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Monitoring of fall armyworm adult population through Pheromone trap catches

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Abstract
To study and monitor the adult population of Fall armyworm during *kharif*, 2021 throughout the entire season of Maize, pheromone traps were installed at farmers field's Chandragiri, Narayanavanam and ARS Perumalpalli. The highest trap catches in the entire season with respect to Chandragiri was noticed at thirty five days after sowing at V8 and V9 stages *viz.*, 81.49 moths / trap / week followed by trap catches in Narayanavanam which recorded 77.99 moths / trap / week at twenty eight days after sowing during V5, V6 and V7 stages. In ARS perumalpalli at twenty one days after sowing during V3 and V4 stages trap catches recorded 22.67 moths / trap / week. The maximum overall mean moth trap catches during *kharif*, 2021 (Table 1) was observed in Pheromone traps at Chandragiri (26.96 moths / trap / week) followed by Narayanavanam (21.94 moths / trap / week) which were statistically found to be at par with one another. Least mean moth trap catches were observed in ARS Perumalpalli (10.13 moths / trap / week) which differed statistically.

Keywords: Pheromone trap catches, fall armyworm, monitoring, *kharif* season

1. Introduction
Fall armyworm is an important pest of Maize, Sweet corn and many other crops. FAW adult moths lay their eggs in masses on the foliage of Sweet corn and other plants (Luginbill, 1928) [3]. Larvae move into the whorls of young corn plants and their feeding causes ragged holes in the foliage. The tassels of older plants also are attacked, but the most serious injury is caused by larvae infesting the ears of Sweet corn. This damage to the crops can be curtailed to certain extent through timely monitoring of fall armyworm adult population. To detect the arrival and estimate its abundance before economic injury occurs, a reliable, convenient and reasonably inexpensive method of monitoring FAW moth populations is needed. Utilization of pheromone traps to determine population dynamics of Fall armyworm was proposed by Knodel and Petzoldt (1995) [2] and Thomas (2008) [4] who found that use of pheromone traps is an excellent tool for monitoring pest populations and it also enhances the ability for early detection, establishing baseline data for action thresholds/decision support, mapping pest distribution, quarantine inspection. Cruz *et al.* (2010) [1] stated that utilizing pheromone traps is the best method for settling on the number of pesticide applications. This information allows growers, extension agents and others to plan and conduct scouting activities more efficiently and to make more precise pest management decisions. Hence a study was conducted to monitor the adult population of FAW to calculate the mean number of moth catches per trap.

2. Materials and Methods
The pheromone trap catches were installed and trap catch was recorded at Narayanavanam (13.6243°N, 79.3779°E), at ARS Perumalpalli (13.3781°N, 79.3243°E) and farmer's field-Chandragiri (13.5891°N, 79.2821°E). Population dynamics of adult *S. frugiperda* were monitored and determined by using captured male moths in pheromone traps. Polythene funnel type of Pheromone trap with yellow rubber septa produced by M/S Pheromone chemicals, Nacharam, Hyderabad were used. The lure was specific for *S. frugiperda* and contained pheromone blend of Z9-14Ac: Z11-16Ac: Z7-12Ac in ratio of (87:12.5:0.5).
The traps were placed one meter from the ground in the seedling stage and 20 cm higher than the plant canopy in the other stages. The traps were placed vertically by tying it to a wooden stick using a rope and other end was secured with a thread. The lures were replaced every 45 days, as per the manufacturer's instruction. Four traps per acre were placed in each field for monitoring the adult population.

The captured adults in each trap were removed from the traps and counted at weekly intervals. Thus mean number of moth catches / trap / week was determined and subjected to statistical analysis. The collected data (Number of moth per trap) was subjected to square root transformation and the data was analysed through OP STAT software and Duncan's Multiple Range Test (DMRT) ($P \leq 0.05$) by using IBM SPSS (Statistical Package for Social Sciences) statistics version 20 for drawing the conclusions.

3. Results and Discussions

Field evaluation of pheromone traps in monitoring of *S. frugiperda* adult population on maize were carried out wherein Pheromone traps were installed at farmer's field in Chandragiri, Narayanavanam and at ARS (Agriculture Research Station) Perumalpalli during *kharif*, 2021 to monitor the adult population of fall armyworm throughout the season and assess the peak of incidence. Data regarding mean number of moth catches per trap is presented here under.

