Integrated Crop Management Practices in Cotton under Greek Conditions

G. Vassiliou[1], C. Le Rumeur[2], T. Veloucas[1], T. Parentis[1] and V. Laios[1]
[1]AgrEvo Hellas SA, 7 Granikou str., 151 10 Maroussi
[2]Private Consultant, 26, Boulevard de l'Quest, 93340 Le Raincy, France.

ABSTRACT

During the last two years (1996-1997), trials were conducted in different locations in Greece to establish an integrated crop management approach over some of the main varieties, mainly through growth regulation. An intensive use of the plant mapping to establish plant parameters (plant height, number of nodes above white flower on position one, top five node average internode length, node of first fruiting branch and fruit set) is critically evaluated. Plant regulating techniques in integrated crop management are discussed.

Introduction

Growth regulation in cotton has been established as one of the most important issues in the management of the crop but in Greece, growth regulation has not been tested or verified either empirically, or according to international standards. Thus, plant parameters like plant height, average internode length (Plant Height/Total Nodes ratio), nodes above white flower (NAWF), length of the five top nodes (LFTN), and fruit set have not been established for the main Greek varieties. The establishment of these parameters is of primary importance, since they could serve as monitoring and crop management tools.

The aim of this study is to check the growth parameters of the plant under different growing conditions and to identify critical values, under or above which cotton development does not lead to the best result for the farmer.

Materials and methods

Three trials were conducted in 1996 and 1997 on the varieties Eva and Aria. Two locations were chosen, Giannitsa (North Greece), where the variety Eva was tested and Stefanovikio (Thessaly in Central Greece), where the variety Aria was tested.

Four different growth regulation regimes were applied through PIX AS (mepiquat chloride 5%):

- Matchhead square (MHS) application: 0.25 lit/Ha f.p. followed by 2 applications of 0.25 and 0.5 l/Ha (1997), or 3 applications of 0.25, 0.25, 0.5 l/ha (1996). The differences resulted from the different climatic conditions in two years.
- First flower (FF) application: 0.5-l/Ha f.p. followed by 1 application of 0.5 l/Ha (1997), or 2 applications of 0.5 l/Ha (1996).
- Application at the beginning (2nd week) of bloom (BB): 1.0 l/Ha was applied, followed by a second application 7-10 days later in 1996. In 1997 there was no additional application.
- No PIX application (control).

Plant density in all trials was 15-17 plants/row meter

Plant mapping was used to assess the effect of these treatments. Two assessments were carried out during the pre-bloom period, three during the flowering period, and two in the post-bloom phase. The parameters assessed were: Plant Height (PHT); Total Nodes (TN); Average internode length (PHT/TN); Length Five Top Nodes (LFTN); Nodes Above White Flower (NAWF); First Fruiting Branch (FFB); Fruitset; Boll Load (open bolls) of 20 plants per treatment; Yield (seed cotton); Open bolls % (OB); Open bolls Position 1 (OB P1); Open bolls Position 2 (OB P2); and Open bolls in the lower10-12 sympodia.

The best treatment was determined on the basis of boll load 20 or yield (seed cotton), plus open bolls percentage. The Duncan's multiple range test was used for the statistical analysis.

Variety Eva

Optimum plant height seems to be around 45 cm at the beginning of bloom, with a range between 41 and 47.5 cm in the best treatment. Plant height reached 61 cm at the end of the flowering period, with a critical value of about 65-cm. The optimum growth pattern of the plant is indicated by a height around 85 cm, 10-15 days before harvesting.

The average internode length is 4.62 cm (Fig.2). The internode length in the best treatment varies between 4.1 and 4.75 cm, the latter appears to be critical.

The value 6.5 at the beginning of bloom indicates the critical level for the Number of Nodes Above White Flower (NAWF) (Fig. 3). Anything less than this calls for irrigation or fertilization. The NAFW value in the control over the 2 years, varied between 7 and 10.5. The cut out value is around 5.

