COMMUNITY PEST MANAGEMENT - A SYSTEMS APPROACH

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Abstract

Pest management communities in Arkansas were initially designed to manage the bollworm, *Helicoverpa zea* Boddie, over a wide geographical area. However, these communities have evolved to manage other pests such as the budworm, *Heliothis virescens*, and the boll weevil, *Anthonomus grandis* Boheman. A systems approach to manage Heliothine spp. involves field population determination through scouting, species determination through moth catch results, and resistance monitoring of the budworm moth using insecticide treated glass vials. Treatment decisions are based on field populations of eggs and small larvae. Timing of community or quadrant sprays are designed to commence with hatchout of the majority of the eggs. Recommendations of treatments are made using species composition and budworm resistance monitoring data. Implementation of treatments are scheduled for a 72 hour period, and evaluation of efficacy for the following 72 hour period.

Introduction

Community Pest Management was developed as a concept in Arkansas by Dr. Jacob Phillips during the mid- 1970's. These pest management communities were initially designed to manage populations of bollworm, *Helicoverpa zea* Boddie, over a wide geographic area. Management of bollworms with community wide treatments have effectively reduced the total number of insecticide applications used on cotton(Rorie, 1995). L&P Pest Management Community is a pest management community that encompasses areas of three counties in central Arkansas. The L & P Pest Management Community has evolved into a broader based program, incorporating scouting data, insect trapping data, resistance monitoring data, and species composition data into an integrated multi-species pest management approach. A grower board governs the implementation of the service and educational components of the community are the responsibility of the Extension Service. The L&P Pest Management Community is a multi-species pest management community dealing with populations of the Heliothine species as well as the boll weevil, *Anthonomus grandis* Boheman. The objective of this paper is to demonstrate a community pest management program approach to multi species pest management using field density of early stage pest, moth trapping data, and resistance monitoring data.

Methods

L&P Pest Management Community consist of approximately 20,000 acres of cotton in central Arkansas. The acreage of cotton was divided into four areas called quadrants. Quadrants were established using geographical and geological features such as river boundaries and soil type as criteria for demarcation. Each quadrant is between 2500 acres to 7000 acres. Each quadrant is treated as a subunit of the entire community, or as a community itself.

Pheromone traps were distributed on a 140 mile circuit in Lonoke, Pulaski, and Jefferson Counties in Arkansas. Forty four moth traps were used. Half were baited with budworm, *Heliothis virescens*, pheromone, and half were baited with bollworm pheromone. Bollworm moth traps were placed alternately with budworm moth traps, and the traps were situated adjacent to cotton fields. Moth traps were placed near structures such as telephone poles, guide wires or highway signs. Moths were counted 5 days per week. A weekend average was calculated based on the Monday catch. Budworm moths were taken to the laboratory and used in vial tests for resistance.

Scouting records from the previous 24 hours were received from Extension, private, and consultant programs on a daily basis. Data from moth catches and field densities of egg and larvae were then compared to each other. When populations of eggs and larvae less than ¼ inch totaled 5000 per acre, treatment levels were reached (University of Arkansas Cooperative Extension Service Recommendations).

In addition, budworm moths were taken to the laboratory and vial test were performed to determine resistance to cypermethrin and profenofos. Before area wide treatments were recommended, species composition and insecticide resistance levels were determined in order to recommend the most effective and economical treatments.

Results and Discussion

Egg deposition peaked on the weeks of 7/8 - 7/14, 7/22 - 7/28, and 7/29 - 8/4 (Table 1). During the same periods the total of eggs and small larvae were above the 5000 level treatment threshold.

Data in Table 2 confirm a higher moth catch during the weeks where high deposition of eggs occurred. However, within the week time frame, the majority of the egg deposition occurred after the peak bollworm trap catch. The results in Table 2 also indicate that budworm moths were present in significant numbers during only the 7/8 - 7/14 date interval.

