



E-ISSN: 2320-7078  
 P-ISSN: 2349-6800  
 JEZS 2017; 5(5): 281-284  
 © 2017 JEZS  
 Received: 06-07-2017  
 Accepted: 07-08-2017

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## Efficacy of selected insecticides against aphids and Leaf hoppers in Cowpea (*Vigna unguiculata* (L.) Walp.)

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### Abstract

Field experiment conducted during kharif 2016-2017 to evaluate efficacy of insecticide against aphids and leaf hoppers. 6 insecticides were used. Buprofezin 25 SC @ 250 g a.i./ha, Profenophos 50 EC @ 500 g a.i./ha, Azadirachtin 300 ppm @ 0.03% Imidacloprid 17.8 SL @ 25 g a.i./ha, Quinalphos 25 EC @ 250 g a.i./ha, Chlorpyrifos 20 EC @ 200 g a.i./ha. Foliar application of imidacloprid 17.8 SL @ 0.30 ml/l (95.66, 100), profenophos 50 EC @ 2 ml/l (92.45, 99.83), chlorpyrifos 20 EC @ 2 ml/l (84.90, 100) and quinalphos 25 EC @ 2 ml/l (81.69, 100) recorded highest protection against leafhopper and aphids respectively.

**Keywords:** Against aphids, Leaf hoppers, *Vigna unguiculata* (L.) Walp.)

### Introduction

Cowpea (*Vigna unguiculata* (L.) Walp.) is one of the most important pulse crops, native to central Africa, belongs to family Fabaceae. The major insect pests which severely damage cowpea during all growth stages are the cowpea aphid (*Aphis craccivora* Koch). Several control measures are available (Jackai, 1985) of which chemicals are most effective giving several fold increase in grain yield (Jackai, 1993). However, sometimes farmers spray their farms as many as 8 to 10 times during the growing season (Omongo *et al.*, 1998) [3]. So we have to use correct dosage as recommendation

### Materials and Methods

#### Efficacy of selected insecticides against Aphids

A field experiment was conducted to evaluate the efficacy of selected insecticides for the control of major pests of cowpea aphids and leafhoppers. Cowpea variety KM-5 was sown on 17th August, 2016 in the experimental plots. Each plot measured 3.6 × 3.0 m with the spacing of 45 × 10 cm. There were seven treatments replicated thrice and laid out in randomized complete block design.

Treatments	Dosage
T1 Buprofezin 25 SC @ 250 g a.i./ha	1 ml/l
T2 Profenophos 50 EC @ 500 g a.i./ha	2 ml/l
T3 Azadirachtin 300 ppm @ 0.03%	5 ml/l
T4 Imidacloprid 17.8 SL @ 25 g a.i./ha	0.3 ml/l
T5 Quinalphos 25 EC @ 250 g a.i./ha	2 ml/l
T6 Chlorpyrifos 20 EC @ 200 g a.i./ha	2 ml/l
T7 Control -	

Insecticides were applied twice, one at pre flowering (45 DAS) and another at pod formation stage (70 DAS). High volume sprayer was used to apply the insecticides. The efficacy of different insecticides in protecting the crop from different pests in a treated crop was assessed based on the population of different pests, pod damage and seed damage.

**Pest population:** It was estimated by observing five plants at random from each treatment and the population a day prior to insecticide application and one, three, five and seven days after

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each application. Percent protection against each pest was calculated by considering the observations recorded at seven days after second spray.

**Statistical analysis:** For statical analysis of data SPSS software and WASP softwares were used and for average data, square root transformation, for percentage data arc sine transformation were used.

**Incidence of cowpea aphids** 1<sup>st</sup> table It is evident from the table that the first appearance of aphids was noticed on August 4th week (34th MW) i.e. 1.55 aphids per 3 leaves, during this period average maximum and minimum temperature, morning and evening relative humidity and rainfall mm respectively. There after, the population started declining up to last week of September, 2016 (41th MW) and it was lowest (0.00 aphids/3 leaves) during the crop period. During this period average maximum and minimum temperature, morning and evening relative humidity and rainfall recorded were 29.3 °C, 19 °C, 94 percent, 51 percent and 30.2 mm respectively.

