* on red gram during *Kharif*, 2016

Treatments	Dose (g a.i./ha)	PTC	Average no. of larval population / 5 Plants														
			First Spray					Second spray					Third spray				
			1 DAS	3 DAS	5 DAS	7 DAS	10 DAS	1 DAS	3 DAS	5 DAS	7 DAS	10 DAS	1 DAS	3 DAS	5 DAS	7 DAS	10 DAS
Quinalphos 25% EC	325	6.93 (2.62)	6.77 (2.59)	6.68 (2.53)	6.44 (2.51)	6.59 (2.56)	6.55 (2.57)	6.32 (2.50)	6.14 (2.46)	6.05 (2.44)	5.33 (2.82)	5.41 (2.30)	5.18 (2.25)	4.75 (2.14)	4.30 (2.03)	3.95 (1.94)	3.70 (1.87)
Quinalphos 25% EC	350	6.74 (2.59)	6.68 (2.57)	5.48 (2.32)	5.11 (2.11)	5.95 (2.42)	6.08 (2.45)	5.99 (2.43)	5.75 (3.38)	5.63 (2.35)	5.09 (2.23)	5.21 (2.25)	4.82 (2.16)	4.11 (1.98)	3.88 (1.92)	3.41 (1.78)	3.24 (1.73)
Quinalphos 25% EC	375	7.05 (2.65)	6.97 (2.63)	5.36 (2.29)	5.13 (2.24)	5.56 (2.33)	5.72 (2.37)	5.52 (2.33)	5.19 (2.25)	5.07 (2.22)	4.35 (2.04)	4.39 (2.05)	4.19 (2.00)	4.07 (1.97)	3.71 (1.87)	3.32 (1.75)	3.18 (1.71)
Quinalphos 25% EC	750	6.78 (2.59)	6.64 (2.57)	5.05 (2.22)	4.85 (2.19)	5.05 (2.22)	5.14 (2.24)	5.03 (2.21)	4.73 (2.14)	4.62 (2.11)	4.02 (1.96)	4.19 (2.00)	3.87 (1.92)	3.19 (1.71)	2.53 (1.50)	2.28 (1.40)	2.08 (1.32)
Indoxacarb 14.5% SC (Standard treatment)	60	6.94 (2.63)	6.81 (2.60)	5.94 (2.42)	5.85 (2.40)	5.97 (2.43)	6.08 (2.45)	5.83 (2.39)	5.58 (2.34)	5.45 (2.31)	5.02 (2.21)	5.17 (2.25)	4.91 (2.18)	4.15 (1.99)	3.78 (1.89)	3.46 (1.80)	3.28 (1.74)
Deltamethrin 2.8% EC (Standard treatment)	12.5	6.88 (2.61)	6.78 (2.59)	6.51 (2.54)	6.47 (2.53)	6.57 (2.55)	6.63 (2.56)	6.45 (2.53)	6.23 (2.48)	6.12 (2.46)	5.79 (2.78)	5.85 (2.39)	5.55 (2.33)	5.14 (2.24)	4.71 (2.13)	4.53 (2.09)	4.30 (2.03)
Untreated control	-	7.37 (2.71)	7.09 (2.66)	7.14 (2.67)	7.30 (2.70)	7.41 (2.72)	7.55 (2.74)	7.72 (2.78)	7.84 (2.80)	8.01 (2.83)	8.30 (2.88)	8.37 (2.90)	8.64 (2.94)	8.84 (2.98)	8.92 (2.99)	9.00 (3.01)	9.00 (3.01)
CD at 5%		**NS**	**0.05**	**0.05**	**0.05**	**0.08**	**0.03**	**0.07**	**0.04**	**0.05**	**0.03**	**0.04**	**0.07**	**0.07**	**0.07**	**0.06**	**0.06**

Figures in the parentheses are √x + 0.5 transformation; **PTC** – Pre Treatment Count; **DAS** – Days After Spraying

Table.2 Bio-efficacy of Quinalphos 25% EC against *H. armigera* on red gram during *Kharif*, 2017

