Sweet Corn Weed Control and Yields in Response to Sowing Date and Cropping Systems

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Abstract. The high vulnerability of sweet corn (*Zea mays* L. var. *saccharata*) to weed competition and the urgent reduction of the dependence on chemical herbicides are major challenges facing the agricultural community. To investigate the effects of plastic mulches on weed control and yields in sweet corn under different sowing dates, a 2-year experiment was conducted at Varamin, Iran, in 2010 and 2011. The mulch treatments included black plastic mulch, semitransparent biodegradable mulch, an unmulched weeded control, and an unmulched unweeded control. The sowing dates were 5 June, 20 June, and 6 July. Results revealed that delayed sowing (6 July) reduced weed dry weight by 51% and 41% compared with the 5 June sowing date in 2010 and 2011, respectively, without reducing crop yield. The black plastic mulch treatment had the lowest weed biomass. The sowing date × mulch interactions on kernel number per ear, length of ear, percentage of unfilled ear tip, and yield of sweet corn were statistically significant ($P < 0.01$) in both years. The maximum kernel number per ear (535) and the highest fresh ear yield (24,684 kg·ha⁻¹) in 2010 were obtained on the 6 July sowing date under biodegradable mulch. The plants sown on 6 July produced the highest fresh kernel yield with the black plastic mulch (12,893 kg·ha⁻¹) and unmulched weeded control (11,777 kg·ha⁻¹) in 2010 and 2011, respectively. The highest percentage of unfilled ear tips in both years was observed in the unmulched unweeded plots sown on 5 June. According to our findings, to suppress the weeds and avoid the sweet corn yield loss in such a hot summer that we had, using the black plastic mulch and delayed sowing are recommended.

Changes in sowing date can strongly affect plants development (Hay, 1986). Sowing dates can be manipulated to avoid the periods of greatest risk from pests, weeds, and diseases and hence increase yield of the crop (Harper, 1999). Many researchers have argued that the correct sowing time for a variety is the date that gets the crop to anthesis at the optimum time. In maize the high air temperature (greater than 38 °C) compounded by water stress at anthesis decreases the kernel set under dry land environments (Ramadoss et al., 2004). Herbek (1986) reported that delayed sowing of corn in hot and dry conditions reduced yield and had harmful effects on pollination and grain filling. In contrast, Oktem et al. (2004) obtained the highest fresh ear yields for a 25 July sowing date and the lowest fresh ear yields for an 25

Apr. sowing date in a hot and dry region of Turkey. Determining the optimal sowing date for corn is thus very crucial for maximizing crop yields (Abdel Rahman et al., 2002). On the other hand, sweet corn should be consumed, canned, or frozen immediately after harvest as a result of the rapid conversion of soluble sugars to starch. Accordingly, sweet corn is planted over a 3-month period in the north-central United States to extend the availability of fresh produce for marketing and processing (Williams, 2008).

Use of variable sowing dates to control weeds is dependent on time of weed emergence. An awareness of the timing of weed emergence facilitates the planting of crops when weeds are at their lowest density. Differences in the growing environment can also influence the number, structure, germinability, and viability of the seeds produced (Nurse and DiTommaso, 2005). Mulder and Doll (1994) reported that in-row weed density decreased significantly in uncultivated treatments when planting was delayed from 25 Apr. to 5 May in 1991. Delayed planting

allows corn to germinate after peak emergence of many weed species (Regnier and Janke, 1990).

Weed suppression is one of the largest benefits of mulching. Mulching can inhibit weeds in two ways: 1) by preventing light from reaching the soil, which reduces germination and seedling growth; and 2) by acting as a physical barrier against the growth of weed seedlings. The beneficial effects of mulches on crop yield have been reported in many studies. Mahajan et al. (2007) found that plastic mulch reduced weed dry matter by 63.8% compared with an unmulched control. Zandstra et al. (2007) reported that the marketable yield of sweet corn increased by 25% to 63% with clear plastic mulch compared with bare soil. Plant height, total dry matter, number of grains per cob, 1000-grain weight, and grain yield of corn were maximized under mulch treatment (Khurshid et al., 2006).

The objective of the present study was to investigate a non-chemical weed control strategy by evaluating opaque plastic and semitransparent biodegradable mulches and different sowing date on sweet corn yield and competitiveness against weeds.

