

Research article

Evaluation of Cyprofen 220 UL (cypermethrin 20g/L / profenfos 200g/L) against the African Bollworm, *Helicoverpa armigera* Hub. (Lepidoptera:Noctuidae) on Sunflower under Gedarif rainfed conditions

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Abstract

The experiment was conducted during 2009/2010, 2010/2011 and 2011/2012 seasons at Northern and Southern areas at Gedarif State to evaluate Cyprofen 220 UL (cypermethrin 20g/L / profenfos 200g/L) against the African bollworm, *Helicoverpa armigera* Hub. The doses 0.94, 0.75 and 0.56 l/fed. were tested. Variety Hysun 33 was sown throughout three successive seasons. The African bollworm population and yield were significantly different between the treatments. Cyprofen 220 UL at the rate of 0.75 l/fed. Recorded an excellent performance against the larvae and gave higher yield than all other treatments and the untreated control (Tables 1,2,3,4,5 and 6). Residue analysis of seeds obtained after crop harvest was done at Pesticides Residue Analysis Laboratory and no residues of cypermethrin or profenofos were detected in the all treatments. **Copyright © WJSRR, all rights reserved.**

Keywords: Sunflower, African bollworm, *Helicoverpa armigera*, Cyprofen, damage, Control.

Introduction

Sunflower, *Helianthus annuus* L. is one of the four important crops grown for edible oil. Its oil is characterized by lower saturated fats than most vegetables oils. The crop is well adapted to wide ranges of environmental conditions. In the Sudan, the crop is grown mainly in the rainfed sector as a summer crop and under irrigation as a winter crop (Ahmed *et. al.* 2010). Sunflowers are attacked by a number of insect pests at various stages of crop development. The African bollworm, *Helicoverpa armigera* is a pest of a major importance in most areas where it occurs. The African bollworm has been reported on 35 crops and 25 wild host plants in eastern and southern Africa (Greathead and Girling 1989). The severity of the damage varies between crops, regions and locations, and between seasons. In eastern Africa, attacked crops include cotton, sunflower, French beans, dry beans, okra, peas, legumes, maize, sorghum, tobacco and tomato. Among these crops, the African bollworm is considered a key pest of cotton, Sunflower, chickpea, pigeon pea and tomato (Sithanantham *et al.*, 2002). Its damages a wide variety of food, fiber, oilseed, fodder and horticultural crops. It is a major pest due to its high mobility, its ability to feed on many species of plants, its high fecundity and reproductive rate. Caterpillars of the African bollworm, *H. armigera* feeds on leaves, buds, growing points, flowers and fruit. Leaf damage reduces leaf area, which can slow plant growth (Suliman, 2009). Feeding on flowers and discs causes the main damage. Flower feeding can prevent seeds formation. Caterpillars usually bore clean, circular holes through discs. Excrements (faeces / waste) of feeding caterpillars are placed away from damaged plant parts. The holes serve as entry points for secondary infection by diseases causing fruit decay

The objective of this study was to evaluate the efficacy of Cyprofen 220 UL (cypermethrin 20 g/l / profenfos 220 g/l) against the African bollworm, *H. armigera* under rainfed conditions.

Materials and Methods

The experiment was conducted during 2009/2010, 2010/2011 and 2011/2012 seasons at Northern and Southern areas of Gedarif State. The variety Hysun 33 was sown on 21/7/2009, 25/7/2010 and 7/8/2011 at the Northern area, and on 15/7/2009-19/7/2010 and 5/8/2011 at Southern area. Plot size was 6 rows × 7 m. long (42 m²). The treatments were arranged in a randomized complete block design (RCBD) with four replications. The plants were thinned to one plant/hole, two weeks after emergence. Hand weeding was carried-out twice. Regular surveys were carried out when the crop recovered the flowering stage. Hundred plants were randomly chosen from each plot and the number of the African bollworm, *H. armigera* larvae were recorded, (pre-spraying and also post-spraying). One spray was done during each of season. ULVA+ (ULVA Plus Micronair) was used for spraying the treatments. Data was analyzed after transformation, when, necessary, by using the software MSTAT program. ANOVA was used for significant differences among treatments and Duncan's Multiple Range Test (DMRT) for mean separation.

