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Effects of Conventional vs. Conservation Tillage Systems on Population Dynamics of Boll Weevil (Coleoptera: Curculionidae) in Dryland Cotton[1]

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ABSTRACT

Studies were conducted during 2000-2001 to determine the effects of a conservation tillage system in dryland cotton on soil surface temperatures, soil moisture, plant canopy structure, light interception, timing of fruit set, and how these factors affect crop yield and boll weevil, *Anthonomus grandis grandis* Boheman, populations compared with a conventional moldboard tillage system. Soil moisture at the 10-40 cm depth was 1.6-1.9-fold higher in the conservation tillage treatment than in the conventional tillage treatment throughout the first 90 days of crop growth due to the decreased evaporation from crop residue mulch. The conventional tillage cotton treatment had a greater water stress, causing plants to shed squares and bolls. Cotton plants in the conventional tillage treatment allocated more resources into vegetative growth while the conservation tillage cotton responded by fruiting at a higher rate. At 110 days after planting the conservation tillage cotton had an average height of 42.4 cm per plant versus 63.0 cm in conventional tillage, and the number of leaves per plant was 32.4 versus 51.7, while fruit numbers were 13.0 versus 7.1, respectively. Increased plant height and number of leaves in the conventional tillage provided significantly more light interception and shading of the soil surface. In the conservation tillage cotton, 60.2% of the incoming sunlight reached the soil surface, while the conventional tillage had only 36.2%. Soil temperatures between the rows in conservation tillage cotton were 8-11º C higher than in conventional tillage and significantly influenced boll weevil mortality in infested squares shed from plants. The number of boll weevils per plant was 2.3 to 3.4-fold higher in the conventional tillage compared with the conservation tillage. Trap counts of weevil populations followed a similar trend with 1.6 to 2.8-fold more weevils in the conventional tillage compared to conservation tillage. The mortality of boll weevils in fallen, naturally infested squares, and in cohorts of laboratory-infested squares collected from the middle of the rows was 1.5-1.8-fold higher in the conservation tillage field than in the conventional. Percent punctured squares by boll weevils during the growing season averaged 2.1-fold higher in conventional than in conservation tillage fields.

RESUMEN

Se realizaron estudios durante el 2000-2001 para determinar los efectos de un sistema de labranza de conservación en algodón de zonas secas sobre la temperatura de la superficie del suelo, la humedad del suelo, la estructura de la canopia de la planta, la intercepción de la luz, el tiempo de fructificación y como estos factores afectan el rendimiento del cultivo y a las poblaciones del picudo del algodón, *Anthonomus grandis grandis* Boheman, en comparación con un sistema convencional de labranza. La humedad del suelo, entre los 10 y 40 cm de profundidad fue 1.6 - 1.9 veces mayor en el tratamiento de labranza de conservación que en los tratamientos convencionales de labranza durante los primeros 90 días de crecimiento debido a la menor evaporación causada por el acolchado de residuos del cultivo. El tratamiento de labranza convencional presentó mayor estrés hídrico, ocasionando que las plantas tiraran las bracteas y las cápsulas. Las plantas de algodón en el tratamiento de labranza convencional dirigieron mas recursos hacia el crecimiento vegetativo mientras que bajo el sistema de labranza de conservación, las plantas respondieron con una taza mayor de fructificación. A los 110 días después de la siembra, el algodón bajo labranza de conservación presentó una altura promedio de 42.4 cm por planta en comparación

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con 63 cm presentada en el sistema de labranza convencional, y el número de hojas por planta fue 32.4 vs 51.7, mientras que la cantidad de frutos fue 13 vs 7.1 respectivamente. El aumento en talla y en el número de hojas en el sistema de labranza convencional permitieron un significativo aumento en la intercepción de la luz y del sombreado de la superficie del suelo. En el algodón bajo labranza de conservación, el 60.2 % de la luz alcanzó la superficie del suelo, mientras que en el algodón bajo labranza convencional solamente el 36.2% lo hizo. Las temperaturas del suelo entre los surcos en el sistema de labranza de conservación fueron 8 a 11º C mas altas que en la labranza convencional e influyeron significativamente en la mortalidad del picudo en las bracteas infestadas desprendidas de las plantas. El número de picudos por planta fue 2.3 a 3.4 veces mayor en el sistema de labranza convencional en comparación con el sistema de labranza de conservación. Los conteos de las poblaciones del picudo siguieron un patrón similar presentándose 1.6 a 2.8 veces mas picudos en la labranza convencional que en la labranza de conservación. La mortalidad de los picudos en las bracteas caídas infestadas naturalmente, y en las bracteas colectadas en el centro de los surcos e infestadas en el laboratorio fue 1.5 a 1.8 veces mayor en el campo con labranza de conservación que en el de labranza convencional. El porcentaje de bracteas perforadas por los picudos durante la estación de crecimiento fue en promedio 2.1 mayor en los campos con labranza convencional que en los campos con labranza de conservación.

