Early Planting Reduces Fall Armyworm Problems in No-till Tropical Corn

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Abstract

The 1989 tropical corn *[Zea mays* (L.)] double-crop growing season in north Florida was characterized by excessive rainfall from 21 May to 27 June, resulting in late planting of most of the tropical corn and the subsequent infestation of fall armyworm [*Spodoptera frugiperda* (J.E. Smith)]. The objective of this note is to document the effect of late planting and fall armyworm injury on selected tropical hybrids. In 1989, two fields were early planted to X-304C (after harvesting wheat) on 26 May and 4 June in a moderate energy input system. Other tropical corn plantings were delayed until after 29 June.

Early planted X-304C yielded 61 bu/A at North Florida Research and Education Center and 65 bu/A in the farmers field. Fall armyworm was not a severe problem in either early planted field. Lower yields were more a function of excess soil water, nitrogen leaching, and oxygen stress in the corn plants. Fields of X-304C planted after 29 June were heavily attacked by fall armyworm. The highest farmer field yields were 30 bu/A. The poorer fields were plowed under. Pioneer X-304C in a tropical corn hybrid yield trial, planted 29 June 1989, yielded 42 bu/A. This experience suggests that planting after 24 May and prior to 10 June could possibly allow X-304C to escape armyworm injury and reduce crop risk.

Introduction

Farmers in the Southeast became interested in tropical corn [*Zea mays* (L.)] in 1984 and planted about 5,000 A predominately Pioneer Brand X-304C hybrid [coded X-304C]. By 1988, plantings had increased to about 10,000 A with good yields and in 1989 approximately 40,000 A were sown to tropical corn. A moderate energy input system for tropical corn was described by Teare, et al. (1989) based on four years research growing X-304C when planted after winter wheat *[Triticum aestivum* (L.)] (harvested around 24 May each year).

Overman and Gallaher (1989) conducted a date of planting study in 1988, where X-304C was grown in a high energy input system (no-till planting at 34,400 plants/A, 270 lb N/A and irrigation) with three planting dates (Mar, May, Aug). These authors reported yields of 150, 114, 78 bu/A for the three respective planting times and attributed yield reduction to differences in temperature and day length. Increased pest problems were only mentioned. Bustillo and Gallaher (1989) state "insect control needs further research [on tropical corn], to determine the most effective and economical control program." Experience in South America (J.E. Funderburk, 1988, personal communication) indicated that IPM practices must be adhered to for control of lesser cornstalk borer [*Elasmopalpus lignosellus* (Zeller)] and fall armyworm [*Spodoptera frugiperda* (J.E. Smith)]. Few insect or disease problems were experienced during 1985 to 1988, but the 1989 season was different.

Fall armyworm is a polyphagous, highly mobile insect that normally arrives in North Florida by late-May. The population probably originates each spring from continuous breeding populations in southern latitudes (Barfield, et al., 1980). The erratic occurrence of fall armyworm "outbreak years" and irregular distribution of heavy infestations indicate that fall armyworm is a "boom or bust" pest. The last "boom" year in the southeastern US was in 1977. Fall armyworm larva developing on corn usually has six larval instars requiring a period of 21 days. However, the life cycle is temperature dependent and can range from 66 to 18 days at temperatures of 64 to 95°F (Barfield et a1.,1978).

Fall armyworm eggs laid on leaves in the whorl, generally escape most natural predators, but egg masses laid after the tassel has emerged are subject to greater predation (Martin et aL.1979). Natural enemies have been observed to move sequentially through crops

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coupled by pest flows and reduce population densities of fall armyworm in a very short period (Martin et a1.,1979).

Many practices are employed to plant, maintain, and harvest any crop. Pest injury avoided by producing a crop at times when pest populations are in nondamaging stages or at low population levels is recognized (Herzog and Funderburk, 1986).

Our experiences in 1989 with tropical corn indicates a cultural practice that improves the wheat-tropical corn doublecrop system proposed by Teare et al. (1989) in relation to planting and fall armyworm. The objective of this note is to document our observations during 1989 on the effect of early and late planting on the susceptibility of X-304C to fall armyworm and to suggest a planting window after wheat harvest (24 May) where tropical corn scems to escape the fall armyworm in a production environment.

