COMPARISON OF COTMAN™ SYSTEM WITH EXTENSION RECOMMENDATIONS IN NORTH CAROLINA

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Introduction

COTMAN™ is a relatively new management tool that models crop growth and development. Plant monitoring and weather data input are used to aid a grower or consultant in making decisions regarding early season square loss, mid season irrigation and plant growth regulator applications, late season insecticide termination, and defoliation timing. Experience with COTMAN™ in North Carolina and the northern regions of the cotton belt has been limited. An evaluation, therefore, of the COTMAN™ system was initiated in North Carolina comparing it to Extension Service recommendations already in place.

Materials and Methods

Cotton was planted on May 10 at the Upper Coastal Plain Research Station near Rocky Mount, NC. Six treatments were imposed:

1. COTMAN™ managed, excess nitrogen, Pix and PGR-IV applied.
2. COTMAN™ managed, excess nitrogen, Pix only applied
3. Extension Recommendation managed, excess nitrogen, Pix only applied.
4. COTMAN™ managed, normal nitrogen, Pix and PGR-IV applied.
5. COTMAN™ managed, normal nitrogen, Pix only applied
6. Extension Recommendation managed, normal nitrogen, Pix only applied.

Normal insect scouting for the bollworm/budworm complex as well as other insect pests with the exception of plant bugs, as recommended by the NC Cooperative Extension Service was conducted in all treatments. In the COTMAN™ treatments, data was collected as called for by the COTMAN™ users manual. In the Extension treatments, in addition to normal insect scouting for the bollworm/budworm complex, plant bug scouting according to NCCES guidelines, plant monitoring according to the Modified Early Bloom Strategy for Pix use, and % open bolls and nodes above cracked boll for defoliation data were collected for management decisions. Excess nitrogen was applied to some treatments in an effort to delay maturity, but excessively wet conditions prevented any noticeable maturity delay from occurring. One of the COTMAN™ decision rules advises the consideration of a "growth enhancing plant growth regulator", therefore PGR-IV was used in treatments 1 and 4only. Data that were collected, in addition to those called for by the two management systems, were the time in seconds required for each sampling date, by plot, for both the COTMAN™ and Extension inputs that were conducted outside of normal insect scouting. Time was recorded from entry into the plot, through data collection, and stopped upon exiting the plot. The time recorded, therefore, does not reflect the time to travel from one site to another in a producer's field. Experimental design was a randomized complete block with four replications. For data analysis, each replication was considered a "site" and the four replications together were considered a "field", giving four sites per field. Plots were not irrigated and were six 36 inch rows ride and 50 feet long, and data was collected from the inside four rows of the plot.

Results and Discussion

Extension treatments were monitored twice for plant bugs with square retention, averaged across Extension treatments, calculated as 98.0% and 98.9% on June 30 and July 7, respectively. For those same two dates COTMAN™ returned square retention values of 98.6% and 98.4, averaged across treatments. High square retention values were not unexpected due to plant bugs being a minor pest, the absence of boll weevils, and a generally light second generation budworm flight in North Carolina.

Due to a late planting season and unusually dry conditions, the crop growth curves generated by COTMAN™ were shifted to the right and flatter than the target development curve. This activated SQUAREMAN decision rule #5 which stated that "a growth enhancing plant growth regulator may help to retain fruit", triggering the application of 4 oz/acre of PGR-IV to treatments 1 and 4. This occurred twice, on July 7 and July 14. Research in North Carolina has shown no response to PGR-IV and its application did not appear to shift the growth curves in any direction different from treatments that did not receive PGR-IV. Additionally, no yield differences were observed (Table 2). In cases where Pix may be a consideration, the COTMAN™ system recommends consulting local Extension advisories. Following the modified early bloom approach, a Pix application at 12 oz/acre was triggered in all treatments on July 21. Plant monitoring according to the modified early bloom strategy was conducted only once in the COTMAN™ treatments, when it was called for, and the time required for this plant monitoring is not included in the total time requirement for

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COTMAN™ treatments shown in Table 1. Extension treatments were monitored twice.