Additional index words: mortality, conventional tillage, conservation tillage, boll weevil

Cotton production in the United States has traditionally been plagued by serious losses to insect pests, the most important of which is the boll weevil, *Anthonomus grandis grandis* Boheman. During 2000, an estimated 838,900 bales were lost to boll weevil alone, and total costs for boll weevil exceeded $388 million (Williams 2001). Currently, the use of conventional insecticides is the predominant cotton protection strategy for reduction of boll weevil populations and their damage where the boll weevil is still an economic pest. Concerns regarding environmental and economic sustainability have escalated the need for a more holistic boll weevil management strategy. Considerable emphasis has been placed on cultural control of cotton insect pests (Walker 1984, Bradley et al. 1986, Walker and Smith 1996). Cultural strategies provide a strong base for ecologically orientated pest-management systems. Tillage operations are among important cultural control techniques. Tillage and subsoiling effects upon cotton yield and soil health have been reported (Stevens et al. 1992, Smart and Bradford 1996, 1998, 1999, and 2000). Tillage operations modify soil habitats where many insect pests (Troxclair and Boethel 1984) and beneficial insects (McPherson et al. 1982, Funderburk et al. 1988) reside during, at least, part of their life cycles. These modifications can manipulate field conditions to minimize pest problems (Herzog and Funderburk 1986). However, little is known about the effects of tillage systems on boll weevil populations in dryland cotton. The objectives of this study were to determine the effects of conservation and conventional tillage systems on soil surface temperatures, soil moisture, plant canopy structure, light interception, timing of fruit set, and how these factors affect boll weevil populations throughout the growing season.

MATERIALS AND METHODS

Studies were conducted in commercial conventional and conservation tillage fields near Hargill, Hidalgo County in the Lower Rio Grande Valley [LRGV] of Texas during 2000-2001. Both fields had grain sorghum as the previous crop. The conservation tillage grain sorghum was chemically terminated prior to sorghum harvest and crop residue was left standing until planting of cotton the following year. An application of glyphosate was applied once in the fall to the sorghum and again in the spring prior to planting cotton. Cotton was planted using a no-till planter into existing grain sorghum stubble. An adjacent field was farmed using a conventional moldboard plow and disk system where essentially all of the crop residue was destroyed or incorporated into the soil. The conventional tillage field had the sorghum stubble mechanically shredded, and the field was disced twice with a heavy tandem disc after sorghum harvest and three more discing operations were

Table 1. Plant characteristics in two tillage systems (2000 year)

Date of observation	Height of cotton plant, cm[1]		Leaves per cotton plant[2]	
	Conservation	Conventional	Conservation	Conventional
5.05	43.4±2.0a	48.1±1.7a	25.7±2.1b	38.3±3.6a
5.11	43.7±2.3b	54.4±1.5a	27.1±1.6b	42.1±2.4a
5.18	39.0±2.3b	54.2±1.5a	32.7+2.6b	45.1+1.6a
5.24	48.3±1.3b	55.4±2.0a	35.1+1.7b	54.2+2.6a
6.01	50.4±1.8b	61.2±1.8a	38.5+4.3b	60.6+3.9a
6.08	53.6±1.8b	71.8±3.2a	43.6+1.4b	72.9+3.5a
6.21	57.8±2.0b	77.2±4.0a	46.0±3.0b	70.6+4.4a
6.28	66.3±2.4b	76.5±2.8a	47.5+2.3b	73.1+3.8a

[1, 2]Pairs of mean±SEM within a row followed by the same letter are not significantly different (*t*-test, $P>0.05$).

performed in the fall to terminate weeds which survived after rainfall. The size of each field was about 4 ha. Soil type was a Willacy fine sand with organic matter content in the top 6 inches measured at less than 0.2%. Cotton (variety DPL 451RR) was planted on March 1, 2000 and February 27-28, 2001 for all fields on 76.2 cm row spacings. Seeding rate, fertilizer, insecticidal applications and other production factors excluding weed management were the same for each paired tillage system. In the conservation tillage field, weeds were controlled with herbicides while in the conventional tillage field weeds were controlled mechanically and chemically. All observations and measurements were conducted weekly beginning 60-70 days after cotton was planted until defoliation.

Survival of boll weevils in naturally infested fallen fruit. Squares were collected from the soil surface from 10 randomly selected edge and middle sites (5 m^2 each) in conservation tillage and conventional tillage fields. In addition, the fruit under cotton plants and from the middle of the row were counted and separated. All samples were returned to the laboratory to be dissected and examined for boll weevil infestation and survival.

Survival of boll weevil cohorts in the different tillage systems. Adult boll weevils were reared from infested squares collected from commercial cotton in the LRGV during the summers of 2000 and 2001. The infested squares were maintained in an environmental chamber at 28±1º C and 65 % RH with a photoperiod of 14:10 (L:D) h. On the day of eclosion, adults were sexed using the method of Sappington and Spurgeon (2000), and males were marked with red paint on the right elytron. Mixed- sex groups of 20 weevils (10 males and 10 females) were held in 15-cm diameter Petri dishes for five days after eclosion under the conditions described above. Dishes were ventilated by a 4-cm diameter circular screened hole in the lid. Each dish contained a cotton wick saturated with water and was provided daily with uninfested, greenhouse- grown squares 7-9 mm in diameter. At the end of the five-day conditioning period, each female was placed into a Petri dish with five squares 7-9 mm in dia. After 24 h, all squares with 1-2 apparent oviposition punctures were placed into screen cages (20x20x20 cm) within an environmental chamber to allow development under the conditions described above. When 75% of the larvae in subsamples reached 2nd or 3rd instars (evaluated by head capsule width; Parrott et al. 1970), the squares were divided into cohorts of five infested squares and were each tied by a knot to a 10-cm string. Each infested square (labeled 1 to 5) was attached at equal distances (19 cm) along the length of a cord for a total of 5 squares per cord. Each cord was placed on the soil surface perpendicular to the rows and the cord was tied at each end to the base of a cotton stalk in adjacent rows. Thus, squares labeled 1 and 5 were located directly beneath the cotton canopy, while squares numbered 2 and 4 were located 19 cm to the left and right, respectively, on the furrow, and square number 3 was directly in the middle of the furrow. Beginning 90 days after planting and terminating at defoliation, 10 cords were placed at random in each field each week and recovered after 7 days. The squares were returned to the laboratory and dissected to determine the fate of the infesting weevils.

