CONTROLLING LATE-SEASON CORN PESTS BY MANAGING CULTURAL VARIABLES: RESULTS AFTER THREE YEARS OF STUDY[1]

by
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SUMMARY

Spider mite pressure was reduced by using short-season corn, but corn borer pressure was not. Apparently, hybrid corn borer susceptibility is more important than the cultural variables tested. Water use for short-season hybrids was reduced, but the cost savings did not make up for the reduced yield potential. The economic returns were higher for full-season corn than for short-season corn. Short-season corn gave better returns than sorghum under full irrigation, but under limited irrigation, sorghum sometimes gave better returns than corn (1 of 2 years).

INTRODUCTION

Corn borers and spider mites are serious pests of corn in southwest Kansas and pesticides often are used to control them. Because both of these pests occur late in the season, it might be possible to plant short-season (95-105 day) corn hybrids early enough to avoid these pests. The following study was conducted to evaluate the feasibility of planting early and planting short-season hybrids to avoid pest infestations.

PROCEDURES

This experiment was conducted in SW Kansas under a modified LEPA center pivot in 1993, 1994 and 1995. The four-factor experiment was arranged in a randomized complete block design, with the pesticide treatment as a subplot of the 12 main plots. The main plots were 12 rows by 70 ft and were replicated four times. The main factors were: 1. <u>three crops</u>; full-season corn (FS corn), short-season corn (SS corn), medium-season sorghum; 2. <u>two planting dates;</u> early and late; 3. <u>two water regimes</u>; minimum and full water; 4. <u>four pesticide treatments</u>; a) untreated, b) miticide, c) corn borer insecticide, and d) miticide and corn borer insecticide. The corn hybrids were selected to differ in maturity by about 20 days (118 and 97 days), but matched in 2nd generation corn borer susceptibility. The full-season corn (FS corn) was P3162, the short-season corn (SS corn) was P3751, and the medium-season sorghum was DK-56. The two planting dates were 7 and 21 May for corn and 21 May and 15 June for sorghum in 1993; 18 April and 18 May for corn and 10 May and 6 June for sorghum in 1994; and 12 April and 22 May for corn and 2 and 22 June for sorghum in 1995. The plots were irrigated using LEPA nozzles in the flat spray mode to meet 100% or 70% of total crop water requirement based on calculated evapotranspiration (ET) measurements (100% ET or 70% ET). The miticide Comite was applied at 3 pt/acre and the corn borer insecticide Lorsban was applied at 2 pt/acre in 1993 and Ambush was applied at 12.8 oz/acre in 1994 and 1995.

Arthropod populations were evaluated weekly on four plants in each plot (or subplot after pesticides were applied). The weekly mite counts were used to calculate mite-days as a measure of the season-long spider mite pressure. Damage by 2nd generation corn borer and corn earworm was determined by dissecting 15 consecutive plants in each subplot. Forty row-ft were hand harvested in each subplot to calculate yield.

Economic returns were calculated above operating and machinery ownership cost, assuming 100% of income and 100% of costs. Seed, insecticide, and irrigation pumping expenses were based on actual inputs. Income was based on actual yield multiplied by the relevant price during the week of harvest. All other operating costs were based on KSU Farm Management Guides.

The data were analyzed as a four-factor test with insecticide treatment split on the three agronomic factors. Means were separated using LSD (p = 0.05).

RESULTS AND DISCUSSION

Spider mite populations were low in 1993 and moderate in 1994 and 1995, reaching 210, 450, and ca 500 per plant in the respective years. Spider mite pressure expressed as mite-days was significantly higher in the limited irrigation treatments in all three years, but the interaction with planting date was different in each year (Figs. 1-3). When hot weather occurred late in the season as in 1994 and 1995, mite pressure was higher in the second planting. Water stress is known to favor development of spider mite populations. Mite pressure was higher in full-season than in short-season corn in 2 of the 3 years (Fig. 4). Mite pressure in sorghum was lower than in corn in 2 of 3 years, but sorghum in 1995 was late maturing and accumulated many mite-days after corn had reached maturity. Mite pressure differed for the two planting dates, but this response was different for each year (Fig. 5). Mite pressure was higher in the second planting in the years with late-season hot weather, 1994 & 1995. Mite pressure was highest in the subplots treated for corn borer (Fig. 6).