Cutout was reached in all of the COTMAN™ treatments on either August 6 or August 8. For late season insecticide termination, 350 DD60s were calculated beginning on August 6 because historical weather data for Raleigh, NC in the COTMAN™ program says that August 6 is the latest possible cutout date. 350 DD60s were accumulated on August 22. During that time period, and later in the fall, no insect damage was found in either the Extension or COTMAN™ plots. There are currently no official Extension recommendations concerning the termination of late season insecticide applications. Producers have generally relied on the 'larger than thumb sized bolls' rule as a determination of when scouting for bollworms can cease. NAWF=5 should be adequate to protect bolls from bollworms, however, European corn borers could pose a potential threat after 350 DD60s have accumulated. The NAWF=5 + 350 DD60 guideline used in COTMAN™ appears to work, but needs validation in North Carolina due to the propensity for early cutout and subsequent regrowth as well as the possibility of a late fall. Further research in this area needs to be conducted.

COTMAN™ initiates defoliation at NAWF=5 + 850 DD60s. Extension recommendations in North Carolina suggest defoliation should begin at 40-60% open bolls and/or nodes above cracked boll of 3-4 dependent upon the boll distribution on the plant. It was determined, due to high overall fruit retention on lower and middle nodes, that the Extension treatments should be defoliated at 50% open and/or NACB=4. Due to Hurricanes Dennis and Floyd, this was not possible. Extension treatments were therefore defoliated on October 1 at 58.5% open and NACB=3.4. The accumulation of 850 DD60s in the COTMAN™ treatments also fell on October 1, and the entire study was defoliated on the same day. The NAWF=5 + 850 DD60s COTMAN™ rule coincided almost exactly with 60% open bolls. Research in North Carolina, however, has shown that defoliation can often be initiated much earlier than 60% with no detrimental effects on yield or fiber quality. Due to generally high early season square retention, the majority of the crop in North Carolina is set over an 8-10 node horizon on the plant. This leads to an overall boll population that is closer in maturity than a crop that is set over a 12-14 node horizon, and often allows earlier defoliation in terms of % open and NACB. It should be remembered, however, that this study is one year's data on defoliation timing and the impact of two major hurricanes cannot be diminished.

As shown in Table 1, the time required for the COTMAN™ data collection was extremely high compared to the Extension treatments. The majority of the time, 53.8%, was spent mapping squares in the early season (data not shown). There were no significant lint yield differences between any of the treatments (Table 2). The COTMAN™ system does provide a wealth of information on crop progress and may aid in scheduling harvest. It is, however, a very time consuming method of monitoring crop development. Given that the average field size in North Carolina is 14.2 acres according to the Boll Weevil Eradication Program, the investment in time to sample and track individual fields would be excessive for a grower or a consultant. The COTMAN™ system also relies heavily on cutout being defined as NAWF=5. Very little of North Carolina's cotton is irrigated, and can often begin flowering at NAWF=6. Lack of irrigation and variable weather patterns often result in 'temporary' cutout with growth resuming with rainfall. This would add another level of complication to interpreting COTMAN™ outputs. In summary, the COTMAN™ system, after one year's experience, appears to require a heavy time input for the quality of the information received. Further research will need to be done to evaluate the various components of the program for non-irrigated cotton in the more northern cotton producing regions of the Southeast.

Table 1. Average time expenditure averaged over all COTMAN™ and Extension treatments[1].

Treatment	Total time
	minutes/site
COTMAN™	31.6
Extension Recommendations[2]	4.9

1. Time is in addition to normal insect scouting, primarily for the bollworm/budworm complex.
2. Includes plant bug scouting (twice), Pix plant monitoring (twice), percent open bolls (twice), and NACB measurements (twice).

Table 2. Lint yield of all treatments.

Management System	N rate	PGRs applied	Lint Yield
			lbs/acre
COTMAN™	high	Pix, PGR-IV	831
COTMAN™	high	Pix	788
Extension	high	Pix	851
COTMAN™	normal	Pix, PGR-IV	825
COTMAN™	normal	Pix	815
Extension	normal	Pix	860
$LSD_{0.05}$			NS
CV(%)			6.2