Table 2. Effects of different tillage systems on square punctures by boll weevil (2001 year)[1]

	Percentage of punctured squares	
Recorded date	conservation	conventional
5.31	4.0 ± 1.6a	7.0 ± 2.6a
6.06	0b	13.0 ± 1.9a
6.13	7.0 ± 4.7a	11.0 ± 3.0a
6.20	4.0 ± 1.6b	14.0 ± 2.6a
6.27	18.0 ± 4.8b	38.0 ± 2.6a
7.03	20.0 ± 1.6b	47.0 ± 3.0a
7.10	33.0 ± 3.4b	75.0 ± 1.9a

[1] Pairs of mean±SEM within a row followed by the same letter are not significantly different (*t*-test, *P*>0.05).

Table 3. Net returns for cotton production (per ha) with conservation and conventional tillage systems (2000 year).

Product	Conservation tillage	Conventional tillage
Seed	$83.2	$48.5
Lint	$506.4	$295.8
Total product costs/ac	$589.7	$344.3
Total expenses/ac	$580.4	$589.7
Net returns/ac	$9.3	$(-245.4)

Boll weevil mortality assessment. Boll weevil mortality was assessed using the method of Sturm and Sterling (1986) and Sterling et al. (1990). The exterior and contents of squares and bolls were examined under a dissecting microscope. Boll weevil larvae that died from heat were characterized by a failure to move when prodded, squeezed, or pressed, milky white to gray-brown discoloration, and loss of resiliency in the integument with slight shriveling. The criteria used to determine death by heat for pupae were the same, except they took longer to become discolored. Squares with a circular hole ca. 1 mm in diameter indicated that the weevil survived to the teneral adult stage and successfully emerged from the fruit. Holes made by ants can be the same size as weevil exit holes but were usually irregularly shaped. Boll weevil larvae that died from desiccation were characterized by a failure to move, but retained the same color as in live specimens.

Plant phenology. Height, number of leaves, squares, and bolls were measured on plants from 20 randomly selected 1 m^2 areas of each field throughout the growing season.

Boll weevil density and damage. The number of live weevils per plant was estimated from 60 randomly selected plants by beat bucket samples (Knutson and Wilson 1999). Number of weevils were evaluated also from pheromone traps placed every 100 feet around the perimeter of each field. Percent boll weevil damage (feeding and egg punctures) was evaluated from 100 randomly selected squares by visual estimation from each field for each sample date.

Soil temperature measurement. During the experiments, soil temperatures were continuously monitored in both fields. Surface temperatures were recorded using HOBO® H8 4-channel loggers from Onset Computer Corporation (Pocasset, MA). Four TMC6-HA external sensors were used for each logger and were placed next to four of the boll weevil cohorts. Data were recorded every 15 minutes and a HOBO Shuttle data transporter was used to download data at the field sites.

Soil moisture measurement. Soil moisture was recorded at 60 and 90 days after cotton planting at depths of 5, 10, 20, and 30 cm using the gravimetric water content method of Gardner (1986).

Light interception. Light interception was recorded at 120 and 145 days after cotton planting at 10 randomly selected sites (5 m long in each site) in the crop rows in each field at 12:00-1:00 p.m. by measurement of shaded and unshaded areas.

Statistical analyses were conducted using analysis of variance (ANOVA) and means were separated by Tukey's studentized range test (Wilkinson et al. 1992). Percentage data were transformed using the arcsine-square root method, but are presented as nontransformed means (Sokal and Rohlf 1994).