Materials and Methods

The fall armyworm observations reported in 1989 are from an on-going tropical corn research program at the North Florida Research and Education Center (NFREC) and surrounding tropical corn fields in Gadsden county. The soils are a Norfolk sandy loam soil [fine-loamy, siliceous, thcrmic, Typic Kandiudult]. All plantings were grown under the moderate energy input system: no-till planting at a plant population of 18,000 plants/A 120 Ib N/A [20 Ib/A as starter fertilizer at planting and 100 Ib/A when the corn was 12 inches tall (approximately 31 days after planting)], and no irrigation. The major difference from previous years was rainfall, date of planting, and incidence of fall armyworm. Rainfall data was collected at the NFREC weather station located approximately 200 to 800 yd from the tropical corn experiments. The early planted experiment at the NFREC was planted 26 May 1989 to X-304C (four rcplications in a randomized block design). The 1989 early planted farmer field was planted 4 June eight miles west of Quincy. The excessive rainfall from 21 May to 27 June delayed other tropical corn plantings and flooded poorly drained areas. About half of the early planted farmer field was not harvested because of excessive soil-water causing oxygen stress in tropical corn. Only the yield of the well-drained area is given. The 1989 late planted (29 June) study was a tropical corn hybrid yield trial (four replications in a randomized block design) containing X-304C. Grain yields were corrected to 15.5 % moisture content.

Results and Discussion

Excessive rainfall, delayed planting, and fall armyworm injury were the major differences that we observed between the years of 1989 and 1985 through 1988. Rainfall from 21 May to 27 June 1989 was 20 inches. Rainfall during the tropical corn growing season of 1989 can be compared with the rainfall for 1988 (Fig. 1). Only two fields of X-304C were planted early in North Florida that we knew of, the rest were delayed until after 27 June. The yield of the early planted tropical corn in 1989 was 61 bu/A at NFREC and 65 bu/A in the farmers field compared to 94 bu/A yield average for 1986, 1987, and 1988 at NFREC Fall armyworm damage in the 1989 early planted X-304C was only noticeable on leaves about the same as observed in 1985 to 1988. The 1989 late planted, fall armyworm infested X-304C (planted 29 June) yielded 42 bu/A. Therefore, we have suggested a window between 24 May and 10 June where fall armyworm damage is at a low risk.

Under severe infestations as observed in 1989 late planted tropical corn, the fall armyworm will skeletonize leaves in early instars or produce ragged holes in later instars and eat the tassels and silks. We have not observed much fall armyworm damage on the ears or stems of the ears of X-304C, but grain fails to develop from lack of pollination. Percent tasseling and silking curves for early planted X-304C in relation to day of year for 1988 show little observable fall armyworm damage (Fig. 2), but percent tasseling and silking curves for late planted X-304C in 1989 show extensive fall armyworm damage. The 1989 change in tasseling pattern was observed on 240 day of year (28 Aug) when fall armyworm consumption of tassels made it appear that tasseling had ceased, followed by a slight increase and then a negative slope at 250 day of year (7 Sept). The consumption of silks in 1989 reduced the silking slope at 244 day of year and it became negative after 250 day of year. This indicates that fall armyworm populations were at their highest levels during tasseling and silking. A very susceptible stage of growth for X-304C in relation to grain yield.