Materials and Methods

Climate. Climate at Varamin has been classified as arid and semiarid. Summers (June to September) are very hot and dry. Temperature reached 45 °C (Fig. 1), and no precipitation fell during June, July, and August. Maximum mean temperature was recorded for July in both years (Fig. 2). Average relative humidity during the summer was 31% to 33%. In addition, a warm wind blows from the south that dries the corn flowers.

Site description. Field experiments were conducted in 2010 and 2011 at the research farm of the Faculty of Agriculture on the Varamin-Pishva Branch, Islamic Azad University, Varamin, Iran (lat. 35°17' N, long. 51°40' E). The previous crop was wheat (*Triticum aestivum* L.). The soil at the beginning of the experiments contained 23% sand, 44% silt, 33% clay, and 0.92% organic carbon and had a pH of 7.6.

The experimental setup was a factorial arrangement in a randomized complete block design with four mulch treatments of black plastic mulch film, semitransparent biodegradable mulch film (starch based), an unmulched weeded control, and an unmulched unweeded and three planting dates of 5 June, 20 June, and 6 July with three replicates. We chose these dates to find the best sowing dates producing the highest yield in a short period between two fall crops. Both the plastic and biodegradable mulches were 120 cm wide. The plastic and biodegradable mulches were 30 and 50 µm thick, respectively. We prepared seed beds by a bed shaper and mulches laid manually on the raised beds (70 cm width) 2 d before planting. Raised beds are often preferred with plastic mulches because they warm more quickly than flat beds and

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Fig. 1. Minimum and maximum daily air temperatures during the growing seasons of 2010 and 2011 in Varamin (based on daily reports of the Iran Meteorological Organization). The arrows show the occurrence of 50% silking in each sowing date (a, 5 June; b, 20 June; c, 6 July).

Fig. 2. Mean monthly temperature during the growing seasons in 2010 and 2011 in Varamin (based on daily reports of the Iran Meteorological Organization).

offer superior drainage (Lamont, 1996; Tarara, 2000). Plot size was 6 m × 6 m. Each plot consisted of four beds 75 cm apart with two rows of sweet corn (*Zea mays* L. var. *saccharata* Sturt) cultivar KSC 403 (yellow su and 85 d) planted in each bed. Sweet corn was hand-seeded through the mulches or into bare soil. The crop was sown with a density of 66,500 seeds/ha with 30 to 35 cm between rows in a bed and 20 cm between plants within the rows. To investigate weed-crop competition, we focused on natural weed population, which emerged from the field seed bank. Herbicides were not applied to the control treatments; we controlled weeds by biweekly manual weeding throughout the season. Fields received cow manure at 25 t·ha⁻¹, zinc at 19 kg·ha⁻¹ (as zinc sulfate), and manganese at 8 kg·ha⁻¹ (as manganese sulfate) in late May and nitrogen at 161 kg·ha⁻¹ (as urea) and

iron at 240 g·ha⁻¹ (as Fe-EDDHA) at three stages (five- to six-leaf stage, tasseling, and kernel filling through a drip irrigation system). We also watered the plants throughout surface drip irrigation system. Diameter of tape was 16 mm, emitter spacing 20 cm, and flow rate 2 L·h⁻¹. The irrigation frequency varied 3 to 5 d according to plant growth stage, temperature, and the presence or absence of mulch.

Data collection. Twelve adjacent plants were hand-harvested from each plot to determine the total biomass and fresh ear yield when the silks were dark brown (≈70% kernel moisture content). We randomly selected five ears from each plot for determining length of ear, unfilled ear tips, kernel number per ear, and fresh kernel yield. At harvest, natural weed population and biomass were assessed by throwing two 50 × 50-cm quadrates two times over the unmulched plots. However, in plastic mulch treatments, weed was assessed from a 3-m length of a row. Harvest index was calculated by the following formula.

$$HI = \frac{\text{fresh ear yield}}{\text{biological yield}} \times 100$$

Growing degree-days (GDD) were determined using minimum ($T_{\min}$) and maximum ($T_{\max}$) air temperatures from daily reports by the Iran Meteorological Organization. A base temperature (T_b) of 10 °C was used as the minimum temperature for sweet corn growth, and 30 °C was used as the air temperature associated with optimal growth. The time of crop sowing was used as the reference point for accumulation of GDD.

$$[GDD = ((T_{\min} + T_{\max})/2) - T_b]$$

Statistical analyses. Data were subjected to analysis of variance using PROC GLM

(Version 9.1.3; SAS, Cary, NC). When F values were significant, the least significant difference test was used to compare differences in means between treatments.