RESULTS AND DISCUSSION

Numerous physical and biological attributes of soil at the site were monitored for changes caused by tillage. Conservation production practices left most of the previous crop residue on the soil surface (6,700 kg/ha in 2000 year and 3,589 kg/ha in 2001) to provide a mulch for soil, and increased water infiltration rate into the soil profile. Soil moisture content in the conservation tillage field was significantly higher than in the conventional tillage field at planting time, and remained higher at 60 and 90 days after planting ($P \leq 0.001$) (Fig. 1). Soil moisture at 25-30 cm was 1.9-fold greater in the conservation tillage field than in conventional tillage field throughout the first 60 days ($t = 11.0$, df = 8, $P \leq 0.0001$) and 90 days ($t = 7.5$, df = 8, $P \leq 0.0001$) of crop growth due to the decreased evaporation from crop residue mulch. The conventional tillage cotton had a greater water stress causing plants to shed squares and bolls. At 90 days after cotton was planted, we collected from the soil surface an average of 7.5±0.9 shed fruit/m^2 in the conservation tillage field versus 12.5±0.9 shed fruit/m^2 in the conventional tillage field ($t = 3.8$, df = 18, $P = 0.001$, 2000), while in 2001 measurements were 2.4±0.3 and 9.5±0.8 shed fruit/m^2 ($t = 8.6$, df = 18, $P = 0.0001$), respectively. Cotton plants in the conventional tillage treatment allocated more resources into vegetative growth while the conservation tillage cotton responded by fruiting at a higher rate. Conservation tillage cotton was 1.3-fold shorter in height on average during the 2000 growing season than the conventional tillage cotton (48.0 cm vs 62.4 cm, $t = 2.9$, df = 14, $P = 0.01$) and had 1.5-fold fewer leaves per plant (35.5 and 54.8, respectively, $t = 3.2$, df = 14, P=0.007) (Table 1). In 2001, we observed the same trend. Conservation tillage cotton was 1.2-fold shorter on average during the 2001 growing season than the conventional tillage cotton (46.9 cm vs 56.3 cm, $t = 1.9$, df = 18, $P = 0.07$), with 1.4-fold fewer leaves per plant (30.8 vs 43.4, respectively, $t = 4.3$, df = 18, P=0.001), and had 1.9-fold more fruit per plant (11.2 vs 6.0, respectively, $t = 5.4$, df=18, $P = 0.0001$) (Figs. 2-5). In the conservation tillage cotton, at 120 DAP, 52.3±2.3% of the incoming sunlight reached the soil surface while the conventional tillage field had only 39.4±4.2% ($t = 2.7$, df = 18, $P = 0.02$). Measurements at 145 DAP were 60.2±5.0% and 36.2±3.9%, respectively ($t = 3.8$, df = 18, $P = 0.001$). Therefore, average soil temperatures between the crop rows in conservation tillage field were at 8-11º C higher than in conventional tillage fields. In the conservation tillage field during the 2000 cotton growing season, mean soil temperature under the plants was 30.4º C while in the middle of the row temperature was 41.2º C; whereas, temperature readings in conventional tillage were 29.2º C and 31.4º C, respectively. The highest temperatures occurred between 1pm to 4 pm and were 39.3º C under plants and 53.1º C in the middle of the crop row in conservation tillage, while those in conventional tillage were 40.2º C and 44.6º C, respectively. In the 2001 season, the conservation tillage field had a mean soil temperature under the plants of 29.6º C and in the middle of the rows temperature was 40.4º C, but in the conventional tillage measurements were 30.6º C and 34.1º C, respectively. The highest temperatures were observed from 1 pm to 4 pm and were 38.5º C under plants and 52.0º C in the middle of the crop rows in the conservation tillage, and readings were 38.8º C to 42.9º C, respectively, in conventional tillage field. Soil temperature significantly affected boll weevil mortality in infested shed squares. The mortality of boll weevils in fallen, naturally-infested squares collected from the conservation (cs) and conventional (cv) tillage fields under plants at field edges (27.0±2.4%, cs tillage, and 31.3±3.3% cv tillage; $t = 1.1$, df = 18, $P = 0.3$) or under plants in the middle of the fields (24.1±1.3%, cs, and 29.8±2.6%,cv: $t = 1.9$, df = 18, $P = 0.07$) was not significantly different because infested squares had fallen in shaded areas (Fig. 6). However, mortality of infested squares falling in the middle of the crop rows was significantly higher in conservation tillage fields. At field edges, mortality was 65.0±4.9%, cs, versus 42.5±2.2%, cv ($t = 4.2$, df = 18, $P = 0.001$); and in the middle of the field mortality was 57.1±2.4, cs, versus 45.2±2.0%, cv ($t = 3.8$, df = 18, $P = 0.001$). Increased plant height and number of leaves in the conventional tillage provided significantly more light interception and shading of the soil surface which made temperatures lower than in conservation tillage fields. The same trend of boll weevil mortality was observed in cohorts of laboratory-infested squares which were exposed on the soil surface weekly in conservation and conventional tillage fields from 90 DAP to defoliation (Figs. 7, 8). Infested fruit exposed to the direct solar radiation would result in some mortality, and shaded squares would provide survival niches in which the population could maintain itself during periods of excessively high temperatures (Fye and Bonhan 1970). Soil solarization has been found to be effective in reducing many soil pests (Katan and DeVay 1991).