European corn borers (ECB) were present in moderate numbers (up to 4.88 larvae per plant) in 1993 and 1994, but in low numbers (up to 0.4 larvae per plant) in 1995 (Figs. 7-9). Corn borer tunneling measured in centimeters (cm). (largely from ECB) was used as an index of corn borer activity. Contrary to expectations, corn borer tunneling was significantly higher in the short-season corn than in the full-season corn. We had expected that short-season corn would finish silking before the moth flight and, therefore, would be at a less favorable growth stage. This did occur in 2 of the the 3 years. The higher tunneling in short- season corn may have been due to this hybrid being more susceptible (in spite of the seed company ratings that show the two hybrids being equal in resistance to second generation corn borer). Southwestern corn borers (SWCB) were present in low numbers.

Corn earworm damage to the grain in the ear was significantly higher in the late plantings of corn (2 of the 3 years) (Fig. 10). Up to 5.21 % of the grain was lost to corn earworms in the late planting of corn.

Total water use (rainfall + applied irrigation +soil water change) in 1994 was nearly the same in first and second plantings. Total water use of full- season corn averaged 2.78 and 2.69 inches more than that of

Fig. 1. Planting date and watering effects on mite-days, Southwest Research-Extension Center, 1993.

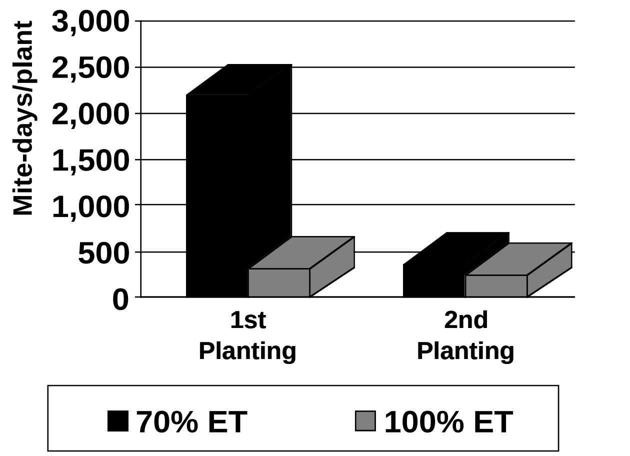


Fig. 2. Planting date and watering effects on mite-days, Southwest Research-Extension Center, 1994.

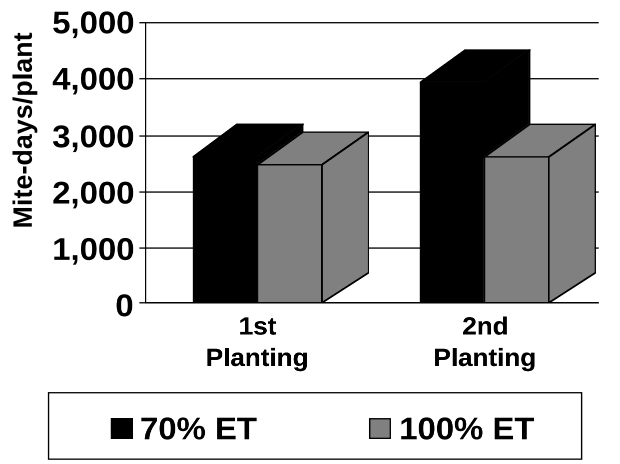


Fig. 3. Planting date and watering effects on mite-days, Southwest Research-Extension Center, 1995.