Treatments:

- 1- Cyprofen 220 UL at the rate of 0.94 l/fed.
- 2- Cyprofen 220 UL at the rate of 0.75 l/fed.

- 3- Cyprofen 220 UL at the rate of 0.56 l/fed.
- 4- Untreated (Control).

Results and Discussions

Results obtained during 2009/2010 season are presented in Table 1 and 2 show differential response between treatments reducing larvae population during the season at different locations e.g. Doka and University Farm. Cyprofen at the rate of 0.75 l/fed. and at 0.94 l/fed. gave good performance against the African bollworm, *H. armigera* larvae at both sites, compared to the untreated control. The highest yield was recorded by the rate of 0.75 l/fed. during 2009/2010 season at both sites viz., 707.0 and 712.0 Kg/fed. for southern and Northern area, respectively. However, low yields were recorded by the untreated Control (413.5 and 401.2 kg/fed.) in the Southern and Northern area , respectively.

Results recorded in Tables 3 and 4 revealed significant differences between treatments. Cyprofen at the rate of 0.75 l/fed. recorded an excellent performance against the African bollworm, *H. armigera* larvae compared to the untreated control. Yield obtained during 2010/2011 season showed significant differences between the treatments. The highest yield was obtained by the rate of 0.75 l/fed. (881.8 and 618.5 kg/fed.) at the southern and northern area, respectively, followed by the rate of 0.94 l/fed. (644.3 and 537.0 kg/fed.) at the Southern and Northern area, respectively. Moreover, the lowest yield recorded by the untreated control viz., 435.3 and 387.8 at the (Southern and Northern area), respectively.

Data presented in the Tables 5 and 6 for 2011/2012 season showed significant differences between the treatments on larvae population at different sites . Treatments Cyprofen at rate of 0.94 and 0.75 were reduced the population of the African bollworm larvae throughout the season as compared to the untreated control. Cyprofen at the rate of 0.75 l/fed. was recorded the highest yield (615.3 and 522.7 kg/fed.), followed the rate of 0.94 l/fed.) 528.5 and 426.6 kg/fed. , followed by Cyprofen at rate of 0.56 l/fed. (490.6 and 410.3 kg/fed.), for both sites , respectively. However, the lowest yield was recorded by the untreated control at both sites (320.3 and 232.5 kg/fed.).

According to the TLC results the Rf value of cypermethrin standard was 0.66 and 0.73 (the two isomers) and profenofos standard was 0.81, and the minimum detectable amount was 0.12 μ g for both standards. The recovery of the method was 86 % and 88% for the two insecticides respectively.

After about 55 days form treatment and harvesting time no residues of cypermethrin or profenofos were detected in the samples. Therefore, it is concluded that the usage of Cyprofen 220 UL (cypermethrin / profenofos) is safe if used at the recommended dosage rate for the control of the African bollworm, *Helioverpa armigera* Hub in sunflower.

Conclusion

Cyprofen at 0.75 l/fed. Showed proved very good performance against the larvae of the African bollworm throughout the three seasons and gave significantly higher yield than all other treatments.

Recommendations

Based on the results mentioned above I recommend Cyprofen 220 UL (cypermethrin 20g/L /profenos 200 g/L) at the rate of 0.75 l/fed. (15/ 150 g.a.i/fed.s) for the control of the African bollworm, *Helicoverpa armigera* Hub. on sunflower on sunflower crop in the Sudan.

