EVALUATION OF BIOTECH COTTON PLANTING DATES FOR SOUTHWESTERN SONORA MEXICO

José L. Martinez-Carrillo
Luciano Castro-Espinoza
Marco A. Gutierrez-Coronado
Maritza Arellano-Gil
Catalina Mungarro-Ibarra
Ofelda Peñuelas-Rubio
Instituto Tecnológico De Sonora. 5 De Febrero 818 Sur, Cd. Obregón Sonora México

Abstract

Official planting dates for Southwestern Sonora have been established form January 1st to February 28th. Considering that plants and insects are poikilothermic organisms then planting dates have to be established in relation to the environmental conditions prevailing in the area and not based in calendar days. Since new biotech varieties are coming into the market and weather affects these organisms, thus planting dates have to be reviewed for this region. The objective of this evaluation was to obtain information to define the best planting dates for this area and to evaluate the agronomic response of six biotech varieties: DP 0912, DP 0935, DP 1032, DP 1044, ST 4498, and ST 5458. The experiment was split plot design with four replications of each variety and three planting dates January 21st, February 20th and March 20th of 2012. Degree days (12.8-30 °C) were calculated from January 1st for each planting date. The highest seedcotton yields were obtained from the early planting for all varieties. However, there were several problems including poor and delayed germination, low plant stand, insect and disease damage. Based on the information generated in this evaluation cotton planting dates should be initiated when at least 120 degree days from January 1st are accumulated. The best planting date is considered to be at 200 degree days and the last planting date should be at 350 degree days to reduce problems with rain during harvest time. The cultivar, DP 1044 yielded the highest seedcotton in the three planting dates tested.

Introduction

Cotton is one of the main crops grown during the summer season in southwestern Sonora, Mexico. Official planting dates have been established form January 1st to February 28th. However, growers do not plant cotton during the first 15 days of January. Thus, the realized planting dates are from January 15th to February 28th. In this region, the lowest temperatures of the year are present in January, and cotton planted during this month usually has problems with thrips, damping off, and poor plant stand, it is not uncommon for growers to re-plant. Late planting has risk for the harvest season it coincides with the summer rainy season. For these reasons, it is important to determine the best window for planting this crop. Considering that plants and insects are poikilothermic organisms, in which temperature is one important factor in its growth and development thus planting dates have to be established in relation to the environmental conditions prevailing in the area and not based in calendar days. In Arizona a neighboring area of Sonora optimum planting dates have been developed for different variety maturity groups based on accumulated heat units form January 1st (Silvertooth et al*.,* 1989, Silvertooth et al., 1994, Unruh and Silvertooth 1996, Norton et al., 1997, Silvertooth et al., 1997, Silvertooth et al., 1998, Norton et al., 2002). This approach should be implemented in Sonora in order to reduce complications caused by poorly timed planting dates for cotton. Besides, since new biotech varieties are coming into the market and climate affects its growth and development, planting dates have to be reviewed for this region. The objective of this evaluation was to obtain information to define the best planting dates for cotton in southwestern Sonora, Mexico, based on the ambient and soil temperature required for good seed germination. Also, it was to evaluate the agronomic response of six biotech varieties under the environmental conditions of this cotton production area.

Materials and Methods

The evaluation was established in the 910-Experimental and Transference Field Station of the Technological Institute of Sonora (ITSON). It is located, in the Block 910, of the Yaqui Valley. It has a heavy clay soil. Biotech varieties evaluated were: DP 0912, DP 0935, DP 1032, DP 1044, ST 4498, and ST 5458. The experimental design was a split-plot within a randomized complete block design, with planting dates as main plots and varieties as split

plots. Experimental plots were four rows of each variety, with row separation 0.95 m and 10 m in length. There were four replications of each variety, and three planting dates January 21st, February 20th, and March 20th of 2012. Seed percent germination, vigor, and insect or disease damage were monitored in each planting date. The key pest was boll weevil *Anthonomus grandis*, but early in the season thrips were present and damaged seedling cotton. There were six, five, and six insecticide applications respectively in each planting date; the first was for thrips and all others for boll weevil. Seedcotton was hand collected form each plot and yield per hectare was estimated. Results were statistically analyzed with an ANOVA. Climatic data was obtained from a meteorological station close to the evaluation area. Degree days (12.8-30 °C) were calculated from January 1st for each planting date.

Results and Discussion

Days to plant emergence and percent germination

The first planting date established on January 20th accumulated 119 day degrees since 1 January and required 18 to 25 days for plant emergence. In the DP 0912 variety plants emerged at 18 days whereas DP 0935 and DP 1032 needed 25 days for emergence. This long period was related to cool temperatures present at time of planting. Some growers even re-planted because of low stands. Germination in this planting date ranged from 57% to 76%. Thus growers that want to establish cotton in this planting date will have to use more seed to have a good stand. Thrips and damping off also were present damaging cotton seedlings and an insecticide was applied to control the thrips.

The second planting date established on February 21st accumulated 266 degree days, and required 10 to 13 days to plant emergence. In DP 0912 emergence was observed at 10 days after planting and in DP 0935 and DP 1032 it was observed after 13 days. Germination varied from 54% to 85%. ST 4498 presented the lowest percentage whereas DP 0912 the highest. Similar to the first planting date thrips were present damaging cotton in this planting date. Thus an insecticide was sprayed to control this pest early in the season.