The average number of boll weevils per plant during the cotton growing season were 2.3-fold (0.633 cv versus 0.279 cs; $t = 2.8$, df = 20, $P = 0.011$; 2000) and 3.5-fold (0.284 cv versus 0.082 cs; $t = 2.1$, df = 20, $P = 0.019$; 2001) higher in conventional tillage than in conservation tillage fields (Figs. 9 and 10), while the average number of boll weevils captured in pheromone traps were 2.2-fold (61.2 cv versus 27.8 cs; $t = 1.6$, df = 16, $P = 0.1$; 2000) and 2.3-fold (7.5 cv versus 3.2 cs; $t = 1.6$, df = 20, $P = 0.1$; 2001) higher in conventional tillage than in conservation tillage (Figs. 11 and 12). The percent of punctured (egg and feeding) squares by boll weevil during the

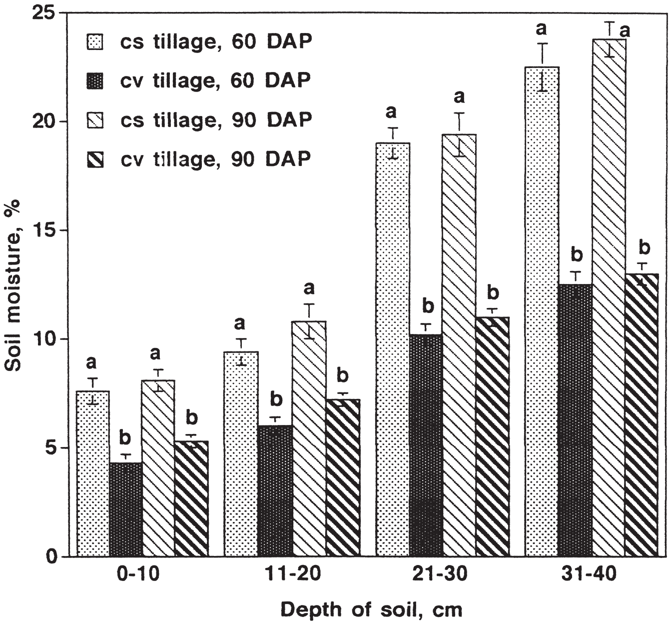

Fig. 1. Percentage of soil moisture at different soil depths in conservation (cs) and conventional (cv) tillage fields (2000 and 2001). Bars represent means and vertical lines represent standard errors of the means. Pairs of bars with different letters are statistically different (Tukey's HSD, $P \leq 0.05$).

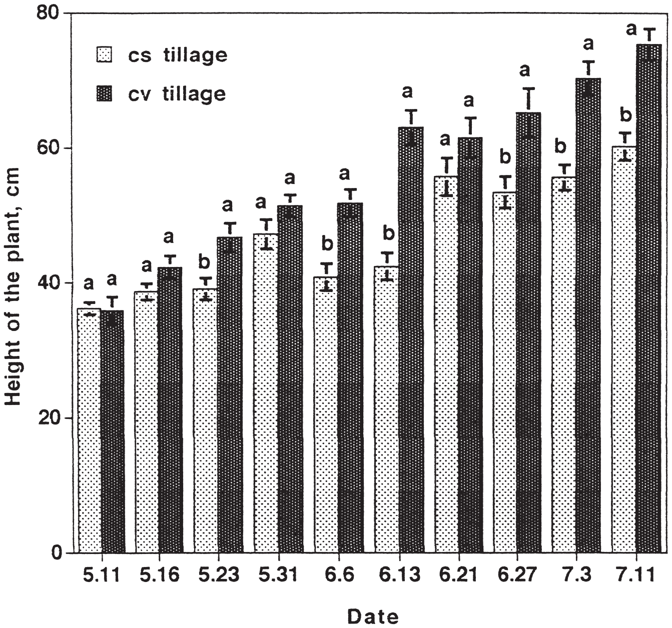

Fig. 2. Height of the plant in different tillage system fields (2001). Bars represent means and vertical lines represent standard errors of the means. Pairs of bars with the same letters are not statistically different (Tukey's HSD, $P \leq 0.05$).

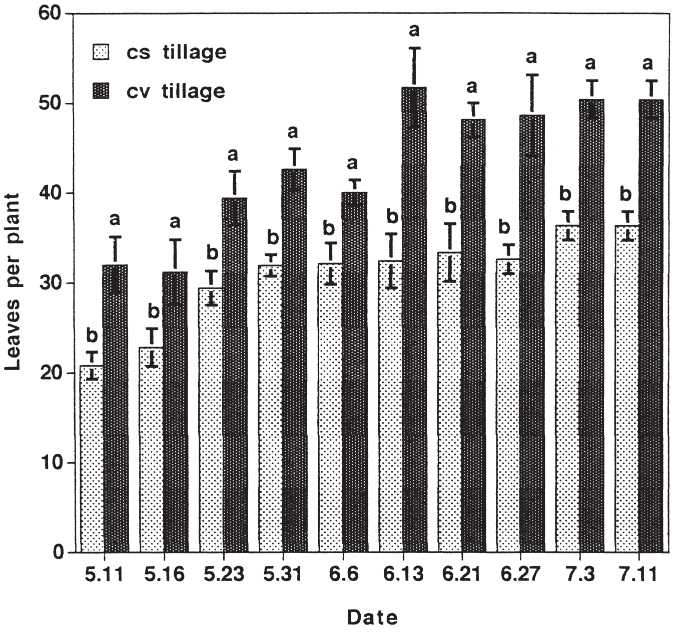

Fig. 3. Number of leaves per plant in different tillage fields (2001). Bars represent means and vertical lines represent standard errors of the means. Pairs of bars with the same letters are not statistically different (Tukey's HSD, $P \leq 0.05$).