References

- [1] Ahmed, E.A, Abdelgadir,H. and Dawoud,D.A (2010). Evaluation of Pendi Might 500 EC and Prowl Aqua 455 CS (pendimethalin) for weed control in sunflower.The 82nd. Meetimg of the National Pests and Diseases Committee, June,2010.
- [2] Greathead, D.J. and Girling, D. J. (1989). Distribution and economic importance of *Heliothis* and of their natural enemies and host plants in southern and eastern Africa. In King, E. C. and Jackson, R. D. (eds) Proceedings of the Workshop on Biological Control of *Heliothis*: Increasing the Effectiveness of Natural Enemies. November 11-15 1985. New Delhi, India. Far Eastern Regional Research Office, United States Department of Agriculture. New Delhi, India. pp 329-345.
- [3] Sithanantham, S., Baumgartner, J. and Matoka, C. (2002). Ecosystem Approach for Management of *Helicoverpa armiguera* in Eastern Africa. In African Bollworm Management in Ethiopia. Status and needs. Proceedings of the National Workshop held at the Plant Protection Research Centre Ambo, Ethiopia. April 2002. pp 129-134.
- [4] Suliman, E. H. (2009). Susceptibility of Sunflower to major insect pests under Gedarif Rainfed conditions. Annual Report 2008/2009, Agricultural Research Corporation, Gedarif Research Station, Sudan

Tables:

Table (1): Effects of Cyprofen on the population density of the African bollworm, *H. armigera* larvae during 2009/2010 Season at Southern area (Doka area,)

Treatment	Pre-spraying count	Post-Spraying count			Yield Kg/fed
		1 st .	2 nd .	3 rd .	
1-Cyprofen at 0.94 l/fed	(8.5) 13.3	(0.5) 1.3 a	(0.5) 1.3 a	(0.0) 0.5 a	705.1 b
2-Cyprofen at 0.75 l/fed.	(7.5) 11.8	(0.2) 0.8 a	(0.1) 0.7 a	(0.0) 0.5 a	787.0 d
3-Cyprofen at 0.56 l/fed.	(8.1) 12.7	(2.2) 3.8 b	(2.8) 4.7 b	(2.5) 4.3 b	602.8 c
Untreated (Control)	(7.0) 11.0	(8.3) 12.9 c	(7.6) 11.9 c	(6.8) 10.7 c	413.5 a
S.E _±	0.80	0.60	0.71	0.70	17.5
C.V.%	10.8	24.0	35.5	30.4	12.8

- Mean in the same column having the same letter(s) were not significantly different at 5% level according to Duncan's Multiple Range Test.
- Actual Data is between parentheses

Table (2): Effects of Cyprofen on the population density of the African bollworm, *H. armigera* larvae during 2009/2010 Season at Northern area (University Farm)

Treatment	Pre-spraying count	Post-Spraying count			Yield Kg/fed
		1 st .	2 nd .	3 rd .	
1-Cyprofen at 0.94 l/fed	(5.2) 8.3	(1.5) 2.8 a	(0.5) 1.3 a	(0.0) 0.5 a	619.3 b
2-Cyprofen at 0.75 l/fed.	(7.3) 11.5	(1.0) 2 a	(0.0) 0.5 a	(0.0) 0.5 a	712.5 c
3-Cyprofen at 0.56 l/fed.	(6.1) 9.7	(2.8) 4.7 b	(2.3) 3.9 b	(2.5) 4.3 b	580.6 b
Untreated (Control)	(7.0) 11	(7.6) 11.9 c	(5.8) 9.2 c	(6.9) 10.9 c	401.2 a
S.E _±	0.21	0.61	0.5	0.7	28.2
C.V.%	3.2	21.0	27.8	36.8	14.9

- Mean in the same column having the same letter(s) were not significantly different at 5% level according to Duncan's Multiple Range Test.
- Actual Data is between parentheses

Table (3): Effects of Cyprofen on the population density of the African bollworm, *H. armigera* larvae during 2010/2011 season at Southern area (Doka area)

Treatment	Pre-spraying count	Post-Spraying count			Yield Kg/fed
		1 st .	2 nd .	3 rd .	
1-Cyprofen at 0.94 l/fed	(29.7) 45.1	(2.0) 3.5 a	(0.75) 1.6 a	(0.0) 0.5 a	644.3 b
2-Cyprofen at 0.75 l/fed.	(24.1) 36.7	(1.2) 2.3 a	(0.5) 1.3 a	(0.0) 0.5 a	881.8 c
3-Cyprofen at 0.56 l/fed.	(21.5) 32.8	(4.5) 7.3 b	(3.8) 6.2 b	(3.5) 5.8 b	620.7 b
Untreated (Control)	(26.2) 39.8	(24.1)36.7c	(25.0) 38 c	(24.6)37.4 c	435.3 a
S.E \pm	0.75	0.65	0.64	0.56	19.8
C.V.%	2.9	8.6	8.8	8.23	13.1