Results and Discussion

Weed control. The dominant weed species in the field included redroot pigweed (*Amaranthus retroflexus* L.), jungle rice (*Echinochloa colona* L.), common purslane (*Portulaca oleracea* L.), green foxtail (*Setaria viridis* L.), and Johnson grass (*Sorghum halepense* L.), all of which have a C4 photosynthetic pathway and high competition ability against summer crops. The total dry weights of weeds were significantly influenced by sowing date and mulch treatment. At harvest, highest weed dry weight was in the plots sown on 5 June, although there was no statistically significant difference between 5 June and 20 June (Table 1). Actually the absence of a significant difference between the first and second planting dates could be related to the peak emergence of weeds occurring in late spring. The seeds of summer annual grasses fall to the ground the previous fall and germinate the next year, from midspring through midsummer. Germination depends on soil temperature, not air temperature, and generally begins when surface soil temperatures reach 13 to 16 °C (Koski, 2008). Delayed sowing (6 July) reduced weed biomass compared with early planting dates (51% and 41% relative to the 5 June and 51% and 33% relative to 20 June in 2010 and 2011, respectively). These reductions can be attributed to reduction in the number of weeds. Weed density significantly reduced from 148 plants/m² in the 5 June sowing date to 113 and 77 plant/m² in 20 June and 6 July in 2010, respectively (Table 1). The number of weeds in 2011 was higher than 2010; however, weed density decreased with delay in sowing. Williams and Lindquist (2007) reported an 80% lower weed biomass at harvest in late-sown corn relative to early-sown corn.

In the mulch treatments, highest weed dry weight was recorded in unmulched unweeded plots (855 and 2176 g·m⁻² in 2010 and 2011, respectively). The black plastic mulch reduced weed dry weights by 91.3% and 94.7% in 2010 and 2011, respectively (Table 1). Zhang et al. (1992) reported that black plastic mulch controlled 100% of the weeds in plantings of tomato and corn. Only a few weeds emerged through the seed holes in our treatment with black plastic mulch. The treatment with biodegradable mulch produced relatively high dry weights of weeds, especially with the first two sowing dates. These results may have been the result of the entrance of solar radiation through the semi-transparent film, higher soil temperatures, and soil-moisture contents relative to bare soil and the early degradation of the mulch.

The treatment of black plastic mulch and 6 July sowing date gave the highest efficiency of weed control (96% and 92% in 2010 and 2011, respectively) relative to the unmulched unweeded treatment (data not shown). The

efficiency of weed control significantly improved with the biodegradable mulch for the 6 July sowing date compared with earlier sowings after for two potential reasons. The reduction of weeds in the 6 July sowing date relative to the other seeding dates (Table 1) and the biodegradable mulch degraded in the 6 July treatment later than the other sowing dates. Temperature was up to 32 °C in July and fell by 29.3 and 30.3 °C in August in 2010 and 2011, respectively. Although mulches were laid in June, there were high temperatures in July (Fig. 2). Ngouajio et al. (2008) concluded that the rapid degradation of mulch in the second year of their experiment was the result of higher temperatures.

Weed also delayed harvest 6 to 10 d in unmulched unweeded plots relative to unmulched weeded treatments. In contrast, plastic mulch advanced maturity by 3 d (Table 2).

Kernel number per ear. Effects of the different sowing dates and mulches on kernel

number per ear were significant ($P < 0.01$) in both years (Table 2). The 6 July sowing date had the highest number of kernels per ear in both years. The lower kernel numbers in the 5 June and 20 June sowing dates are probably associated with the high temperatures in August (Fig. 1) during anthesis and pollination of sweet corn. Kernel number in corn is affected by environmental conditions, which are in turn affected by planting date. Variation in planting date commonly influences the number of grains per ear (Harris et al., 1984). The findings of Ramadoss et al. (2004) indicated a contribution of high air temperatures to reduce grain numbers and grain yields of corn planted in October in Australia when extreme air temperatures (greater than 38 °C) coincided with anthesis. High temperatures can lead to the death of silks and can reduce the viability of the pollen. Pollen vigor decreased above 35 °C (Sleper and Poehlman, 2006). Herrero and Johnson (1980) also suggested that prolonged exposure to

temperatures above 32 °C can reduce pollen germination.