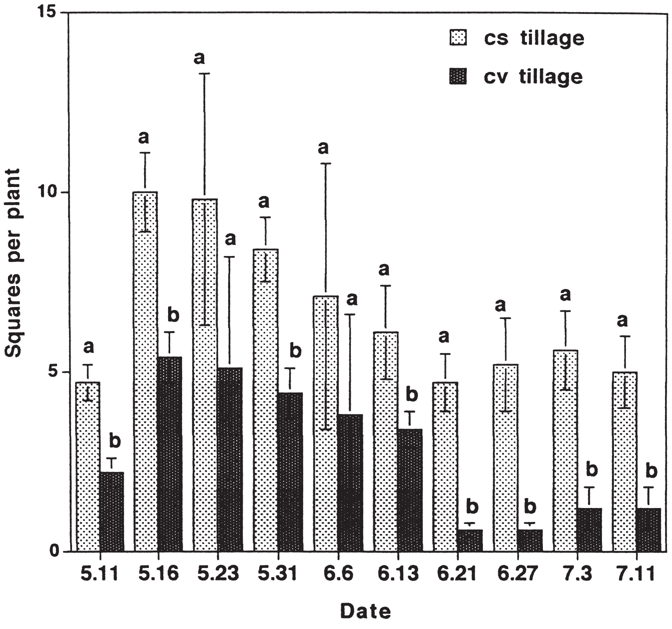

Fig. 4. Number of squares per plant in conservation and conventional tillage fields during the cotton growing season (2001). Bars represent means and vertical lines represent standard errors of the means. Pairs of bars with the same letters are not statistically different (Tukey's HSD, $P \leq 0.05$).

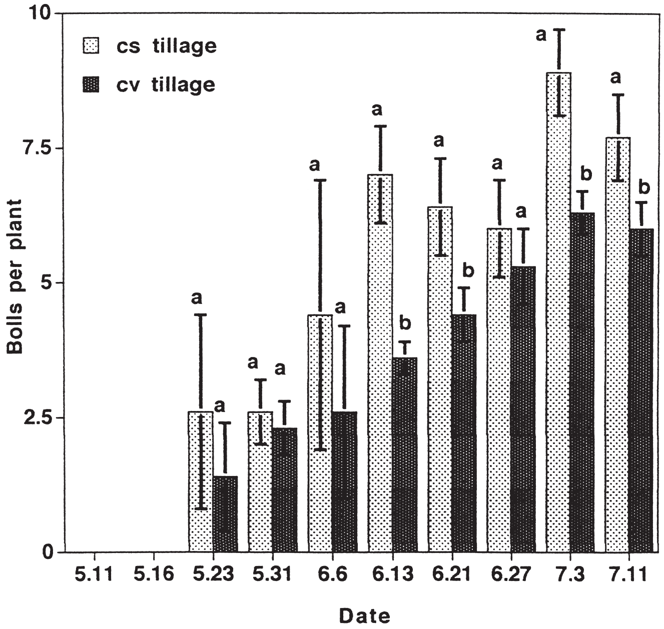

Fig. 5. Number of bolls per plant in conservation and conventional tillage fields during the cotton growing season (2001). Bars represent means and vertical lines represent standard errors of the means. Pairs of bars with the same letters are not statistically different (Tukey's HSD, $P \leq 0.05$).

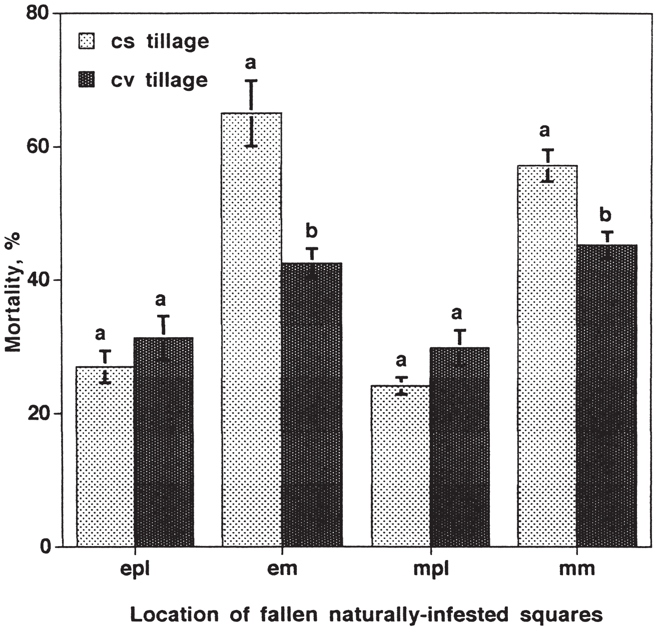

Fig. 6. Percentage of boll weevil mortality in naturally-infested squares at different locations in the crop rows, Hargill 2000. Bars represent means and vertical lines represent standard errors of the means. Pairs of bars with the same letters are not statistically different (Tukey's HSD, $P \leq 0.05$); epl - under plants at the field edges; em - middle of the crop row at the field edges; mpl - under plants in the middle of the field; mm - middle of the crop row in the middle of the field.