Again increasing trend of aphid population was noticed from 43rd MW (2.08 aphids/ 3 leaves) and reached its peak (18.38 aphids/ 3 leaves) during harvesting of crop

### Efficacy of selected insecticides against cowpea pests

#### Population of Aphids, *Aphis craccivora* (per 3 leaves)

##### First spray

A day before treatment uniform distribution of the pest was observed. One day after spray least population of aphids was observed in the treatment with chlorpyrifos 20 EC @ 2 ml/l (1.07 aphids/3 leaves), which was on par with quinalphos 25 EC @ 2ml/l (1.17 aphids/3leaves), Imidaclorpid 17.8 SL @ 0.3 ml/l (1.20 aphids/3 leaves) and profenophos 50 EC @ 2 ml/l (1.33 aphids/3 leaves). Whereas in untreated check highest population (40.25 aphids/3 leaves) was recorded (Table 1). Similar trends were observed at three and five days after spraying.

At seven days after spray no population of aphids was observed in the treatments with imidaclorpid 17.8 SL @ 0.3ml/l, quinalphos 25 EC @ 2 ml/l, chlorpyrifos 20 EC @ 2 ml/l with 100 percent protection, which was on par with profenophos 50 EC @ 2 ml/l (0.07 aphids/ 3 leaves) with 99.83 percent protection followed by azadirachtin 0.03% @ 5 ml/l (5.91aphids/3 leaves) with 85.67 percent protection. Whereas in untreated check highest population (41.25 aphids/ 3 leaves) was recorded Table1

**Table 1:** Efficacy of selected insecticides against Aphids *Aphis craccivora* at vegetative stage during, Kharif 2016 (first spray)

Sl. No	Treatments	Populationof <i>Aphis craccivora</i> per 3 leavesat					Percent protection
		Pre treatment	1DAT	3 DAT	5 DAT	7 DAT	
1	Buprofezin 25 SC @ 1 ml/l	37.43 (6.18)	23.38b (4.93)	20.11b (4.59)	19.17b (4.48)	10.63b (3.41)	74.23
2	Profenophos 50 EC @ 2 ml/l	41.33 (6.50)	1.33c (1.52)	0.54e (1.22)	0.07d (1.03)	0.07d (1.03)	99.83
3	Azadirachtin 300 ppm@ 5 ml/l	43.30 (5.60)	17.43b (4.23)	12.94c (3.73)	9.15c (3.11)	5.91c (2.57)	85.67
4	Imidaclorpid 17.8 SL@ 0.3 ml/l	41.50 (6.51)	1.20c (1.48)	0.41e (1.19)	0.17d (1.08)	0.00d (1.00)	100
5	Quinalphos 25 EC @ 2 ml/l	39.77 (6.13)	1.17c (1.45)	0.55e (1.22)	0.03d (1.02)	0.00d (1.00)	100
6	Chlorpyrifos 20 EC @ 2 ml/l	39.72 (6.38)	1.07c (1.43)	0.43d (1.78)	0.00d (1.00)	0.00d (1.00)	100
7	Control	44.27 (6.70)	40.25a (6.42)	41.19a (6.48)	39.92a (6.39)	41.25a (6.48)	-
Ftest		NS	91.25	248.90	97.43	82.10	-
SEM±		-	0.22	0.14	0.22	0.19	-
CD(p=0.05)		-	0.68	0.43	0.68	0.58	-
CV(%)		-	12.38	8.44	14.65	14.57	-

**Note:** Figures in the parentheses are  $\sqrt{x}+0.5$  transformed values. In vertical columns, means followed by similar alphabets are not different statistically (0.05) as per DMRT

#### Population of Aphids, *Aphis craccivora* (around 1inch pod)

**Second spray:** A day before treatment uniform distribution of the pest was observed. One day after spray least population of aphids was observed in the treatments with chlorpyrifos 20 EC @ 2 ml/l (0.30/inch pod length) and quinalphos 25 EC @ 2 ml/l (0.30/inch pod length), which was on par with profenophos 50 EC @ 2 ml/l (0.40/inch pod length) and imidaclorpid 17.8 SL @ 0.3 ml/l (1.27/ inch pod length), followed by azadirachtin 0.03% @ 5 ml/l (9.50/inch pod length). Whereas in untreated check highest population (39.93/ inch pod length) was recorded (Table 16). Similar trends were observed at three and five days after spraying. At seven days after spray no population of aphids was observed in the treatments with imidaclorpid 17.8 SL @ 0.3 ml/l, quinalphos 25 EC @ 2 ml/l, chlorpyrifos 20 EC @ 2 ml/l with 100 percent protection, which was on par with profenophos 50 EC @ 2ml/l (0.8 aphids/ inch pod length) with 97.60

percent protection followed by azadirachtin 0.03% @ 5 ml/l (2.4 aphids/ inch pod length) with 92.60 percent protection. Whereas in untreated check highest population (32.8 aphids/ inch pod length) was recorded