Treatments	Dose (g a.i./ha)	PTC	Average no. of larval population / 5 Plants														
			First Spray					Second spray					Third spray				
			1 DAS	3 DAS	5 DAS	7 DAS	10 DAS	1 DAS	3 DAS	5 DAS	7 DAS	10 DAS	1 DAS	3 DAS	5 DAS	7 DAS	10 DAS
Quinalphos 25% EC	325	6.32 (3.01)	6.16 (2.98)	5.87 (2.92)	5.83 (2.91)	5.98 (2.95)	6.04 (2.96)	5.71 (2.89)	5.53 (2.85)	5.44 (2.83)	4.72 (2.67)	4.80 (2.69)	4.57 (2.64)	4.34 (2.53)	3.69 (2.42)	3.34 (2.33)	3.09 (2.26)
Quinalphos 25% EC	350	6.13 (2.98)	6.07 (2.96)	4.87 (2.71)	4.50 (2.61)	5.34 (2.81)	5.47 (2.84)	5.38 (2.82)	5.14 (2.77)	5.02 (2.74)	4.48 (2.62)	4.60 (2.64)	4.21 (2.55)	3.50 (2.37)	3.27 (2.30)	2.80 (2.17)	2.63 (2.12)
Quinalphos 25% EC	375	6.44 (3.04)	6.36 (3.02)	4.75 (2.68)	4.52 (2.63)	4.95 (2.72)	5.11 (2.76)	4.91 (2.72)	4.85 (2.64)	4.46 (2.61)	3.74 (2.43)	2.78 (2.44)	3.58 (2.39)	3.46 (2.36)	3.10 (2.26)	2.71 (2.14)	2.57 (2.10)
Quinalphos 25% EC	750	6.17 (2.98)	6.03 (2.96)	4.44 (2.61)	4.34 (2.58)	4.44 (2.61)	4.53 (2.63)	4.42 (2.60)	4.12 (2.53)	4.01 (2.50)	3.41 (2.35)	3.58 (2.39)	3.26 (2.31)	2.58 (2.10)	1.92 (1.89)	1.67 (1.79)	1.47 (1.71)
Indoxacarb 14.5% SC (Standard treatment)	60	6.33 (3.02)	6.20 (2.99)	5.33 (2.81)	5.24 (2.79)	5.36 (2.82)	5.47 (2.84)	5.22 (2.78)	4.97 (2.73)	4.84 (2.70)	4.41 (2.60)	4.56 (2.64)	4.30 (2.57)	3.54 (2.38)	3.17 (2.28)	2.85 (2.19)	2.67 (2.13)
Deltamethrin 2.8% EC (Standard treatment)	12.5	6.27 (3.00)	6.17 (2.98)	5.90 (2.93)	5.86 (2.92)	5.96 (2.94)	6.02 (2.95)	5.84 (2.92)	5.62 (2.87)	5.51 (2.85)	5.18 (3.17)	5.24 (2.78)	4.94 (2.72)	4.53 (2.63)	4.10 (2.52)	3.92 (2.48)	3.69 (2.42)
Untreated control	-	6.76 (3.19)	6.48 (3.05)	6.53 (3.06)	6.69 (3.09)	6.80 (3.11)	6.94 (3.13)	7.11 (3.17)	7.23 (3.19)	7.40 (3.22)	7.69 (3.27)	7.76 (3.29)	8.03 (3.33)	8.23 (2.37)	8.31 (3.38)	8.39 (3.40)	8.50 (3.41)
CD at 5%		**NS**	**0.03**	**0.03**	**0.03**	**0.06**	**0.01**	**0.05**	**0.02**	**0.03**	**0.02**	**0.03**	**0.05**	**0.05**	**0.05**	**0.04**	**0.04**

Figures in the parentheses are √x + 0.5 transformation; **PTC** – Pre Treatment Count; **DAS** – Days After Spraying

Table.3 Effect of different doses of Quinalphos 25% EC on per cent pod damage by pod borer, *H. armigera*

S. No	Treatments	Dose (g a.i./ha)	**Pod damage (%) by *H. armigera*	
			2016	2017
1.	Quinalphos 25% EC	325	8.09(16.34)	10.05(17.58)
2.	Quinalphos 25% EC	350	7.20(15.38)	9.18(16.60)
3.	Quinalphos 25% EC	375	6.91(15.04)	8.89(16.26)
4.	Quinalphos 25% EC	750	4.99(12.45)	6.97(13.67)
5.	Indoxacarb 14.5% SC (Standard treatment)	60	7.76(16.05)	9.74(17.27)
6.	Deltamethrin 2.8% EC (Standard treatment)	12.5	8.10(16.44)	10.08(17.66)
7.	Untreated control	-	10.96 (19.40)	12.94 (20.62)
CD at 5%			**1.27**	**1.30**

**Figures in the parentheses are Angular transformed values

Table.4 Effect of different doses of Quinalphos 25% EC on per cent pod damage by pod fly, *M. obtusa*

S.No	Treatments	Dose (g a.i./ha)	**Pod damage (%) by *M. obtuse*	
			2016	2017
1.	Quinalphos 25% EC	325	35.30(35.56)	39.80(39.96)
2.	Quinalphos 25% EC	350	33.83(34.69)	38.13(38.99)
3.	Quinalphos 25% EC	375	33.41(34.43)	37.71(38.73)
4.	Quinalphos 25% EC	750	33.04(34.22)	37.34(38.52)
5.	Indoxacarb 14.5% SC (Standard treatment)	60	34.21(34.92)	38.51(39.22)
6.	Deltamethrin 2.8% EC (Standard treatment)	12.5	35.47(35.72)	39.87(40.02)
7.	Untreated control	-	40.39(38.96)	43.69(42.26)
CD at 5%			**1.06**	**1.11**

**Figures in the parentheses are Angular transformed values

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