- Mean in the same column having the same letter(s) were not significantly different at 5% level according to Duncan's Multiple Range Test.
- Actual Data is between parentheses

Table (4): Effects of Cyprofen on the population density of the African bollworm, *H. armigera* larvae and yield during 2010/2011Season at Northern area (University Farm)

Treatment	Pre-spraying count	Post-Spraying count			Yield Kg/fed
		1 st .	2 nd .	3 rd .	
1-Cyprofen at 0.94 l/fed	(17.6) 26.9	(1.8) 3.2 a	(1.0) 2 a	(2.0) 3.5 ab	537.0 b
2-Cyprofen at 0.75 l/fed.	(19.2) 29.3	(1.5) 2.8 a	(0.8) 2.1 a	(1.5) 2.8 a	618.5 c
3-Cyprofen at 0.56 l/fed.	(15.5) 23.8	(4.5) 7.3 b	(3.5) 5.8 b	(3.8) 6.2 b	513.2 b
Untreated (Control)	(18.1) 27.7	(17.6)26.9 c	(15.5)23.8 c	(14.3)21.9 c	387.8 a
S.E \pm	0.34	0.81	0.44	0.70	10.1
C.V.%	11.9	14.0	9.2	13.2	12.7

- Mean in the same column having the same letter(s) were not significantly different at 5% level according to Duncan's Multiple Range Test.
- Actual Data is between parentheses

Table (5): Effects of Cyprofen on the population density of the African bollworm, *H. armigera* larvae and yield during 2011/2012 season at Southern area (Doka area)

Treatment	Pre-spraying count	Post-Spraying count			Yield Kg/fed
		1st.	2nd.	3rd.	
1-Cyprofen at 0.94 l/fed	(12.6) 19.4	(1.7) 3.1 a	(0.75) 1.6 a	(0.0) 0.5 a	528.5 b
2-Cyprofen at 0.75 l/fed.	(15.2) 23.3	(1.0) 2 a	(0.64) 1.5 a	(0.0) 0.5 a	615.3 c
3-Cyprofen at 0.56 l/fed.	(11.6) 17.9	(4.6) 7.4 b	(4.1) 6.7 a	(3.6) 5.9 b	490.6 b
Untreated (Control)	(12.8) 19.7	(11.7) 18.1 c	(12.0) 18.5 b	(10.5) 16.3 c	320.3 a
S.E _±	0.33	0.9	1.2	1.1	12.9
C.V.%	5.4	20.1	28.5	33.7	16.2

- Mean in the same column having the same letter(s) were not significantly different at 5% level according to Duncan's Multiple Range Test.
- Actual Data is between parentheses

Table (6): Effects of Cyprofen on the population density of the African bollworm, *H. armigera* larvae and on yield during 2011/2012 season at Northern area (University Farm)

Treatment	Pre-spraying count	Post-Spraying count			Yield Kg/fed
		1st.	2nd.	3rd.	
1-Cyprofen at 0.94 l/fed	(13.6) 20.9	(1.5) 2.8 a	(0.0) 0.5 a	(0.0) 0.5 a	426.6 b
2-Cyprofen at 0.75 l/fed.	(11.5) 17.75	(1.2) 2.3 a	(0.0) 0.5 a	(0.0) 0.5 a	522.7 c
3-Cyprofen at 0.56 l/fed.	(10.1) 15.65	(4.5) 7.3 b	(3.7) 6.1b	(3.2) 5.3 b	410.3 b
Untreated (Control)	(11.8) 18.2	(10.5) 16.3 c	(11.3) 17.5 c	(9.7) 15.1 c	232.5 a
S.E _±	0.31	0.48	0.58	0.49	12.85
C.V.%	12.6	11.8	16.6	17.2	14.23

- Mean in the same column having the same letter(s) were not significantly different at 5% level according to Duncan's Multiple Range Test.
- Actual Data is between parentheses