#### Population of Aphids, *Aphis craccivora* (per 3 leaves)

All the selected insecticides were effective in reducing the aphids over untreated control. However, chlorpyrifos 20 EC @ 2 ml/l, quinalphos 25 EC @ 2 ml/l, imidaclorpid 17.8 SL@ 0.3 ml/l proved to be superior against aphids which were followed by profenophos 50 EC @ 2 ml/l and azadirachtin 300 ppm @ 5 ml/l. Previous findings by Jena *et al.* (1997) showed that application of dichlorvos 76 EC @ 0.5 kg a.i./ha twice at 35 and 50 days after sowing significantly reduced the aphid infestation over control in groundnut 5.3.3 Pod and seed damage Among various treatments chlorpyrifos 20 EC @ 2 ml/l, profenophos 50 EC @ 2 ml/l followed by quinalphos 25 EC @ 2 ml/l and imidaclorpid 17.8 SL @ 0.3 ml/l showed

less percent pod and seed damage. These findings are in agreement with the reports of Ganapathy and Durairaj (2000) that cumulative pod borer damage caused by *M. vitrata* in blackgram was the lowest in quinalphos (0.04%) followed by profenophos (0.1%), alanycarb (0.06%), endosulfan (0.07%), dimethoate (0.03%) and acephate (0.075%). Rao (2000) reported that profenophos @ 0.01% alone and also in

combination with lufenuron (0.05%) (profenophos 0.05% + lufenuron 0.005%) proved effective in controlling *M. vitrata* in pigeonpea by recording larval population reduction of 42.96 and 49.35 percent, respectively. 5.3.4 Grain yield Grain yield recorded in various treatments during the present investigation. The highest B: C ratio was obtained in the treatment profenophos 50 EC @ 2 ml/l, (B :C ratio

**Table 2:** Efficacy of selected insecticides against aphids *Aphis craccivora* at poding stage around 1 inch pod length during, Kharif 2016 (Second spray)

Sl. No	Treatments	Population of <i>Aphis craccivora</i> per 1 inch around pod at					Percent protection
		Pre treatment	1 DAT	3 DAT	5 DAT	7 DAT	
1	Buprofezin 25 SC @ 1ml/l	37.93 (6.15)	16.40b (4.09)	10.77b (3.35)	6.13b (2.56)	3.7b (2.03)	88.72
2	Profenophos 50 EC @ 2 ml/l	34.67 (5.87)	0.40d (0.91)	0.30c (0.87)	0.63c (1.02)	0.8cd (1.11)	97.60
3	Azadirachtin 300 ppm @ 5 ml/l	49.30 (6.95)	9.50c (3.12)	7.80b (2.78)	5.87b (2.44)	2.4bc (1.62)	92.70
4	Imidacloprid 17.8 SL @ 0.3ml/l	39.17 (6.12)	1.23d (1.18)	0.40c (0.71)	0.00c (0.71)	0.0d (0.71)	100
5	Quinalphos 25 EC @ 2 ml/l	36.47 (6.02)	0.30d (0.88)	0.07c (0.71)	0.00c (0.71)	0.0d (0.71)	100
6	Chlorpyrifos 20 EC @ 2 ml/l	36.40 (6.03)	0.30d (0.89)	0.09c (0.75)	0.00c (0.71)	0.0d (0.71)	100
7	Control	48.60 (6.91)	39.93a (6.35)	35.90a (6.04)	33.85a (5.86)	32.8a (5.77)	-
F test		NS	61.09*	73.88*	80.27*	95.10*	-
SE m <sup>+</sup>		-	0.28	0.24	0.21	0.19	-
CD (p=0.05)		-	0.84	0.73	0.65	0.58	-
CV (%)		-	18.96	18.83	18.25	17.91	-