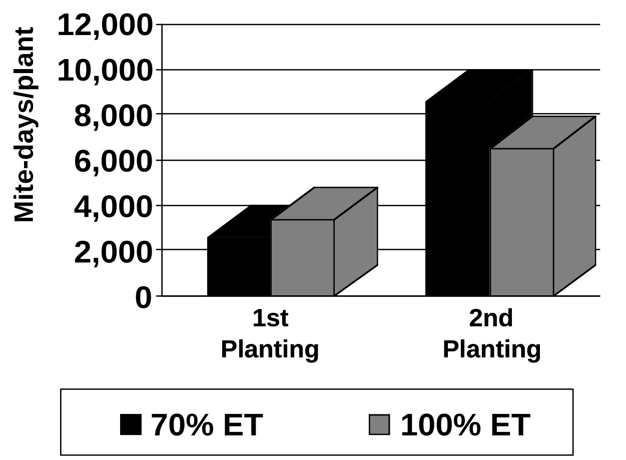


Fig. 4. Effects of three crops on mite-days, Southwest Research-Extension Center.

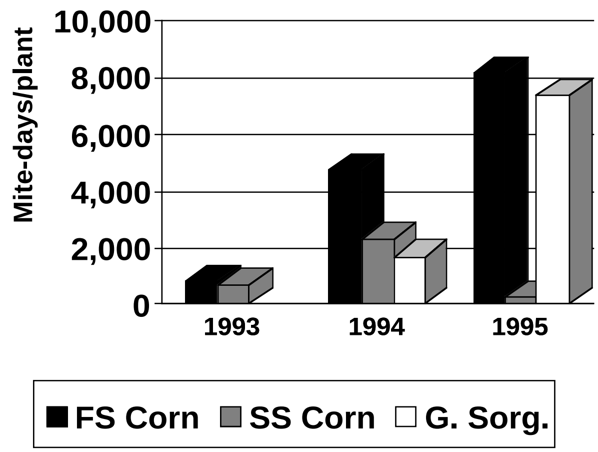


Fig. 5. Planting date effects on mite-days, Southwest Research-Extension Center.

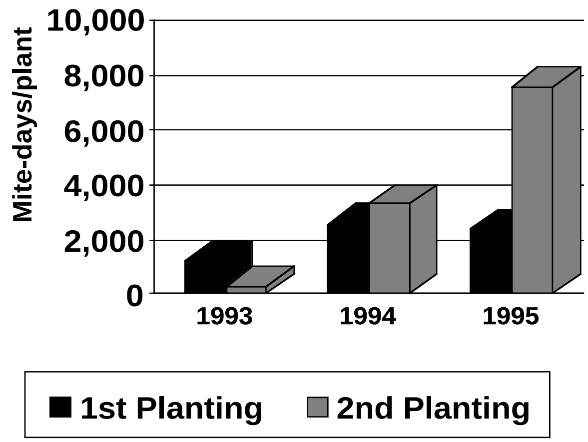


Fig. 6. Effects of two pesticides on mite-days, Southwest Research-Extension Center, 1994.

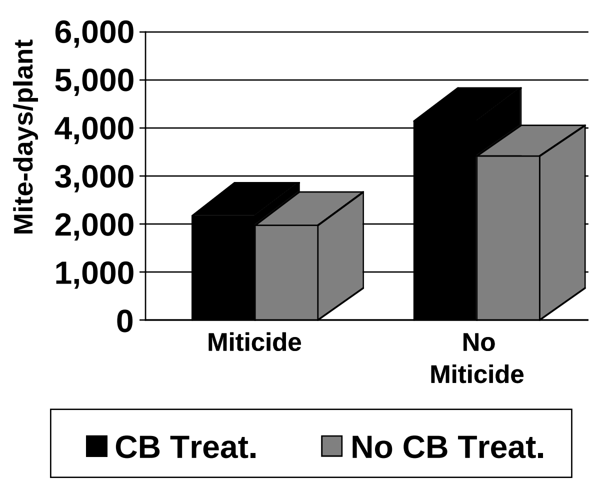


Fig. 7. Planting date and crop effects on corn borer tunneling, Southwest Research-Extension Center, 1993.