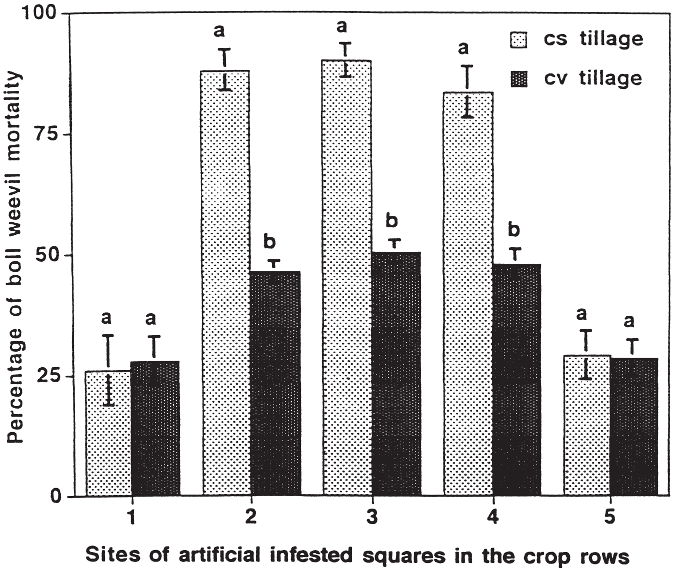

Fig. 7. Percentage mortality in boll weevil cohorts placed in the field, Hargill 2000. Bars represent means and vertical lines represent standard errors of the means. Pairs of bars with the same letters are not statistically different (Tukey's HSD, $P \leq 0.05$); 1, 5 - squares were placed under plants; 2, 3, 4 - squares were placed in the middle of the crop rows.

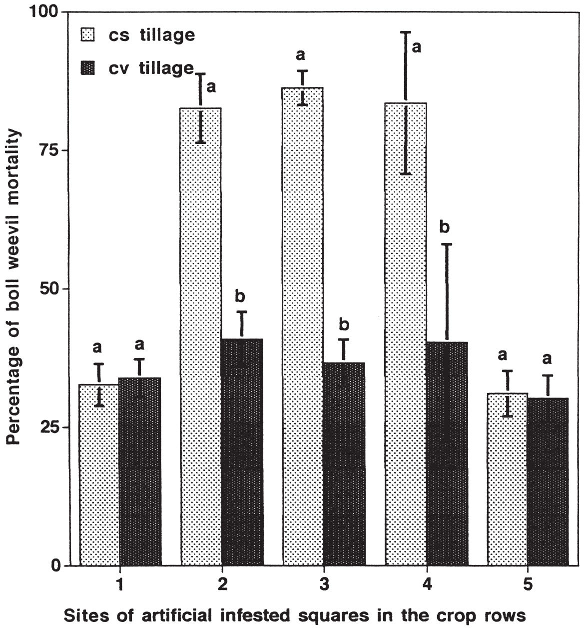

Fig. 8. Percentage mortality in boll weevil cohorts placed in the field, Hargill 2001. Bars represent means and vertical lines represent standard errors of the means. Pairs of bars with the same letters are not statistically different (Tukey's HSD, $P \leq 0.05$); 1, 5 - squares were placed under plants; 2, 3, 4 - squares were placed in the middle of the crop rows.

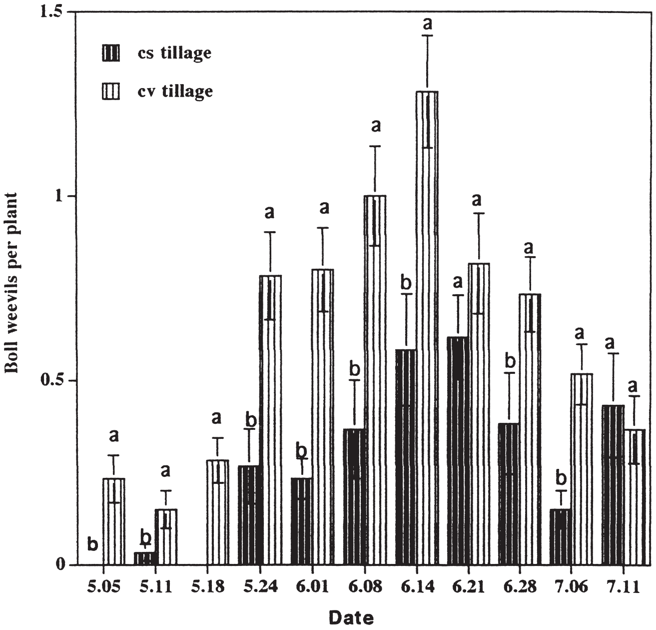

Fig. 9. Number of boll weevils per plant in conservation and conventional tillage fields, Hargill 2000. Bars represent means and vertical lines represent standard errors of the means. Pairs of bars with the same letters are not statistically different (Tukey's HSD, $P \leq 0.05$).