Proceedings of the World Cotton Research Conference-2. Athens, Greece, September 6-12, 1998. pp.401-404.

Values of 25 to 35 during bloom for the length of the top five internodes require growth regulation. (Fig.4). Values of 17 to 19 guarantee optimum growth.

A fruitset of 10 in mid-bloom, protects the plant from shedding. A value of 8 is considered critical (Fig. **5).**

The NAWF varies over the bloom period between 7.5 and 4.3 (Fig 8).

The fruit set potential is quite high, reaching 17-18 during flowering (Fig. 9).

Variety Aria

Aria is rather vegetative. Height values over 65 cm in mid bloom, indicate a potential to excessive growth (Fig.6). The application window with mepiquat chloride is quite wide in the best treatment, ranging from matchhead square (MHS) to first flower (FF) (Table 2). An internode length of 3.5 cm, at the beginning of bloom (BB), is probably the critical value (Fig. 7). A well-developed crop should have an average internode length of 4-4.5 cm at cut out. Six nodes above white flower in mid bloom indicates the level above which a correction is usually needed.

Conclusion

- Both varieties profited through growth regulation in terms of earliness and/or yield.
- EVA seems to profit more from a growth regulation starting at first flower. The gain in this case is in earliness rather than to yield.
- It is evident that the best treatment for Eva is at the matchhead square stage (Table 1).
- ARIA has a wider application window. However, it should be no later than the first flower stage.
- In spite of the vegetative nature of ARIA, the height difference with EVA at cut out, does not exceed the 5 cm.
- By the beginning of bloom, ARIA has in average one more node above white flower than EVA.

Table 1. Response of Eva to different application timings with mepiquat chloride(Pix).

	Boll Load 20 plants	**Open Bolls**
Control	698 g a	68%
MHS	682 g a	79%
FF	855 g b	84%
BB	714 g a	68%

- Fruit set is considerably higher in ARIA, EVA being oriented more to earliness.
- Timely supportive first development (pre bloom) phase is needed for the plant can reach its full potential in the bloom period. In this phase, growth regulation through PIXx can bring excellent results in terms of seed cotton yield and earliness.

References

Bourland, F.M., Oosterhuis, D.M., and J.D. Lammers. (1997): Critical NAWF values for identifying the last effective boll population. In: Proc. Beltwide Cotton Conf., P Dugger and D Richter (Ed). Natl. Cotton Council, Memphis TN. Pp. 1361-1362

Johnson, L., and K.L. Edmisten. (1997): Application of Mepiquat Chloride with a wick applicator.In: Proc. Beltwide Cotton Conf. P Dugger and D Richter (Ed). Natl. Cotton Council, Memphis TN. Pp 1400-1401

Kerby, T. (1996): Management considerations in cotton production. Delta and Pine Land Company, Scott, MS.

Landivar, J.A. and J.A. Hickey. (1997): Using plant mapping to determine potential lint yields of cotton crops. Proc. Beltwide Cotton Conf., P Dugger and D Richter (Ed). Natl. Cotton Council, Memphis TN. Pp. 1362

Mauney, J. (1997): The history of cotton physiology. Proc. Beltwide Cotton Conf., P Dugger and D Richter (Ed). Nat. Cotton Council, Memphis TN. Pp 1360-1361

Millholon, E.P. and J.C. Waters. (1997): Evaluationof several plant growth regulators in Louisiana. Proc. Beltwide Cotton Conf., P Dugger and D Richter (Ed). Natl. Cotton Council, Memphis TN. Pp. 1472-1474

Silvertooth, J. (1994): Cotton. College of Agriculture. Univ. Arizona, Tucson Report Series. 94 pp.

Table 2. Response of Aria to mepiquat chloride.

	Boll load 20 Plants	**Open Bolls**
Control	702g a	76%
MHS	992g c	92%
FF	973g c	94%
BB	892g b	86%

Figure 1. Influence of time of application on height development: Eva.

