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Use of Pheromone Lures for the Management of Red hairy Caterpillar *Amsacta Albistriga* in Rainfed Groundnut

Prasanna Lakshmi Ravuri*[1], Sahaja Deva[2], P Murali Krishna[3], M K Jyosthna[4] and K Devaki[5]

Regional Agricultural Research Station, Tirupati 517502
Acharya N G Ranga Agricultural University, Guntur, Andhra Pradesh

ABSTRACT

Red hairy caterpillar (*Amsacta albistriga)* is a major pest in *kharif* groundnut causing 25-100 per cent damage in endemic villages in Chittoor and YSR Kadapa districts of Andhra Pradesh. Pheromone lures, which is a novel pest control method, were not available for this pest till 2016. The Department of Entomology, Regional Agricultural Research Station, Tirupati under Acharya N G Ranga Agricultural University, Guntur in collaboration with CSIR-IICT, Hyderabad developed pheromone lures and these lures were tested by Krishi Vigyan Kendra, Kalikiri in endemic villages of the pest during *kharif,* 2018 and *kharif,* 2019. Field evaluation during *kharif,* 2018 revealed that silica septa lure was effective over plastic septa lure in attracting male moths of Red hairy caterpillar. Silica septa lures were evaluated against solar light traps during *kharif,* 2019. Pheromone traps were superior over solar light trap which attracted more number of male moths. During *kharif*, 2018 adult catches were high during 1st week of August and 1st week of September whereas during *kharif,* 2019 catches were high during the last week of July, 2019 and thereafter, catches gradually declined. Larval population reached economic threshold level during *kharif*, 2019 and poison bait was applied to manage the pest.

Key Words: Groundnut, Light, Management, Pheromone lures, Red hairy caterpillar, Trap.

INTRODUCTION

Red hairy caterpillar (*Amsacta albistriga)* is a polyphagous pest feeding on variety of field crops causing yield losses up to 25-100 per cent (Reddy *et al,* 2003). The pest comes out from its winter hibernation during the months of May and June soon after receiving summer showers. The female adults lay eggs in mass of 800-1000 and their caterpillars feed voraciously on a variety of field crops especially on groundnut and enter pupal diapause during September/October months. They move in swarms from one field to another field by damaging the groundnut crop leaving only stems. Spraying of insecticides is not that much effective as the larvae have long hair all over its body and also move from one field to another in swarms. Hence, integrated pest management practices like growing of trap crops, egg mass collection, bonfires, trench formation around field and spraying of insecticides etc. are being recommended to control *Amsacta albistriga* in Groundnut. Pheromone lures based strategy is the emerging pest control method which was not available for this pest till 2016.

Sex pheromones are one of the major components of pest management strategies against a broad category of insects worldwide.

Corresponding Author's Email: r.prasannalakshmi@angrau.ac.in

1Assistant Professor (Entomology), S.V.Agricultural College, Tirupati 517502

2Scientist (Agronomy), Agricultural Research Station, Anantapur 515001

3Coordinator, District Agricultural Advisory and Transfer of Technology Centre, Utukur, Kadapa 516126

4Associate Professor (Pathology), S.V. Agricultural College, Tirupati 517502

5Senior Scientist (Entomology), Regional Agricultural Research Station, Tirupati 517502

Acharya N G Ranga Agricultural University, Guntur, Andhra Pradesh

Table 1. Comparison of adult male moth catches in silica and plastic septa during *Kharif,* 2018.

Time of visit	Total Adult catches		Rainfall (mm)
	Silica septa	Plastic septa	
26th standard week	6	2	5.6
27th standard week	5	1	18.9
28th standard week	9	2	16.5
29th standard week	15	1	21.2
30th standard week	0	0	12.5
31st standard week	11	2	39.4
32nd standard week	0	0	21.3
33rd standard week	0	0	22.9
34th standard week	0	0	20.6
Total	46	8	178.9
Mean	5.11	0.88	18.15
SD	5.62	0.92	10.76

A better understanding of the chemical ecology of many insects has led to the incorporation of behaviour-modifying compounds into existing IPM programmes (Pickett *et al*, 1997). Sex pheromone was first discovered by Butenandt in the silk worm (*Bombyx mori*) (David *et al*, 1985). Sex pheromones can be utilized as monitoring, mass trapping and mating disruption agents. Pheromone lure for the management of red hairy caterpillar was developed for the first time by the Department of Entomology of Regional Agricultural Research Station, Tirupati, Acharya N G Ranga Agricultural University in collaboration with CSIR-IICT, Hyderabad during the year 2016. Field evaluation of efficacy of pheromone lure against *Amsacta albistriga* was done by Krishi Vigyan Kendra, Kalikiri during two seasons in Red hairy caterpillar endemic villages to assess the performance of various types of pheromone lures in the management of the pest.