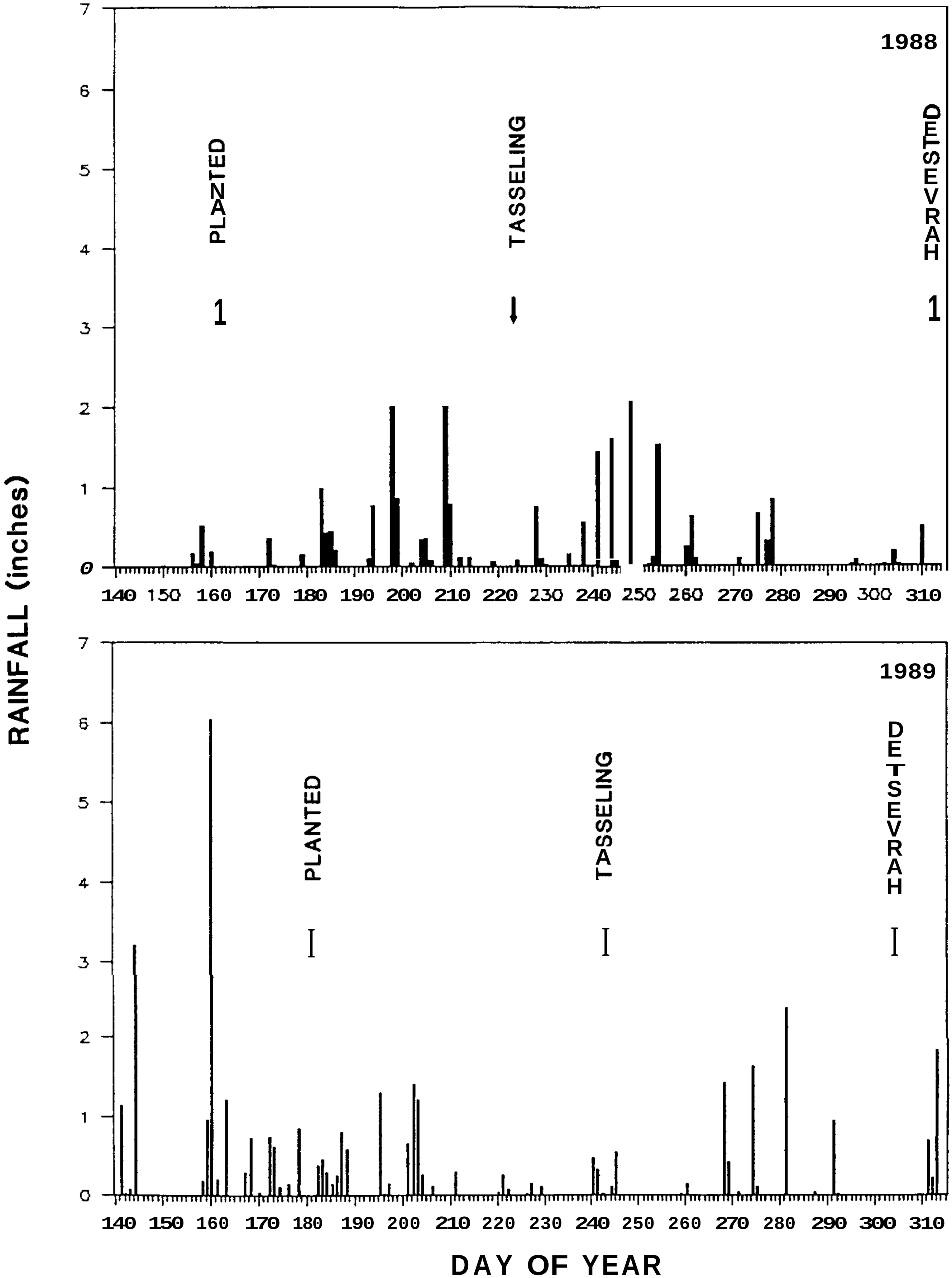

Figure 1. Rainfall, planting date, 50% tasseling, und harvest date during 1989 and 1988 tropical corn growing seasons in relation to day of year.

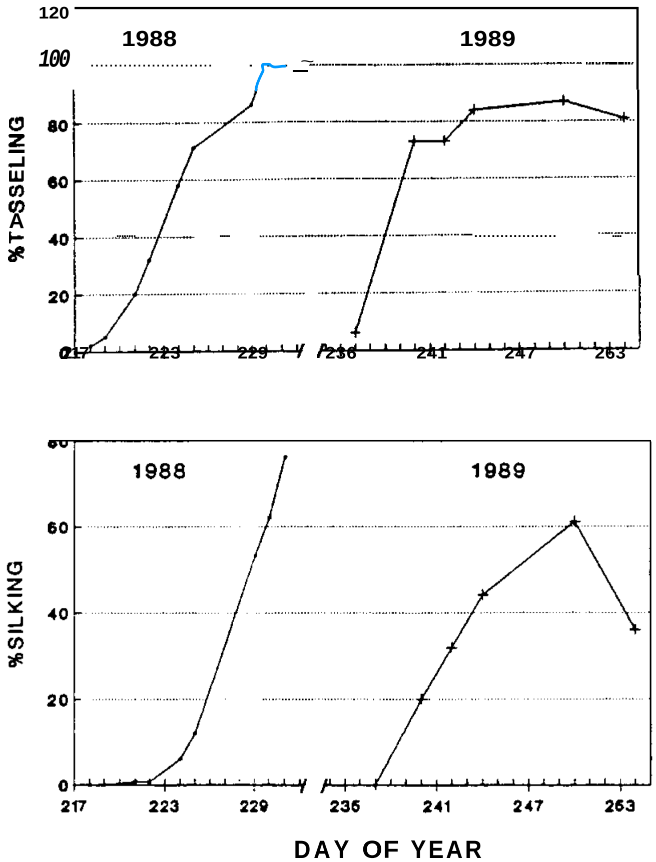

Figure 2. Comparison of tasseling and silking for 1989 in relation to 1988. Negative slope after 250 day of year (7 Sept) indicated time of severe fall armyworm damage in 1989.

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