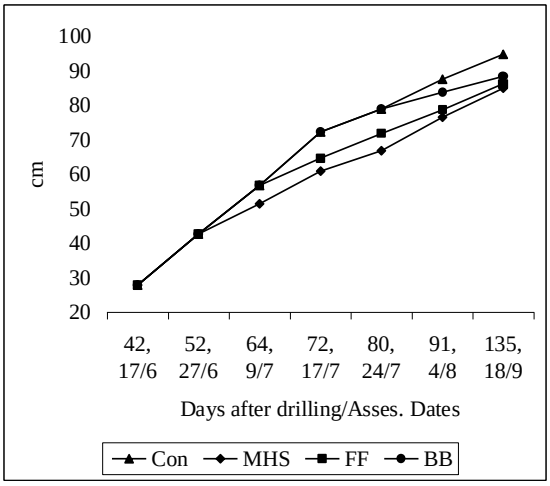

Figure 2. Influence of time of application on internode length: Eva.

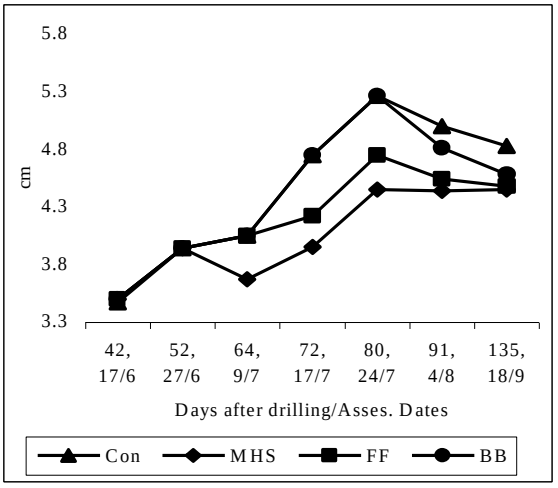

Figure 3. Influence of time of application on nodes above white flower: Eva.

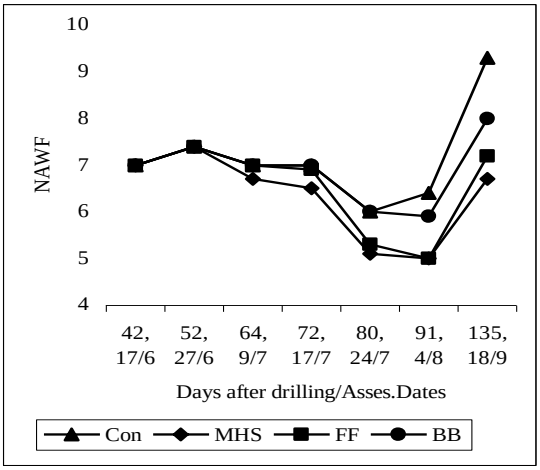

Figure 4. Influence of time of application on top five nodes: Eva.

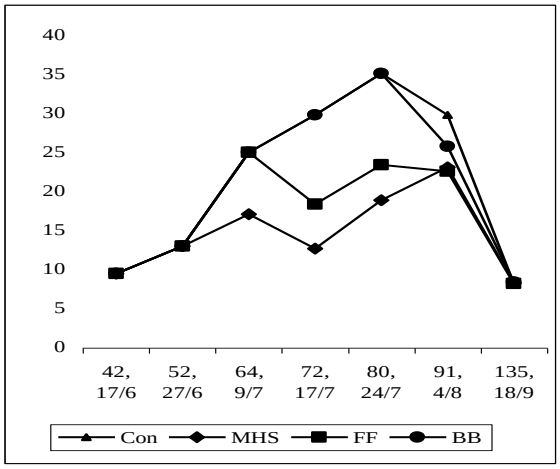

Figure 5. Influence of time of application on fruitset: Eva.