#### Population of leafhopper, *Emposca kerri*

The non-significant difference among the various treatments prior to application indicated the uniform distribution of the pest in the experimental area (Table 3). One day after spray, least population of leafhoppers was observed in the treatment of imidacloprid 17.8 SL @ 0.30 ml/l (1.23 leafhoppers/3 leaves) which was on par with profenophos 50 EC @ 2 ml/l (1.37 leafhoppers plant) followed by buprofezin 25 SC @ 1.0 ml/l (1.60 leafhoppers/3 leaves). Whereas in untreated check highest population (5.20 leafhoppers/3 leaves) was recorded. Similar trend was observed at three and five days after spray. At seven days after spray lowest population of leafhoppers was observed in the treatment with imidacloprid 17.8 SL @ 0.30 ml/l (0.23 leafhoppers/3 leaves) with the protection of 95.66 percent which was on par with profenophos 50 EC @ 2 ml/ (0.40 leafhoppers/3 leaves) with protection of 92.45 percent which was followed by buprofezin 25 SC @ 1.0 ml/l (0.60 leafhoppers/3 leaves) with 88.68 percent protection. Whereas, chlorpyrifos 20 EC @ 2 ml/l (0.80 leafhoppers/3 leaves) protection was 84.90 percent, quinolphos 25 EC @ 2ml/l (0.97 leafhoppers/3 leaves) with the protection of 81.69 percent. Least percent protection was observed in the treatment azadirachtin 0.03% @ 5 ml/l (81.13%). Whereas in untreated check highest population (5.30 leafhoppers/ 3 leaves) was recorded. Buprofezin 25 SC @ 1.0 ml/l (0.60 leafhoppers/3 leaves) with 88.68 percent protection. Whereas, chlorpyrifos 20 EC @ 2 ml/l (0.80 leafhoppers/3 leaves) protection was 84.90 percent, quinolphos 25 EC @ 2ml/l (0.97 leafhoppers/3 leaves) with the protection of 81.69 percent. Least percent protection was observed in the treatment azadirachtin 0.03% @ 5 ml/l (81.13%). Whereas in untreated check highest population (5.30 leafhoppers/ 3 leaves) was recorded. 4.3.3.2 Second spray The non-significant difference among the various treatments prior to

application indicated the uniform distribution of the pest in the experimental area (Table 18). One day after spray, least population of leafhoppers was observed in the treatment of imidacloprid 17.8 SL @ 0.30 ml/l (0.13 leafhoppers/3 leaves) which was on par with profenophos 50 EC @ 2 ml/l (0.30 leafhoppers plant) followed by quinolphos 25 EC @ 2 ml/l (0.57 leafhoppers/3 leaves). Whereas in untreated check highest population (2.63 leafhoppers/3 leaves) was recorded

#### Second spray

The non-significant difference among the various treatments prior to application indicated the uniform distribution of the pest in the experimental area (Table 4). One day after spray, least population of leafhoppers was observed in the treatment of imidacloprid 17.8 SL @ 0.30 ml/l (0.13 leafhoppers/3 leaves) which was on par with profenophos 50 EC @ 2 ml/l (0.30 leafhoppers plant) followed by quinolphos 25 EC @ 2 ml/l (0.57 leafhoppers/3 leaves). Whereas in untreated check highest population (2.63 leafhoppers/3 leaves) was recorded. Similar trend was observed at three and five days after spray. At seven days after spray no population of leafhoppers was observed in the treatment with imidacloprid 17.8 SL @ 0.30 ml/l (0.00 leafhoppers/3 leaves) and quinolphos 25 EC @ 2 ml/l with the protection of 100 percent, which was on par with profenophos 50 EC @ 2 ml/ (0.13 leafhoppers/3 leaves) with protection of 94.60 percent which was followed by, buprofezin 25 SC @ 1.0 ml/l (0.27 leafhoppers/3 leaves) 84.90 percent protection. Whereas, chlorpyrifos 20 EC @ 2 ml/l (0.33 leafhoppers/3 leaves) with 86.25 percent protection. Least percent protection was observed in the treatment azadirachtin 0.03% @ 5 ml/l (67.92%). Whereas in untreated check highest population (2.40 leafhoppers/3 leaves) was recorded.