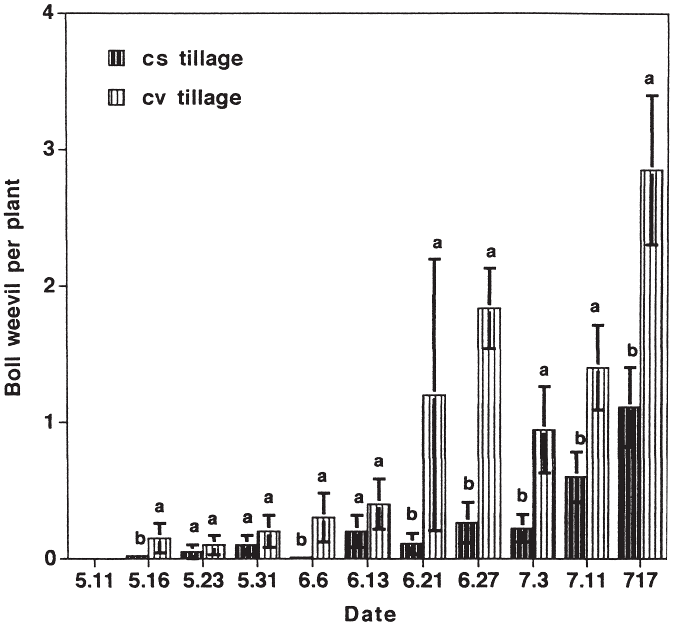

Fig. 10. Number of boll weevils per plant in conservation and conventional tillage fields, Hargill 2001. Bars represent means and vertical lines represent standard errors of the means. Pairs of bars with the same letters are not statistically different (Tukey's HSD, $P \leq 0.05$).

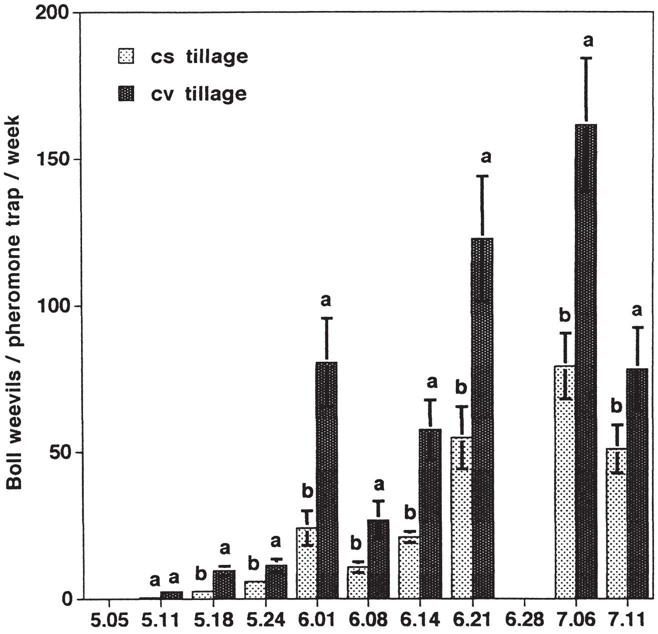

Fig. 11. Number of boll weevils captured per pheromone trap per week around the perimeter of conservation and conventional fields, Hargill 2000. Bars represent means and vertical lines represent standard errors of the means. Pairs of bars with the same letters are not statistically different (Tukey's HSD, $P \leq 0.05$).

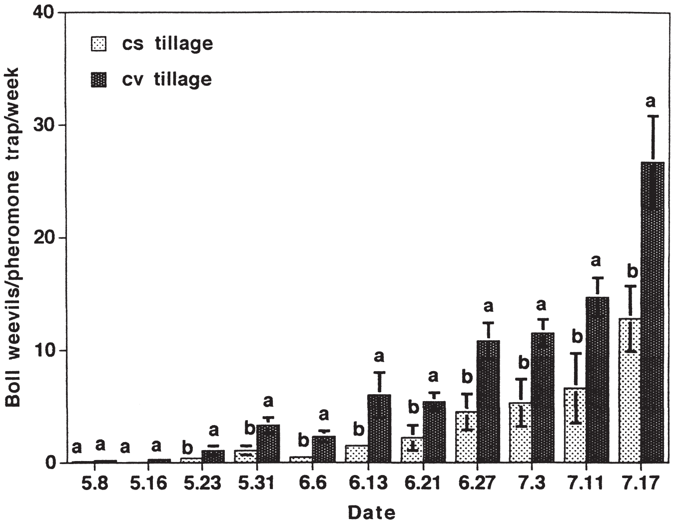

Fig. 12. Number of boll weevils captured per pheromone trap per week around the perimeter of conservation and conventional fields, Hargill 2001. Bars represent means and vertical lines represent standard errors of the means. Pairs of bars with the same letters are not statistically different (Tukey's HSD, $P \leq 0.05$).

growing crop season averaged 2.1-fold higher in conventional tillage than in conservation tillage fields (Table 2).

Average cotton lint yield in the conservation tillage field was 397.8 kg of lint per hectare while the conventional tillage field yielded 231.4 kg/ha (2000 year). The total production costs, including all field operations from harvesting the previous crop until cotton harvest and ginning for both tillage systems, were $589.7/ha for the conventional tillage field and $580.4/ha for the conservation tillage field. The net returns for the conservation tillage system were $9.3/ha while a net loss of $245/ha was calculated for the conventional tillage system due to increased tillage costs and a lower lint yield (Table 3).

Our results document the impact of tillage systems on management of boll weevil in dryland cotton under weather patterns similar to the LRGV. Conservation tillage cotton produced more bolls and lint and had fewer boll weevils than conventional tillage cotton. Conservation tillage systems in dryland cotton agroecosystems may contribute to lower boll weevil numbers by adversely affecting the life cycle of the insect through a more limited cotton canopy development and the resulting mortality due to exposure of boll weevil larvae to solar radiation and higher temperatures.

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