MATERIALS AND METHODS

The experiment was conducted during *kharif* 2018 and *kharif* 2019in endemic locations of Redhairy caterpillar. During kharif 2018, the pheromone lures with two types of septa *i.e.* silica septa and plastic septa were tested for their efficiency. During *kharif* 2019, silica septa lures which performed better during 2018 were compared for their efficacy against solar light traps. Endemic villages of Redhairy caterpillar were selected *i.e.* Talapula of Piler mandal and Nayakulavaripalli of Kalikiri mandal and pheromone traps were installed

Table 2. Correlation between pheromone trap catches of *A. albistriga* adults and rainfall

	Silica septa	Plastic septa	Rainfall
Silica septa	r =1	-	r=0.745 p=0.021
Plastic septa	-	r =1	r=0.198 p=0.034
Rainfall	r=0.745* p=0.021	r=0.198* p=0.034	r =1

*significant at 5% level

Table 3. Comparison of Larval population in demonstration plot and farmers' practice.

Time of visit	Number of larvae/sq.m	
	Demonstration plot	Farmers' practice
27th standard week	0.0	1.5
28th standard week	5.4	6.9
29th standard week	6.5	8.3
30th standard week	0.0	0.0
31st standard week	0.0	0.0
32nd standard week	0.0	0.0
33rd standard week	0.0	0.0
Mean	1.7	2.38
SD	2.921	3.626
't' value	3.9^{NS}	
'p' value	0.704	

at 6 farmers' fields with rainfed groundnut crop during first week of June, 2018.

T1: Pheromone traps @20 per ha

T2: Farmers practice (Spraying of insecticides)

Two types of lures *i.e.* silica septa and plastic septa were used in all the locations. Data on pheromone trap catches and larval population on groundnut crop were recorded at weekly intervals. Lures were changed at monthly interval in both places till crop harvest.

Kharif, 2019

Two endemic villages of Redhairy caterpillar on groundnut were selected *i.e.* Kottapeta of Piler

Table 4. Adult catches in pheromone traps and solar light trap

Standard week	Total Adult catches in traps		Weekly rainfall (mm)
	Pheromone traps	Solar light trap	
24th standard week	08	04	21.4
25th standard week	06	01	0.0
26th standard week	0	0	20.4
27th standard week	17	10	36.4
28th standard week	09	6	15.5
29th standard week	01	5	0.0
30th standard week	01	0	0.0
31st standard week	0	0	12.5
32nd standard week	0	0	15.5
33rd standard week	0	0	0.0
34th standard week	0	0	0.0
Total	39	26	121.7
Mean	3.25	2.1	10.14
SD	5.43	3.326	12.06

Table 5: Correlation between adult catches in traps and rainfall

	Pheromone traps	Solar light trap	Rainfall
Pheromone traps	r =1	r=0.885** p=0.00013	r= 0.698* p = 0.12
Solar light trap	r=0.885** p=0.00013	r =1	r = 0.632* p = 0.002
Rainfall	r= 0.698* p = 0.012	r = 0.632* p = 0.002	r =1

*Significant at 5% level

**significant at 1% level

mandal and Kuchamvaripalli of Kalikiri mandal in Chittoor district of Andhra Pradesh to evaluate performance of pheromone traps. Pheromone traps and solar light trap were installed in 3 locations at each village during1st week of June, 2019. Data on pheromone trap catches of male moths and larval population on groundnut crop were recorded at weekly interval. Lures were changed at monthly interval in all the locations.

T1: Pheromone traps @20 per hectare

T2: Solar light trap @ one per hectare

T3: Farmers practice (Spraying of insecticides/ poison baiting)

RESULTS AND DISCUSSION

The data (Table1) revealed that silica septa recorded more number of adult male moth catches than plastic septa. Adult catches were high during 1st week of August (29th standard week) and then population declined and again trap catches increased during 1st week of September, 2018 (31st standard week) and after that adult catches drastically reduced and by the end of second fortnight of September, 2018 the catches were not observed at any of the locations. In plastic septa very low adult catches were recorded during 1st week of August and 1st week of September only.

