FREQUENCY OF INSECTICIDE APPLICATIONS IN ARKANSAS FIELDS APPROACHING CUTOUT AS DEFINED BY COTMAN

W.H. King Jr., M. J. Cochran, and N.P. Tugwell
Graduate Student, Agricultural Economist, and Entomologist
University of Arkansas
Fayetteville, AR

Abstract

COTMAN procedures were used to identify Type I and Type II growth patterns in fields located in three regions of the state in 1995. Comparisons are made as to the total number insecticide applications and their associated costs in Type I and Type II fields. Potential savings ($/A) with implementation of the COTMAN Insecticide Termination Rule were also examined. Results indicate greater control costs associated with Type II fields. When insecticide treatments are terminated according to COTMAN recommendations, a great potential for savings was realized.

Introduction

COTMAN is a computer aided Cotton Management system composed of SQUAREMAN (pre-flower) and BOLLMAN (post-flower) which enables growers to make more informed management decisions. Plant monitoring, current and long term weather data, and individual farm and field information are integrated into this system. The output generated by COTMAN includes : a current diagnosis of vegetative and fruiting status, timing for termination of insecticides, timing for initiation of defoliation, and harvest scheduling for each field.

COTMAN enables one to categorize and manage fields which are tracking one of two growth curves. These curves are graphically illustrated in COTMAN utilizing the number of squaring nodes associated with the days after planting (DAP). Optimally, Type I fields should reach first flower at 60 DAP possessing an average of 9.25 squaring nodes with cutout being reached in approximately 80 DAP. Type I fields are not considered to be late; therefore, insecticide termination and initiation of defoliation can be predicted using current weather information and crop oriented rules. With Type I growth patterns, the flower date of the last effective boll population is defined by NAWF=5. With Type II fields, the crop is stressed or in some way delayed, therefore, exhibiting late cutout and late maturity. Management in these fields must then rely upon historical and current weather information (weather oriented rules). These rules reflect a compromise between maturing top bolls and reducing the harvest risk associated with poor weather in late season. The flower date of the last effective boll population is defined by the latest possible cutout date which is based upon the grower selected acceptable risk level and the long term historical weather.

Insect pressure (boll weevil, budworm, bollworm) is always at its peak toward the end of the season. Therefore, it is preferable to mature the crop before encountering these pests. Earliness is an essential concern in cotton production for avoidance of late season insects and unnecessary insecticide applications, thus enhancing of resistance management. Timing for termination of insecticides is an issue which plagues producers and consultants each year. Frequently, late-season insecticide termination is based upon personal feelings or past experiences; however, COTMAN offers an alternative. COTMAN allows one to time insecticide termination based on crop growth patterns and accumulation of heat units (HU) past cutout. Termination of insecticide applications is recommended when HU= 350 to 450 have been accumulated after cutout. The foundation of this recommendation is based on the following studies: Bourland, Oosterhuis, and Tugwell (1992), Bagwell and Tugwell (1992), and current field validation tests.

Methods and Data

Fields, in which COTMAN program was conducted, were examined at 3 geographic regions. Sampling records, insecticide application reports, and average insecticide costs were obtained for each region. The number of fields observed and percentage of Type I fields in each region are as follows: Northeast -- 82 (80%), Eastern/Central -- 87 (57%), and Southeast -- 98 (92%). In this study, a 15% risk level was used to define Type I fields.

Results and Discussion

The results from the LSD test indicate that significant differences did exist among the cost and number of insecticide applications associated with Type I and Type II fields. In the Northeast (NE), significant differences did not occur. This could possibly be attributed to the fact that this area of the state possesses the least insect pressure of the three regions and in 1995, this region had a number of fields that were partially replanted. However, a $4/ac difference in cost and a slight difference in the number of applications did occur. In the Eastern/Central (EC) and Southeastern (SE) regions, differences in costs between Type I and Type II fields after July 21 were $12 and $22/ac respectively. Differences in numbers of insecticide applications in the EC and SE regions between Type I and Type II fields after July 21 were 1 and 2 respectively. Table 1 displays these results.

Results indicate that the average daily insecticide costs after July 21 were $.63/ac/day in the NE region, $1.15/ac/day in

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the EC region, and $2.00/ac/day in the SE region of the state. The regression analysis also indicated that every 17 days in the NE, 12 days in the EC, and 6 days in the SE after July 21 resulted in an additional insecticide application. Table 2 displays these results.

The results from the insecticide termination survey indicated that a great potential for savings can be realized from implementation of the Insecticide Termination Rule (Table 3). In the SE where insect pressure is the greatest, an average savings of $21.20/ac would have been realized. Even in the EC and NE, where insect pressure is not as great, a savings of $13.54 and $7.77 were estimated, respectively.

Conclusion

As the season progresses, production costs escalate. Therefore, to profitably minimize the risks and costs associated with late season insects and poor weather conditions earliness is promoted. As indicated in this study, fields tracking Type II growth curves will inevitably be more costly. Greater numbers of insecticide applications will be required in these fields resulting in greater production costs and acceleration of resistance. The risks associated with poor weather toward the end of the season can be reduced with a Type I growth pattern. Use of the COTMAN system as a guide for termination of late-season insecticide treatments also offers potential for savings, particularly in Type I fields.

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References

1. Bagwell, R. and N. P. Tugwell. 1992. Defining the Period of Boll Susceptibility to Insect Damage in Heat Units from Flower. Proceedings of the 1992 Beltwide Cotton Conferences. National Cotton Council. pp. 767-768.

2. Bourland, F., D. Oosterhuis, and N.P. Tugwell. 1992. Conceptual model for Modelling Plant Growth and Development Using Main-Stem Node Counts. Journal of Production Agriculture. 5:532-538.

Table 1. Cost and No. of Insecticide Applications after July 21 in Type I and Type II fields

Location	N	Type	Cost($/A)	No. of App.
Northeast	16	II	20.31a	1.8a
	66	I	16.48a	1.4a
			(LSD 6.06)	(LSD.59)
Eastern	37	II	63.70a	5.6a
Central	50	I	51.34b	4.7b
			(LSD 6.76)	(LSD.52)
Southeast	8	II	85.76a	7.3a
	90	I	63.97b	5.5b
			(LSD 13.06)	(LSD 1.1)

Table 2. Regression Analysis of Cost and No. of Insecticide Applications after July 21

Location	Dep. Var.	Days after 7/21	R^2
Northeast	cost	0.63	.049
		(.4077)*	
	applications	0.063	.052
		(.0887)	
Eastern/	cost	1.15	.174
Central		(.0001)	
	applications	0.08	.158
		(.0001)	
Southeast	cost	2.00	.410
		(.0001)	
	applications	0.17	.428
		(.0001)	

*Values in parentheses are P>[T] for the parameter

Table 3. Potential Savings from Insecticide Termination Rule

Location	No. sprayed after 350 HU	No. which were Type I	Cost*
Northeast	8	2	7.77
Eastern/Central	44	4	13.54
Southeast	83	0	21.20

*Average Cost in $/A