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A high level of resistance to cypermethrin was observed in June (Fig. 1), but no level of resistance was detected to prophenphos in June prior to any treatments targeting the Heliothine spp. Resistance to prophenophos became detectable using the 20ug vial in July and in August. Resistance to prophenophos was detected using 25ug vials in August. Cypermethrin resistance during the growing season declined into July, but remained relatively constant in August. However, resistance levels to cypermethrin never declined below the 40 percent level. After moth counts of the bollworm peaked, field egg and larval densities reached treatment level in each of the quadrants, triggering a community treatment. Quadrant treatments levels were reached the week of 8/13 - 8/18, however, the community as a whole did not reach treatment level.

Summary and Conclusions

When making a decision to treat field density of Heliothine species on a community basis, eggs and larvae numbers are not the only consideration. Moth traps give an indication as to species composition (Johnson, 1966). Resistance monitoring data give an indication to treatments which should be employed, but more importantly to which treatments that will not be as effective. For example, since cypermethrin resistant budworms were present as a significant part of the field population in the week of 7/4 - 7/8 (Table 1), *Bacillus thuringiensis* (Bt) plus carbamate or organophosphate mixtures were recommended. Where boll weevils were present and pyrethroids were going to be used, Bt was recommended as the mixture of choice followed by carbamates.

When one or more quadrants, but not the community reach treatment levels, treatments may be employed based on the species composition indicated by moth catch results (Johnson, 1996) and by resistance levels indicated by vial test results. The quadrant, then, is treated as a single community.

Budworm and bollworm moth peak trap counts can be used as a relative guide in estimating the date of treatment for a community. It is only a relative guide, and should be cautiously considered in combination with complete scouting records.

After a community or quadrant treatment decision, communication with the individual producer, aerial applicator, consultant, and dealer in the area is made through fax or phone call. Seventy two hours are required to implement community or quadrant treatments. Evaluation of all community and quadrant sprays occurs the following 72 hours.

A community's goal is to initiate treatment at hatchout of the majority of eggs present in the field. In order to meet this standard, it is necessary to have scouting reports processed within a 24 hour period from initiation. It is also necessary to consider other critical factors such as relative species composition, results of resistance monitoring, and the time frame necessary to implement the decision to treat.

References

Rorie, K., Johnson, D. R. Johnson, C. D. Klein, and A. M. Jordan. 1995. Community Management of the Heliothine Complex in Jefferson County Arkansas. Proc. Beltwide Cotton Prod. Conf., pp. 782.

Johnson, D. R. 1995. Unpublished data.

Table 1. 1996 Daily mean egg and larvae per acre density of Heliothine spp. in L & P Community.

Date	Egg	Small. Larvae	Total. Larvae
6/2-6/9	66	29	31
6/10-6/16	97	101	102
6/17-6/23	185	259	439
6/24-6/30	513	306	623
7/1-7/7	975	328	540
7/8-7/14 *	9123	775	1124
7/15-7/21	1859	863	1186
7/22-7/28 *	4648	792	1762
7/29-8/4 *	4801	983	1922
8/5-8/12	2494	814	1511
8/13-8/18 **	3592	1124	1871

* Community treatments.
** Quadrant treatments.

Table 2. 1996 Daily mean bollworm and budworm moth trap catches over a 7 day period.

Date	BW	TBW
6/2-6/9	28.73	0.75
6/10-6/16	25.4	0.35
6/17-6/23	20.75	0.38
6/24-6/30	37.83	5.94
7/1-7/7	32.74	6.44
7/8-7/14 *	38.11	5.97
7/15-7/21	21.94	1
7/22-7/28 *	24.79	0.61
7/29-8/4 *	28.69	1.57
8/5-8/12	13.24	1.06
8/13-8/18 **	9.6	0.71

* Community treatments.
** Quadrant treatments.

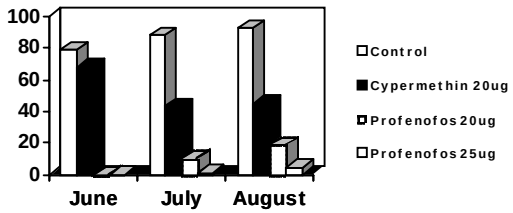

Figure 1. 1996 Vial Test Results using Cypermethrin and Profenofos