Black plastic mulch and unmulched weeded treatments had the highest kernel numbers per ear (459 and 436 in 2010 and 2011, respectively) (Table 2). Lowest kernel number was observed in corn plants severely infested with weeds (196 and 191 kernel per ear in 2010 and 2011, respectively). This reduction was clearly a consequence of the competition between the weeds and the corn. Incomplete ear filling may also be related to the abortion of kernels. Heat, drought, and a shortage of nutrients can lead to kernel abortion (Thomison, 2012).

Ear size and unfilled ear tips. Effects of sowing date and mulch on length of ear and the percentage of unfilled ear tips were significant ($P < 0.01$) in both years. The percentage of unfilled ear tips differed significantly between the 2 years (Table 2). The percentage of unfilled ear tips was significantly higher on 5 June and 20 June sowing dates compared with 6 July. Several factors can contribute to incomplete grain fill. Dry and hot conditions during pollination can cause the silks at the tip of the ear to emerge after most of the pollen has fallen. In those cases, the ear tips may not have pollinated. Dry and hot conditions after pollination may also cause kernel abortion at the tip of the ear. This is evident by the drying up of kernels. Average maximum temperature in the kernel filling period (50% silking to harvest) was 37.8, 36.9, and 34.6 °C for 5 June, 20 June, and 6 July in 2010 and 39.3, 36.9, and 33.9 °C in 2011, respectively (Fig. 1). In addition, high night temperatures increase plant respiration rates and expend energy that could otherwise support kernel development. Vyn (2010) stated that grain fill is a 24-h process, so both day and nighttime temperatures matter. High night temperatures (21 or 26.6 °C) result in wasteful respiration and a lower amount of dry matter accumulation in plants. With high night temperatures, more of the sugars produced by photosynthesis during the

Table 1. Effects of sowing date and mulch on number, biomass and control efficiency of weeds in Summer 2010 and 2011 in Varamin, Iran.

Treatment		Number of weed (plant/m ²)		Weed biomass (g·m ⁻²)		Weed control efficiency (%)	
		2010	2011	2010	2011	2010	2011
Sowing date	5 June	148	424	460	1014	51	53
	20 June	113	320	472	910	44	58
	6 July	77	167	230	601	64	70
LSD		26.18	102.1	203	327	19	15.37
Mulch	BPM	3	5	74	115	91.3	94.7
	BMF	141	253	622	1077	21	47.6
	UNW	0	0	0	0	100	100
	UNU	307	955	855	2176	0	0
LSD		30.23	117.8	234	378	22	17.7
Year		113 a ^z	303 b	387 a	842 b	53 a	60.5 a
CV		26.3	23.7	35.7	25.8	42.4	29.97

^zDifferent letters for year indicate significant differences.

LSD = least significant difference; BPM = black plastic mulch; BMF = biodegradable mulch film; UNW = unmulched weeded; UNU = unmulched unweeded.

Table 2. Effects of sowing date and mulch on kernel number per ear, length of ear, unfilled ear tips, and days from sowing to harvest and 50% silking to harvest for sweet corn in Summer 2010 and 2011 in Varamin, Iran.

Treatment		Kernel number per ear		Length of ear (cm)		Unfilled ear tips (%)		Sowing to harvest (days)		50% silking to harvest (days)	
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
Sowing date	5 June	232	211	12.4	12.2	14.1	19.1	88	84.5	19.7	20.0
	20 June	377	316	15.7	14.6	15.1	17.6	87	82	26.2	27.2
	6 July	465	464	17.0	16.8	11.3	11.1	84.6	84	30.3	31.2
LSD		54.26	44.69	1.38	1.17	2.27	2.85	0.43	0.42	0.63	0.73
Mulch	BPM	459	365	18.2	16.8	11.3	15.4	81	77.7	24.6	24.8
	BMF	342	330	14.4	13.9	13.8	16.5	89	85	25.2	26.1
	UNW	434	436	16.8	17.4	8.6	8.5	84.7	80.7	24.6	24.7
	UNU	196	191	10.8	10.2	20.2	23.2	91	90.7	27.1	29.0
LSD		62.65	51.60	1.59	1.35	2.6	3.3	0.50	0.48	0.66	0.76
Year		358.2 a ^z	330.6 a	15.1 a	14.6 a	13.5 a	15.9 b	86.5 a	83.5 b	26.0 a	27.0 b
CV		17.89	15.96	10.82	9.48	19.90	21.15	0.59	0.59	2.92	2.98

^zDifferent letters for year indicate significant differences.