3.1 Mean number of moth catches/trap/week during *kharif*, 2021

At seven days after sowing (VE/ Emergence stage), highest number of moths were recorded in trap catches of Chandragiri (14.33 moths / trap / week) and Narayanavanam (12.01 moths / trap / week) which were statistically and at par and followed by ARS, Perumalpalli which recorded least number of moths (9.69 moths / trap / week).

At fourteen days after sowing (V1 and V2 stages), highest number of moths were recorded in trap catches of Chandragiri (52.36 moths / trap / week) which was statistically different and followed by Narayanavanam (47.98 moths / trap / week) and least number of moth trap catches were recorded in ARS, Perumalpalli (4.65 moths / trap / week).

At twenty one days after sowing (V3 and V4 stages), maximum number of moths were recorded in trap catches of Chandragiri (52.36 moths / trap / week) which was statistically different from Narayanavanam (47.98 moths / trap / week) followed by ARS, Perumalpalli which recorded least number of moths (6.64 moths / trap / week).

At twenty eight days after sowing (V5, V6 and V7 stages), highest trap catches were recorded in Narayanavanam (77.99 moths / trap / week) which was statistically at par with Chandragiri (68.79 moths / trap / week). Minimum number of moths were recorded by ARS, Perumalpalli (34.12 moths / trap / week)

At thirty five days after sowing (V8 and V9 stages), highest number of moths were recorded in trap catches of Chandragiri (81.49 moths / trap / week) which was statistically different from Narayanavanam (15.67 moths / trap / week) followed by ARS, Perumalpalli (13.33 moths / trap / week) which were statistically at par.

At forty two days after sowing (V10, V11, V12 and V13 stages), highest moth trap catches were recorded in Chandragiri (19.33 moths / trap / week) and Narayanavanam, (16.77 moths / trap / week) which were statistically at par with each other followed by ARS, Perumalapalli which recorded least number of moth catches (9.98 moths / trap / week).

At forty nine days after sowing (V14,V15,V16 and V17 stages), highest moth trap catches were recorded in Chandragiri (27.11 moths / trap / week) which was statistically different from ARS, Perumalpalli (22.27 moths / trap / week) followed by Narayanavanam (20.87 moths / trap / week) which also did not show any statistical similarity with one another.

At fifty six days after sowing (V18 and V19 stages), highest moth trap catches were recorded in Narayanavanam and Chandragiri (18.67 moths / trap / week), (16.01 moths / trap / week) respectively followed by ARS Perumalpalli (14.39 moths / trap / week) which were statistically on par with one another.

At sixty three days after sowing (V20,V21 stages), highest moth trap catches were recorded in Chandragiri (18.87 moths / trap / week) which was statistically different and followed by ARS, Perumalpalli and Narayanavanam (12.47 moths / trap / week) and (11.67 moths / trap / week) respectively which were statistically on par with one another.

At seventy days after sowing (VT Tasseling stage) maximum number of moths were observed in trap catches of Narayanavanam (18.33 moths / trap / week) which was statistically different and followed by Chandragiri (14.01 moths / trap / week) and ARS, Perumalpalli (11.32 moths / trap / week) respectively which were statistically on par with one another.

At seventy seven days after sowing (R1 / Silk Stage), maximum number of moths were observed in trap catches of Narayanavanam (16.87 moths / trap / week) which was statistically on par with Chandragiri (11.67 moths / trap / week). Minimum number of moth catches were observed in ARS, Perumalpalli (6.87 moths / trap / week).

At eighty four days after sowing (R2 / Blister stage) maximum number of moths were observed in trap catches of Narayanavanam (12.33 moths / trap / week) which was statistically on par with Chandragiri (8.67 moths / trap / week) followed by ARS, Perumalpalli (4.35 moths / trap / week) which recorded minimum number of moth catches.

At ninety one days after sowing (R3 / Milking stage) maximum number of moths were observed in trap catches of Narayanavanam (7.39 moths / trap / week) which was statistically different and followed by Chandragiri (4.33 moths / trap / week), ARS Perumalpalli (2.98 moths / trap / week) which recorded minimum number of moth catches and were statistically at par.

At ninety eight days after sowing (R4 / Dough stage) maximum number of moths were observed in trap catches of Narayanavanam (2.67 moths / trap / week) which was statistically different and followed by Chandragiri (1.33 moths / trap / week), ARS, Perumalpalli (0.33 moths / trap / week) which recorded minimum number of moth catches and were statistically at par with one another.