The third planting date was established on March 21st at 416 degree days accumulated since January 1st. Days to emergence varied from 8 to 11. In DP 0912 emergence occurred at eight days, and in DP 1044, ST 4498, and ST 5458 emergence was observed in nine days whereas for DP 1032 and DP 1035 there were required 11 days for emergence. The percentage of emerged plants varied from 60% to 90%. DP 0912 has the highest (90%) and DP 0935 the lowest emergence (60%). In this plating date as in the other two, thrips were present and an insecticide spray was applied. This insect pest is a regional problem mainly because wheat is the main crop planted in the area, and thrips populations move to cotton plantings.

Insect Pests

During the development of this evaluation, there were several insect pests present. General sampling was performed and actions were taken to control them. Early in the season, thrips *Frankliniella* spp. were a problem for cotton plantings as mentioned before. This pest affected the growth and development of the plants attacked. The key pest was boll weevil, which was present since plant emergence and damage was observed since the first cotton squares were available. There were required 5 and 6 insecticide application to reduce its populations. Late plantings were the most affected by this pest.

Seedcotton Yield

Seedcotton yields for each variety evaluated are presented in Table 1. For the first planting date of January 20th DP 1044 had the highest yield and was significantly different from DP 1032 and ST 5458 forming a different group with the other varieties evaluated. Average yield for this planting date was 4234 Kg/ha. In the second planting date of February 21st, DP 1044 showed the highest yield being significantly different from DP 1032 and forming a different group with the other varieties in the trial. The average yield for this second planting date was 3803 Kg/ha. There is a difference of 431 Kg in favor of the first as compared to the second planting date, which represents 10% less seedcotton yield. For the third planting date established on March 21st again, DP 1044 had the highest yield. However, there were no significant differences among the varieties evaluated according to ANOVA, even though, there was a difference of 784 kg between this variety and DP1032 which had the lowest seedcotton yield. Average yield for this planting date was 3071 kg/ha, which represents 19% less seedcotton compared to the second planting date and 27% less than the first planting date.

The ANOVA for planting dates indicated significant difference among them. The January planting day had the highest seedcotton yield, followed by the second and finally the third one being different each one of the other.

Table 1. Seed cotton yield per hectare in six Biotech cotton varieties evaluated in Southwestern Sonora, Mexico in the 2012 season.

Planting Date	January 20th	February 21st	March 21st
Day Degrees	119	266	416
Variety	Kg/ha	Kg/ha	Kg/ha
DP 1044	4739 a	4139 a	3427 a
DP 0935	4269 ab	3682 ab	2924 a
DP 0912	4264 ab	3847 ab	3342 a
ST 4498	4192 ab	3806 ab	2997 a
DP 1032	4011 b	3432 b	2679 a
ST 5458	3927 b	3912 ab	3056 a
Average Yield	4234 a	3803 b	3071 c

Treatment means within columns or within the row for average yield by planting date, followed by the same letter are not significantly different at P≥ 0.05.
Degree Days 12.8-30 °C

Summary

The highest seedcotton yield was obtained in the early planting (January 20th) for all varieties. However, in this planting date, there were present several problem including poor and delayed germination, low plant stand, insect and disease damage. According to the information generated in this evaluation cotton planting dates should be initiated at least when 120 degree days (12.8-30 °C) from January 1st have accumulated. The best planting date is considered to be at 200 degree days and the last planting date should be at 350 degree days, to reduce risks of harvest complications with summer rains at the harvest time. DP 1044 was the variety with the highest seedcotton yield in all three planting dates. Boll weevil was the key pest during this cotton season and up to six insecticide applications were used to control this pest. Thrips damaged all three planting dates.

Acknowledgements

We gratefully acknowledge the financial support provided by Fundación Produce Sonora to obtain information for cotton producers in Southwestern Sonora. Also, we appreciate the valuable assistance from the personnel at the CETT-910 and support of authorities of ITSON to carry out these evaluations.

References

Norton, E. R., J. C. Silvertooth, and P. W. Brown. 1997. Evaluation of date of planting effects on crop growth and yield for Upland and Pima cotton, Marana, 1995. p. 41-48. Cotton, Univ. of Arizona. Rep. P-108.

Norton, E. R., L. J. Clark, and E. W. Carpenter. 2002. Planting day by variety evaluation in Graham County. Arizona Cotton Report, The University of Arizona College of Agriculture and Life Sciences, index at http://ag.arizona.edu/pubs/crops/az1283

Silvertooth J. C., J. E. Malcuit, D. R. Howell, and P. Else. 1989. Effect of date of planting on the lint yield of several cotton varieties planted at four locations in Arizona, 1988. p. 69-72. Cotton, Univ. of Arizona Rep. P-77.

Silvertooth J. C., P. W. Brown, E.R. Norton, and B. L. Unruh. 1994. Evaluation of date of planting on the yield of several Upland varieties at Marana, 1993. p. 26-32. Cotton, Univ. of Arizona Rep. P-96.

Silvertooth J. C., P. W. Brown, E. R. Norton, and B. L. Unruh. 1997. Evaluation of planting date effects on crop growth and yield for Upland and Pima cotton, 1996. p. 49-61. Cotton, Univ. of Arizona Rep. P-108.

Silvertooth, J. C., E. R. Norton, and P. W. Brown. 1998. Evaluation of planting date effects on crop growth and yield for Upland and Pima cotton, 1997. Cotton, Univ. of Arizona Report Series P-112: 20-33.

Unruh, B. L., and J. C. Silvertooth. 1996. Comparisons between an Upland and a Pima cotton cultivar: I. Growth and yield. Agron. J. 88:583-589.