LSD = least significant difference; BPM = black plastic mulch; BMF = biodegradable mulch film; UNW = unmulched weeded; UNU = unmulched unweeded.

day are lost; less is available to fill developing kernels grain, thereby lowering potential grain yield (Thomison, 2005). Plant sown in 5 June and 20 June experienced some days with minimum temperature of 22 to 26 °C (Fig. 1).

The highest percentage of unfilled ear tips (20% to 23%) and the lowest length of ear (10.2 to 10.8 cm) were recorded in unmulched weeded plots followed by the biodegradable mulch (Table 2). The competition from weeds likely led to smaller ears with unfilled ear tips (Lawson and Taber, 2005). If plant ingredients (sugars and proteins) are limited during the early stages of kernel development, then kernels at the tip of the ear may abort (Thomison, 2012). The percentage of unfilled tips was significantly higher in the black plastic mulch than in unmulched weeded treatment. The black color of the plastic likely led to higher canopy temperatures, which affected flowering and grain filling. Air temperatures tend to be higher over plastic mulch than over bare soil (Ashrafuzzaman et al., 2011).

Yields. Over 2 two years, fresh ear and kernel yields were significantly influenced by planting date and mulch treatment (Table 3). Fresh ear and kernel yields generally decreased in 2011 relative to 2010 as a result of an unexpected increase in temperature at flowering from 8 to 28 Aug. (Fig. 1) and to a severe increase in weeds. Delayed sowing (6 July) increased fresh ear yield and fresh kernel yield compared with 5 June in 2010 and 2011, respectively. Dahmardeh (2012) reported that seed yields generally increased with later planting dates with the lowest yield from the earliest planting date. Low yields from the first and second sowing dates were likely associated with the detrimental effects of high temperatures and low humidity on pollination, fertilization, and grain filling. The highest GDD was computed for the 5 June sowing date and fresh kernel and ear yield decreased with increasing GDD (Fig. 3). It is obvious that the increase in GDD is a direct result of two factors, temperature and number of days. Regarding the small difference (only 4 d) among three planting dates (Table 2) for the number of days from planting to harvest, it can be concluded that high temperatures have reduced yields. Pollination should not coincide with high midsummer temperatures (Norwood, 2001). Oktem et al. (2004)

obtained the highest fresh ear yields from sowings in late June and later in Turkey. On the other hand, high temperatures can shorten the grain-filling period in corn, which can lead to lower yields. In our study, the period from 50% silking to harvest in crops sown on 6 July was 4 and 11 d longer than that for the 20 June and 5 June sowing dates, respectively (Table 2). Temperatures higher than 30 °C can abort kernels and shorten the grain-filling period (Jones et al., 1981). Plants sown in first and second sowing dates experienced days with temperature 35 to 43 °C after silk emergence in both years (Fig. 1).

The black plastic mulch treatment produced ≈ 2 t·ha⁻¹ fresh ears in 2010 more than unmulched weeded treatment, although the difference between those were not statistically significant (Table 3). Li et al. (2004) and Gul et al. (2009) recorded highest grain yield and highest biological yield of corn on plastic mulch film, respectively. However, in 2011, yields were lower in plastic mulch treatment than the unmulched weeded plots as a result of increasing temperature, although there were no significant differences between these treatments.

Table 3. Effects of sowing date and mulch on fresh ear yield, fresh kernel yield, and harvest index for sweet corn in Summer 2010 and 2011 in Varamin, Iran.