The highest trap catches in the entire season with respect to Chandragiri was noticed at thirty five days after sowing at V8 and V9 stages *viz.*, 81.49 moths / trap / week followed by trap catches in Narayanavanam which recorded 77.99 moths / trap / week at twenty eight days after sowing during V5,V6 and V7 stages. In ARS perumalpalli at twenty one days after sowing during V3 and V4 stages trap catches recorded 22.67 moths / trap / week. The maximum overall mean moth trap catches during *kharif*, 2021 (Table 1) was observed in Pheromone traps at Chandragiri (26.96 moths / trap / week) followed by Narayanavanam (21.94 moths / trap / week) which were statistically found to be at par with one another. Least mean moth trap catches were observed in ARS Perumalpalli (10.13 moths / trap / week) which differed statistically.

Table 1: Mean number of moth catches in pheromone traps during *kharif*, 2021

Mean number of moth catches / trap / week*															
Place of Pheromone Installation	**7 DAS**	**14 DAS**	**21 DAS**	**28 DAS**	**35 DAS**	**42 DAS**	**49 DAS**	**56 DAS**	**63 DAS**	**70 DAS**	**77 DAS**	**84 DAS**	**91 DAS**	**98 DAS**	**Average moth count**
Chandragiri[1]	14.33 (3.91)a	39.18 (6.33)a	52.36 (7.30)a	68.79 (8.35)ab	81.49 (9.08)a	19.33 (4.50)a	27.11 (5.30)a	16.01 (4.12)ab	18.87 (4.45)a	14.01 (3.87)b	11.67 (3.55)ab	8.67 (3.11)ab	4.33 (2.30)bc	1.33 (1.52)bc	26.96 (5.28)a
ARS perumalpalli[2]	9.69 (3.27)ab	4.65 (2.37)c	6.64 (2.76)c	34.12 (5.92)c	13.33 (3.78)bc	9.98 (3.31)b	22.27 (3.60)b	14.39 (3.92)bc	12.47 (3.60)b	11.32 (3.51)bc	6.87 (2.80)c	4.35 (2.31)c	2.98 (1.99)c	0.33 (1.15)c	10.13 (2.99)c
Narayanavanam[3]	12.01 (3.60)a	28.09 (5.39)ab	47.98 (4.76)b	77.99 (8.88)a	15.67 (4.08)b	16.67 (4.20)ab	20.87 (2.75)c	18.67 (4.43)a	11.67 (3.55)bc	18.33 (4.39)a	16.87 (4.22)a	12.33 (3.65)a	7.39 (2.89)a	2.67 (1.91)ab	21.94 (4.79)ab
S.Em.+	0.10	0.14	0.25	0.16	0.22	0.18	0.16	0.27	0.15	0.22	0.17	0.22	0.16	0.15	0.30
CD (P = 0.05)	0.29	0.45	0.75	0.47	0.67	0.59	0.49	0.89	0.48	0.67	0.56	0.69	0.51	0.49	0.90
CV%	15.39	19.81	17.85	12.82	18.97	17.71	18.04	17.78	11.96	17.19	13.49	17.29	13.77	13.45	13.39

*Figures in the parentheses are square root transformed values.
In each column the values having the same alphabet are non-significant.
Dates of sowing: 3=21/7/21, 2=23/7/21, 1=28/7/21.
Pheromone Blend: Z9-14Ac: Z11-16Ac:Z7-12Ac (87:12.5:0.5)