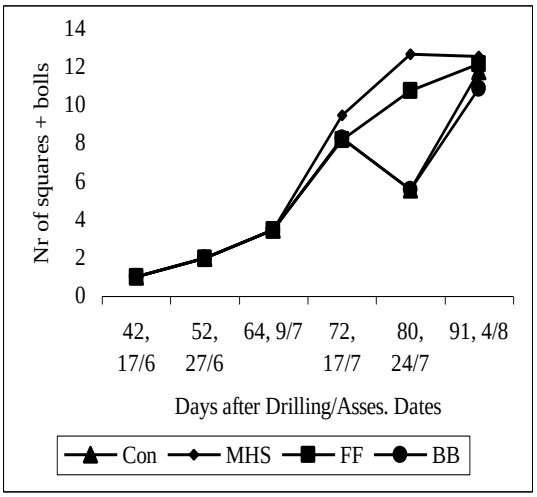

Figure 6. Influence of time of application on height development: Aria.

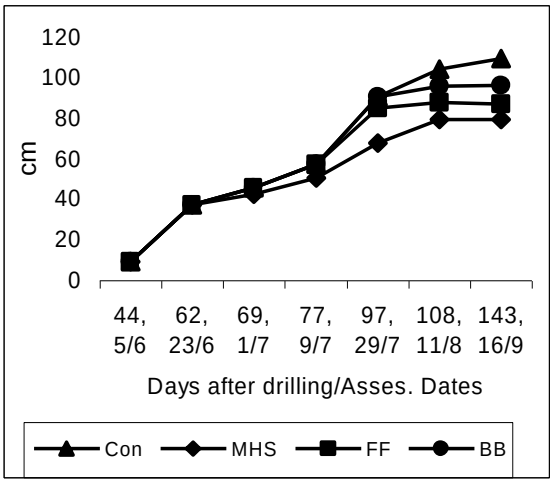

Figure 7. Influence of time of application on internode length: Aria.

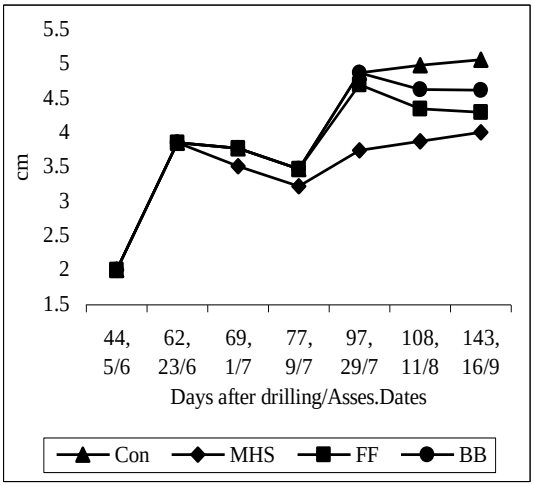

Figure 8. Influence of time of application on nodes above white flower: Aria.

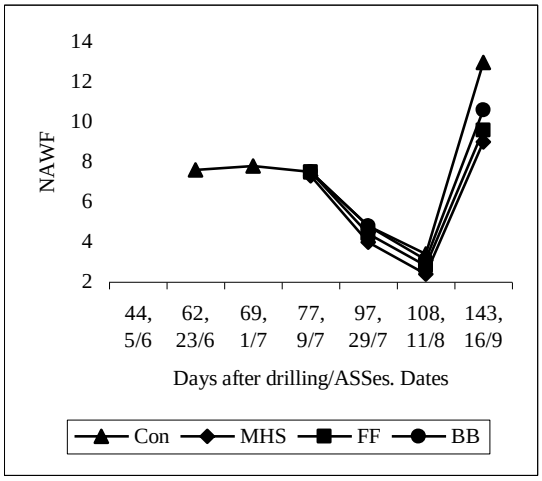

Figure 9. Influence of time of application on fruitset: Aria.