The data (Table 2) showed that there is significant correlation between weekly rainfall and adult catches in pheromone traps in both the silica septa and plastic septa. Further regression analysis was also carried out to assess the impact of rainfall.

The data (Table 3) showed that in demonstration plot, larval incidence started from 3rdweek of July @ 5.4 larvae per sq. m but damage was below ETL whereas in control, larval incidence was observed from 1st week of July, 2018 and continued up to July ending. After that, larval population was not observed in either demo or check plots. This may be attributed to unfavorable climatic conditions like temperature and relative humidity. Farrukh Baig *et al* (2015) reported that due to unfavorable conditions Red hairy caterpillar damage has not reached to EIL even though larvae are present.

The data (Table 4) revealed that adult catches started from 2nd week of June, 2019 (24th standard

Table 6. Regression analysis

	Kharif 2018		Kharif 2019	
	Silica septa	Plastic septa	Pheromone trap catches	Solar light trap catches
R^2	0.504	0.098	0.536	0.439
F value	1.132*	0.287	9.49*	6.645*

*Significant at 5% level

Table 7. Comparison of Larval population on groundnut crop in all the treatments

Time of visit	Number of larvae/sq.m		
	Pheromone traps	Solar light trap	Check
27th standard week	-	-	-
28th standard week	1.3	1.1	8.9
29th standard week	3.6	4.2	12.9
30th standard week	5.3	4.9	14.4
31st standard week	1.1	1.5	6.8
32nd standard week	0.0	0.0	1.9
33rd standard week	1.61	2.65	6.57
Mean	1.70	2.05	7.35
SD	2.07	5.27	5.79
't' value	2.13**	2.08	
'p' value	0.000	0.93	

** Significant at 1% level

week). Adult catches in pheromone traps were higher than solar light trap catches. Maximum number of catches were recorded during 1st week of July, 2019 (27th standard week) in both pheromone traps (17) and in solar light traps (10) coinciding with high rainfall *i.e.* 36.4mm during that week. Population gradually declined from 3rdweek of July and it was not recorded from 1st week of August (31st standard week) till the crop was harvested. Farrukh Baig *et al* (2015) reported that Red hairy caterpillar population was increased with increasing rainfall and temperature. Pheromones are species specific and are effective over larger area and hence more number of insects gets attracted to pheromone traps than light traps. Muhammad Arshad *et al* (2020) reported that pheromone traps recorded more number of adult catches of pink bollworm than light traps in cotton.

During *Kharif*, 2019 also significant correlation was observed between pheromone trap catches and rainfall**.** Solar light trap catches of adult moths were also significantly correlated with rainfall. There was a significant correlation between pheromone traps and light trap.

Regression analysis was carried out by taking rainfall as independent variable and trap catches as dependent variable. It was revealed that during *kharif,* 2018, influence of rainfall on silica septa catches was observed to be 50 per cent and during *kharif*,2019 also it was found to be 53.6 and 43.9 per cent with respect to pheromone trap and solar trap catches, respectively.

Larval population were observed from 2nd week of July, 2019 in both demonstration and check plots. Minimum of 1.3 larvae/sq.m was recorded in solar light trap catches whereas in check maximum of 8.9 larvae/sq.m were recorded. The larval population increased to 5.3, 4.9 and 14.4 per sq.m during 4th week of July, 2019 in pheromone traps installed plot, solar trap installed plot and check plot, respectively. Statistical analysis revealed that there is significant difference between use of pheromone traps and check with respect to larval population. Pheromone traps were found superior over solar trap in attracting male moths of Red hairy caterpillar.

As the larval population reached economic threshold level, farmers adopted poison baiting with

monocrotophos 36%SL during 1st week of August in demo and check plot and number of larvae per sq.m reduced to 1.1 and 6.8 in demonstration and check, respectively. In check plot, poison baiting was done twice to control the pest whereas in demonstration plots poison baiting was done only once.

The performance of pheromone lures is affected by various biotic and abiotic factors. Latheef *et al* (1991) reported that catches of corn earworm moths, *Helicoverpa zea* were affected by crop phenology, crop cover, moon light, pheromone release rate and moth behaviour. Heuskin *et al* (2011) reported that the effectiveness of pheromones in insect communication is affected by multiple factors including chemical nature, volatility, solubility and persistence in the environment.

CONCLUSION

Community adoption of pheromone lures in Red hairy caterpillar endemic areas soon after onset of monsoons reduces larval population along with other integrated pest management practices like growing of trap crops, poison baiting which is not only safe to environment but also reduces cost of cultivation and protect the crop.

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