**Table 3:** Efficacy of selected insecticides against leafhopper, *Empoasca kerri* at vegetative stage during, Kharif 2016 (First spray)

Sl. No	Treatments	Population of <i>Empoasca kerri</i> per 3 leaves at					Percent protection
		Pre treatment	1 DAT	3 DAT	5 DAT	7 DAT	
1	Buprofezin 25 SC @ 1 ml/l	5.37 (2.32)	1.60bcd (1.26)	0.77d (0.87)	0.70bc (0.83)	0.60cd (0.77)	88.68
2	Profenophos 50 EC @ 2 ml/l	5.33 (2.31)	1.37cd (1.17)	0.80d (0.89)	0.40c (0.62)	0.40de (0.63)	92.45
3	Azadirachtin 300 ppm @ 5 ml/l	5.83 (2.42)	1.87b (1.37)	1.83b (1.35)	1.03b (1.00)	1.00b (0.99)	81.13
4	Imidacloprid 17.8 SL @ 0.3 ml/l	5.63 (2.37)	1.23d (1.11)	0.67d (0.82)	0.43c (0.65)	0.23e (0.48)	95.66
5	Quinalphos 25 EC @ 2ml/l	5.33 (2.31)	1.67bc (1.28)	1.33c (1.15)	0.97b (0.98)	0.97bc (0.97)	81.69
6	Chlorpyrifos 20 EC @ 2 ml/l	4.93 (2.22)	1.67bc (1.29)	1.10c (1.05)	0.63bc (0.79)	0.80bc (0.89)	84.90
7	Control	5.3 (2.30)	5.20a (2.28)	5.17a (2.27)	5.27a (2.29)	5.30a (2.30)	-
F test		NS	49.34*	121.62*	47.58*	78.74*	-
SE m±		-	0.02	0.02	0.03	0.03	-
CD (p=0.05)		-	0.17	0.14	0.26	0.21	-
CV		-	7.08	6.65	14.17	11.66	-

**Table 4:** Efficacy of selected insecticides against leafhopper, *Empoasca kerri* at poding stage during, Kharif 2016 (Second spray)

Sl. No	Treatments	Population of <i>Empoasca kerri</i> per 3 leaves at					Percent protection
		Pre treatment	1 DAT	3 DAT	5 DAT	7 DAT	
1	Buprofezin 25 SC @ 1 ml/l	3.47 (1.85)	0.93b (1.19)	0.43b (0.95)	0.37c (0.89)	0.27c (0.87)	88.75
2	Profenophos 50 EC @ 2ml/l	4.03 (2.01)	0.30c (0.89)	0.23bc (0.86)	0.13c (0.79)	0.13cd (0.79)	94.60
3	Azadirachtin 300 ppm @ 5 ml/l	2.60 (1.61)	1.73a (1.49)	1.73a (1.49)	1.03b (1.23)	0.77b (1.12)	67.92
4	Imidacloprid 17.8 SL @ 0.3 ml/l	2.93 (1.70)	0.13c (0.79)	0.03c (0.73)	0.07c (0.75)	0.00d (0.71)	100
5	Quinalphos 25 EC @ 2 ml/l	2.87 (1.69)	0.57bc (1.02)	0.13bc (0.80)	0.17c (0.81)	0.00d (0.71)	100
6	Chlorpyrifos 20 EC @ 2 ml/l	3.27 (1.81)	0.67bc (1.06)	0.43b (0.96)	0.43bc (0.96)	0.33c (0.91)	86.25
7	Control	3.50 (1.85)	2.63a (1.77)	2.30a (1.67)	2.30a (1.67)	2.40a (1.70)	-
F test		NS	14.08*	34.25*	10.32*	69.43*	-
SE m±		-	0.03	0.02	0.04	0.02	-
CD (p=0.05)		-	0.28	0.19	0.32	0.13	-
CV		-	13.61	10.15	17.53	7.48	-

### Conclusion

Foliar application of imidacloprid 17.8 SL @ 0.30 ml/l (95.66, 100), profenophos 50 EC @ 2 ml/l (92.45, 99.83), chlorpyrifos 20 EC @ 2 ml/l (84.90, 100) and quinalphos 25 EC @ 2 ml/l (81.69, 100) recorded highest protection against leafhopper and aphids respectively.

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