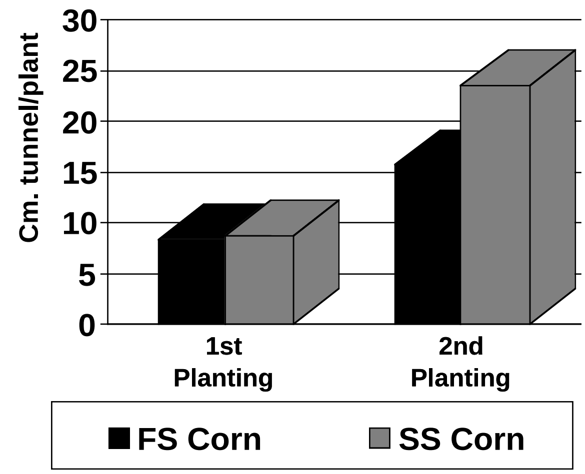


Fig. 8. Planting date and crop effects on corn borer tunneling, Southwest Research-Extension Center, 1994.

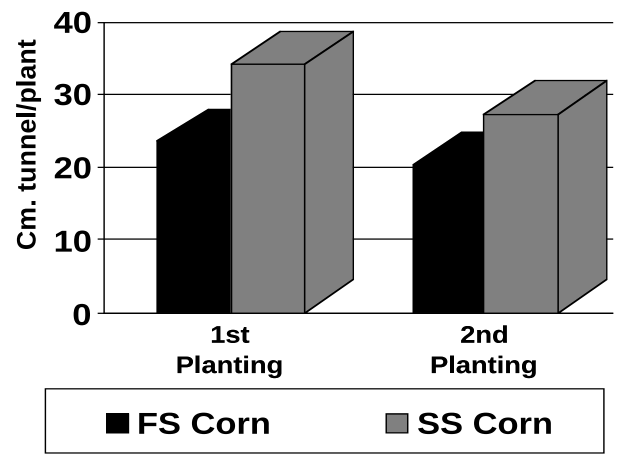
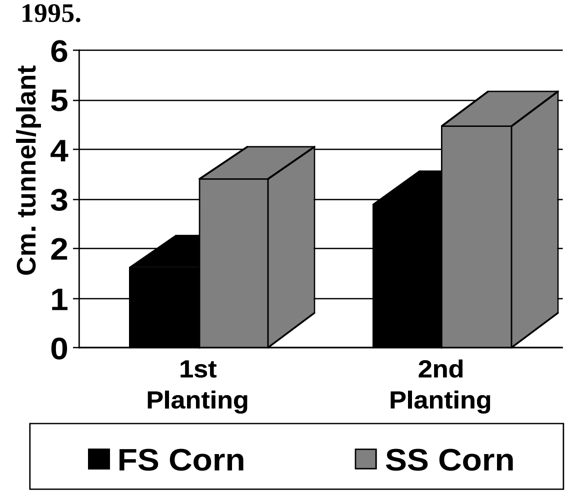
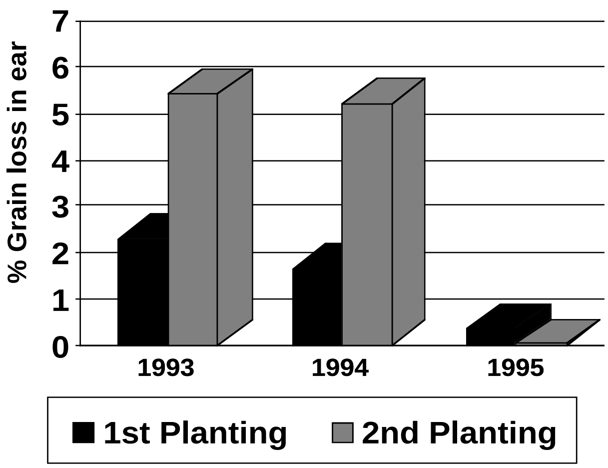