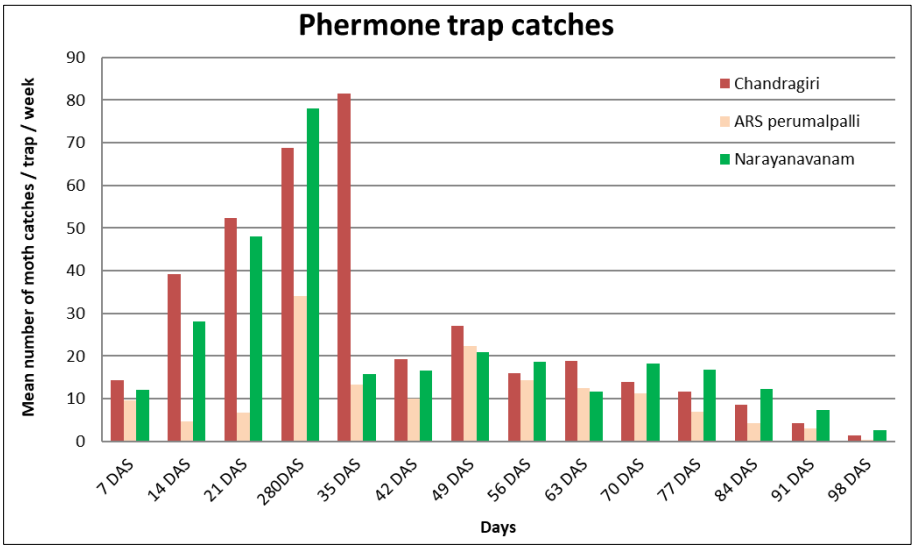

Fig 1: Pheromone trap catches of fall armyworm adult in *kharif*, 2021

Barlow and Kuhar (2009) [5] suggested that pheromone traps are more efficient and sensitive to changes in population and also indicate the presence of moths in an area and they further confirmed that insecticidal applications should take place only when a pheromone trap catches 10 to 20 adult moths per trap in a night (~70 to 100 adults in a trap per week), which is regarded as the threshold level to initiate insecticide applications. The results of the pheromone trap catches during *kharif*, 2021 revealed significant variations in number of Moths catches across the different dates of observation (Table 1) throughout the season. During *kharif*, 2021 the adult population crossed the ETL (Economic Threshold level) in Chandragiri (81.49 moths / trap / week) at 35 DAS (Days After Sowing), in Narayanavanam (77.99 moths / trap / week) at 28DAS. DAS. However the adult population count in ARS, Perumalpalli (*kharif*, 2021) did not reach ETL level this could be because the farmer's field in Chandragiri and Narayanavanam could have attracted more number of moths from the adjacent fields but ARS, Perumalpalli showed maximum moth population count at 28DAS (34.12 moths / trap / week) during *kharif*, 2021. In the current study during *kharif*, 2021 the minimum to maximum range of moth trap catches in Chandragiri was in between 1.33 to 81.49 moths / trap / week, in ARS, Perumalpalli the range of moth trap catches was in between 0.33 to 34.12 moths / trap / week, in Narayanavanam the range of moth trap catches was in between 0.33 to 34.12 moths / trap / week. The overall average moth count in Chandragiri, ARS Perumalpalli, Narayanavanam was 26.96, 10.13 and 21.94 moths / trap / week respectively. Hence it can be inferred that the peak period of moth activity in all the three regions was observed in between 21 DAS to 35 DAS, wherein insecticidal applications should take place based on the ETL levels.

4. Conclusion

Pheromone traps can be used to detect early pest infestations, such as the first occurrence of migratory pests, define areas of pest infestations, track the build-up of a pest population and help in decision making for pest management. Pheromone traps have been successful in estimating pest population densities and the potential risk of crop damage. Since pheromone traps are relatively easy to use and inexpensive, species specific and environmentally benign they make ideal tools for IPM programs.

5. Acknowledgements

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6. Declarations

6.1 Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

7. Ethical approval

This is an observational study. The University's Research Ethics Committee has confirmed that no ethical approval is required.

8. Consent to participate

Informed consent was obtained from all individual participants included in the study.

9. Consent to publish

No ethical approval is required as there is no personal data of the authors in the article.

10. References

1. Cruz I, Figueiredo MLC, Silva RB, Foster JE. Efficiency of Chemical Pesticides to Control *Spodoptera frugiperda* and Validation of Pheromone Trap as a Pest Management Tool in Maize Crop. Revista Brasileira de Milho e Sorgo. 2010;9(2):107-122.
2. Knodel Curtis, Petzoldt H. IPM Support Group, NYS Agricultural Experiment Station at Geneva, and Michael P. Hoffmann, Department of Entomology, Cornell University. 2001;7(2):11-14.
3. Luginbill P. The Fall Armyworm. USDA Technical Bulletin. 1928;34:91.
4. Thomas CB. Use of Pheromones in IPM. 2008. ISBN: 978 0 521 875950.10-14.
5. Barlow VM, Kuhar P. Fall Armyworm in Vegetable Crops. Research bulletin; c2019. p. 444-449.