Treatment		Fresh ear yield (kg·ha ⁻¹)		Fresh kernel yield (kg·ha ⁻¹)		Harvest index (%)	
		2010	2011	2010	2011	2010	2011
Individual effects							
Sowing date	5 June	8,643	7,702	4,466	3,353	29.2	35.1
	20 June	14,250	10,150	7,375	4,211	39.8	38.3
	6 July	19,083	16,892	10,053	8,641	38.8	42.6
LSD		2,857	1,970	1,190	981	2.49	4.01
Mulch	BPM	19,810	14,994	10,665	6,717	43.3	43.2
	BMF	12,615	9,538	6,036	4,584	35.4	42.1
	UNW	17,647	16,941	9,357	7,754	35.9	40.1
	UNU	5,896	4,851	3,133	2,552	30.1	29.3
LSD		3,299	2,275	1,374	1,133	2.88	4.63
Year		13,992 a ^z	11,581 b	7,298 a	5,402 b	36.2 a	38.7 b
Sowing date × mulch							
5 June	BPM	14,764	12,502	8,000	5,261	42.6	44.1
	BMF	2,495	3,132	1,181	1,606	22.4	37.5
	UNW	16,238	14,076	8,278	6,167	36.1	39.5
	UNU	1,077	1,099	407	378	18.3	19.4
20 June	BPM	20,971	11,673	11,104	4,533	44.5	36.2
	BMF	10,667	8,683	5,634	3,736	42.8	49.2
	UNW	17,300	13,649	8,777	5,320	36.8	34.9
	UNU	8,063	6,594	3,985	3,258	35.3	32.8
6 July	BPM	23,695	20,807	12,893	10,358	42.8	49.5
	BMF	24,684	16,800	11,294	8,411	41.0	39.5
	UNW	19,404	23,098	11,014	11,777	34.8	45.9
	UNU	8,548	6,861	5,007	4,019	36.7	35.8
LSD		5,714	3,941	2,381	1,963	4.99	8.02
CV		24.11	20.09	19.26	21.45	8.15	12.24

^zDifferent letters for year indicate significant differences.

LSD = least significant difference; BPM = black plastic mulch; BMF = biodegradable mulch film; UNW = unmulched weeded; UNU = unmulched unweeded.

Fig. 3. Regression relationship between growing degree-days (sowing to harvest) with fresh kernel and fresh ear yield of sowing dates (2010 and 2011).

An interaction between sowing date and mulch treatment was significant ($P < 0.01$) for fresh ear and kernel yields in both years. Plants sown on 6 July of 2010 with the biodegradable mulch had the highest fresh ear yield (24,684 kg·ha⁻¹), which was 27% higher than in the unmulched weeded treatment (Table 3). Results for 2011, however, were different; unmulched weeded treatment had the highest fresh ear yield (23,098 kg·ha⁻¹) followed by the black plastic mulch (20,807 kg·ha⁻¹) and the biodegradable mulch treatment (16,800 kg·ha⁻¹). Higher temperatures and weed biomasses likely led to lower yields in 2011. Plants sown on 6 July also produced the highest kernel yield in black plastic mulch (12,893 kg·ha⁻¹) and unmulched weeded (11,777 kg·ha⁻¹) treatments in 2010 and 2011, respectively. In the unweeded plots, the effect of sowing date on the ability of corn to compete against weeds was clearly observed. In this regard, it was observed that kernel yields in unmulched unweeded plots in 2010 increased from 407 kg·ha⁻¹ for the 5 June sowing date to 3985 and 5007 kg·ha⁻¹ for the 20 June and 6 July sowing dates, respectively.

Harvest index. Main effects and interaction of sowing date and mulch were significant on harvest index (HI) (Table 3). The 6 July sowing date gave the highest HI value (42.6%). Black plastic mulch had the highest HI (43.3%), whereas unmulched unweeded plots had the lowest HI (30.1%). A combination of plastic mulch and 6 July sowing date led to the highest HI in both years (Table 3). Higher HI in the plastic mulch treatment was likely the result of lower tillers than in unmulched weeded and biodegradable mulch treatments. Plastic mulch increased HI in all planting dates for silage maize (Kwabiah, 2005).

Sweet corn performed significantly better under the conditions when sown on 6 July than at earlier sowing dates. The anthesis of sweet corn coincided with reduced air temperature, which ultimately led to improved yields. Weeds were also significantly reduced with delayed sowing. Black plastic mulch satisfactorily controlled weeds. Sweet corn yields also likely increased resulting from better conservation of soil moisture, thermal conditions, and weed control in the mulch treatments in either of the 2 years of the study. Polyethylene mulches, however, must be removed from the field after harvest, and disposal can be expensive and poses an environmental problem. Biodegradable mulch can thus be a good alternative to polyethylene mulch, but it should remain intact at least until the tassels of sweet corn emerge to be effective in weed suppression.

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