Fig. 9. Planting date and crop effects on corn borer tunneling, Southwest Research-Extension Center, 1995.



short-season corn for first and second plantings. The fully irrigated corn used an average 6.4 and 4.92 inches more total water than the limited irrigation corn for first and second plantings, respectively. The fully irrigated sorghum used an average of 4.35 inches more total water over limited irrigation sorghum. Total water use efficiency ranged from 5.96 bu/acre-inch for early planted sorghum to 8.04 bu/acre-inch for early planted short-season corn.

Fig. 10. Effects of planting date on corn earworm ear damage, Southwest Research-Extension Center.



Grain yield in the best plots averaged 163, 169, and 128 bu/acre for the 3 respective years (Fig. 11). Full-season corn yielded more than short-season corn and sorghum, and crops that received full irrigation yielded more than crops that received limited irrigation.

The best economic returns were for full-season corn receiving full irrigation: $167, 145, and 180 per acre for the respective years (Fig. 12). The best economic returns for short-season corn occurred with full irrigation; $144, 159, and 131 per acre for the respective years. In sorghum, the best economic returns were under limited irrigation in 2 of 3 years ($96 and 43 per acre), but in the good year, it was under full irrigation ($123 per acre).

Fig. 11. Effects of crop and watering on grain yield, Southwest Research-Extension Center.

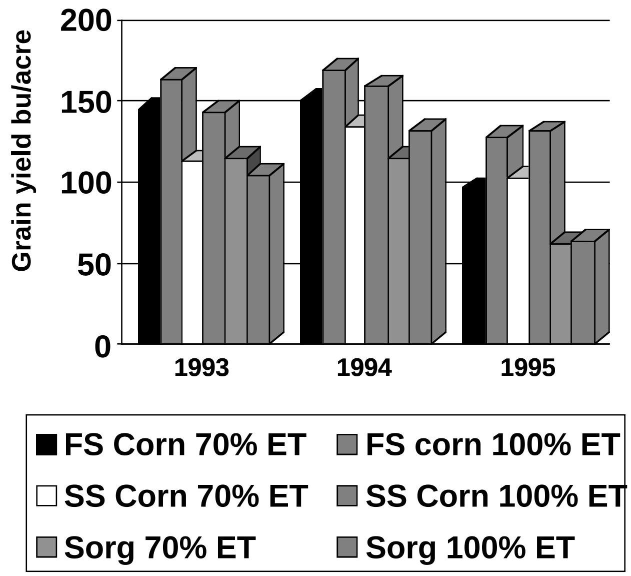
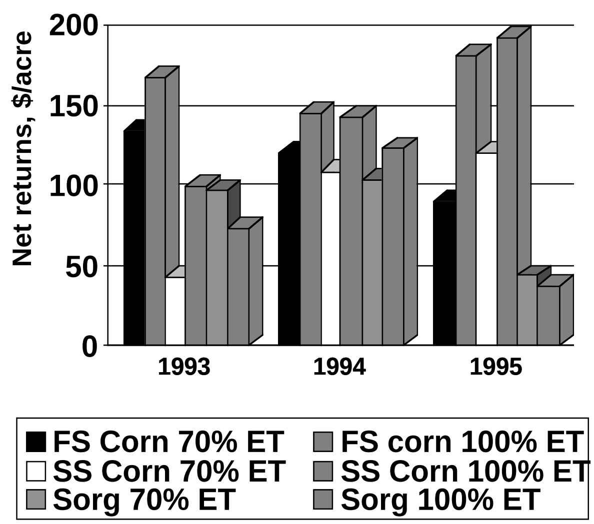


Fig. 12. Effects of crop and watering on economic returns, Southwest Research-Extension Center.



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