CHARACTERIZATION OF THE FRUITING GROWTH CURVE USED IN CROP MONITORING

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RESEARCH PROBLEM

The COTMAN crop monitoring program follows the progress of squares and flowers in relation to main-stem nodal development to assist with end-of-season management decisions (Bourland *et al.*, 1992). Comparing actual recorded fruiting data with a standard "target" fruiting growth curve serves as a basis for management decisions. More field data are necessary to understand the effect of major production inputs, such as mepiquat chloride (Oosterhuis *et al.*, 1991) and nitrogen (Maples *et al.*, 1990), and how these may influence the fruiting growth curve.

BACKGROUND INFORMATION

The currently used standard fruiting growth curve in COTMAN is based upon number of calendar days from planting. However, there is sufficient evidence in the physiological literature to indicate that heat unit accumulation may be more accurate and indicative of prevailing growing conditions (Brown, 1989; Burke *et al.*, 1988; Reddy *et al.*, 1991). Information is needed about the relationship between the fruiting growth curve and heat unit accumulation. The objectives of this study were (1) to characterize the standard fruiting growth curve in cotton with regard to days after planting and heat unit accumulation, for several geographical locations, between major phenological stages [pinhead square, first flower, and physiological cutout (NAWF=5)], and (2) to determine the effect of production management inputs, mepiquat chloride, and soil nitrogen status, on the fruiting growth curve. This is the third year of this regional study (1997-1999) which was repeated in Louisiana, Georgia, and Virginia.

RESEARCH DESCRIPTION

The cotton cultivar 'Suregrow 125' was planted 11 May 1999 in a Captina silt loam soil in Fayetteville. Treatments were: (1) an untreated control, (2) two foliar applications of PIX™ at pinhead square and first flower (4 oz/acre and 12 oz/acre, respectively), and (3) low nitrogen. Preplant and pinhead square applications of nitrogen fertilizer (NH_4NO_3) were applied to the control and Pix™ plots (total 100 lb N/acre) and the low nitrogen plots (total 50 lb N/acre). The experimental design was a random-

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ized complete block with three replications. Measurements included COTMAN crop monitoring records, and number of days and heat units from planting until pinhead square, first flower, and NAWF=5. First position white flowers were tagged at NAWF=7, 6, 5, 4, and 3 beginning at NAWF=7. These tagged flowers were harvested as open bolls at the end of the growing season. Fruit retention and boll weight (recorded as the number of bolls required for 1 lb of seedcotton) were calculated at each tagged main-stem nodal position. Insect control and irrigation were applied as needed throughout the growing season according to standard cotton recommendations.

RESULTS

Figure 1 shows the three treatment curves plotted against the standard *target development curve.* Heat unit accumulation after planting and days after planting until pinhead square, first flower, and NAWF=5 for all treatments are shown in Table 1. Surprisingly, the low nitrogen treatment most closely tracked the target development curve (Fig. 1). The PIX rate may have been too high, because the apogee was lowered to seven main-stem nodes (compared to 7.5 and 8.25 in the control and low N treatments). Also, the apogee of the curve was reached very early (about 57 days after planting) compared to 62 days in the control. Physiological cutout (i.e., NAWF=5) did not differ much between the treatments; 74 days in the control, 71 days in the PIX treatment, and 73 days in the low N treatment (Table 1 and Fig. 1). The control treatment appeared to experience stress and shown by the low apogee and early cutout. This may have been related to the excessively hot, dry weather occurring during boll development in 1999.

Figure 2 shows the effect of the treatments on the number of bolls required to produce 1 lb of seedcotton as boll position progressed towards the terminal, i.e., NAWF= 7, 6, 5, 4, and 3. In the control treatment, there was a gradual increase in the boll number required to produce 1 lb of seedcotton as the position progressed toward the terminal, and a sharper increase above NAWF=5 as was expected from previous work. For the PIX and low N treatments, there was a sharp increase above NAWF=4, as has also been reported in previous years. The pattern with fruit retention was not clear (Fig. 3) except for the PIX treatment, where retention dropped off as the NAWF progressed below 4.

PRACTICAL APPLICATION

The early fruiting pattern for all treatments was delayed compared to the standard target development curve. The number of fruiting nodes at first flower was decreased in all treatments especially by PIX. The PIX and low N treatments reached physiological maturity (NAWF=5) earlier than the control or the target development curve. The growth patterns of the control, as well as the PIX and low-N treatments indicated that the plants had experienced stress as shown by the low apogee and early cutout. This may have been related to the excessively hot, dry weather occurring during boll development in 1999. The results will be analyzed over the 3 years of the study and compared with similar data from Virginia, Georgia, and Louisiana to determine the reliability of the current target development curve and characterize the effect of production inputs on the development of the fruiting curve.

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Table 1. Days after planting and heat unit accumulation after planting until pinhead square, first flower, and NAWF=5, Fayetteville 1999.

	Days after planting			Heat units after planting		
Treatment	PHS[z]	FF[z]	NAWF=5[y]	PHS	FF	NAWF=5
Control	35	62	74	533	1094	1351
PIX	35	57	71	533	979	1309
Low nitrogen	35	62	73	533	1094	1337

[z] PHS = pinhead square; FF = first flower.

[y] Physiological cutout.