EFFECT OF PLANTING DATES OF NO-TILL AND CONVENTIONAL CORN ON SOILS WITH RESTRICTED DRAINAGE

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No-tillage corn is best adapted to well-drained soils. It is on these soils that no-tillage has been most successful and the practice is most widely accepted. On soils that are moderately to somewhat poorly drained, no-tillage corn is successful but more management is required. Three areas which require more attention are weed control, nitrogen management and planting. A four to five day delay in planting date is presently recommended in Kentucky on well-drained soils to allow the cooler soils under no-till conditions to warm sufficiently. It has been recognized for years that development of young corn seedlings is retarded by low temperatures (Blacklow, 1972) and that soil temperatures are usually lower under no-tillage than conventional tillage (Blevins and Cook, 1970; Burrows and Larson, 1962). Willis and Amemiya (1973) showed that optimum average soil temperature for corn seedlings is 72° F. Results of studies in Virginia (Moody et al., 1963) shows a faster rate of overall development of corn for no-tillage and they attributed this to increased mid-season soil moisture on the mulched plots. Additional research indicates that there are diseases that attack the corn seedling in the emergence stage that are more prevalent in no-till stands (Van Doren, et al., 1975). These diseases are most common when the soil is saturated and causes the most damage when the soil is cool resulting in a slow growing seedling and stress conditions.

It is well known that delaying planting past an optimum planting period often depresses corn yields (Hatfield, et al., 1965; Pendleton and Egli, 1969). After observing the problem in experiments and on farmer's fields in Kentucky with early no-till plantings on soils with restricted drainage, it was postulated that delayed plantings might improve no-till stands and yields. Another concern is whether delayed planting dates on no-till would result in depressed yield as it does in conventional tillage. The objectives of this study were to evaluate the effects of planting dates on no-till and conventionally tilled corn on soils with restricted drainage.

METHODS

A field experiment was established in the spring of 1979 at the Kentucky Agricultural Experiment Station, West Kentucky Research and Education Center, Princeton. The study site is a transitional area of moderately well-drained Tilsit silt loam (Typic Fragiudults) and somewhat poorly drained Johnsburg silt loam (Aquic Fragiudults). Both soils are

underlain with a fragipan ranging from 18 inches to 28 inches below the soil surface. Corn (Zea mays L., 'Pioneer 3369A') was planted by no-till methods in early May, mid-May and early June (Table 1) at approximately 22,000 seeds per acre. The mulch on the no-till corn was corn residue and a wheat cover crop established each fall. The corn residue and wheat cover crop was turn-plowed before planting for the conventional tillage treatment followed by two to three disking operations to prepare a seedbed. All treatments received Furadan (carbofuran) at 20 lbs. of material/acre in the row. At planting time all treatments were sprayed with 2 lbs. of atrazine, 3 qts. of alachlor and 2 pints of paraquat per acre. The research plot design was a randomized complete block with four replications.

TABLE 1. PLANTING DATES BY YEAR (1979-82)

Planting Date	1979	1980	1981	1982
1	++	Apr 25	May 2	Apr 28
2	May 17	May 12	May 28	May 12
3	June 19	June 6	June 13	June 9

++ Not planted due to excessive wetness

RESULTS

Effect on Yield. Corn yields and stands are given in Table 2 and rainfall and air temperatures data is not included due to space limitations but are noted in the text. The summary at the bottom of Table 2 only includes the last 3 years of the experiment since the first planting date was not planted in 1979 due to excessive wetness. Over the 4 years, no-till yields were higher than conventional yields for the second and third planting dates and equal to them on the early May planting date. During the wetter years (1979 and 1981) conventionally tilled corn yields were comparable to or higher than those from no-till. However, no-till corn yields were considerably better during the dryer years (1980 and 1982). Conventional yields decreased consistently and dramatically with each delay in planting date. May 1 is usually about as early as conventionally tilled corn can be planted on these soils due to wetness. It is felt that the conventional yields decreased with time due to increasing moisture stress that develops in mid and late season. The no-till yields decreased only on the last planting date and the mid-May planting was a little better than the early May planting.

The increased soil moisture available in the no-till plantings was probably responsible for the higher yields at later planting dates. The delayed planting date of mid-May (about 2 weeks later than the optimum date for conventional tillage) appeared to be the optimum planting date of no-till. Evidentally, this date allowed the soil temperature to warm sufficiently to produce a vigorous growing seedling and reduced the chances of encountering excessively wet conditions. The second planting date was the best for 2 of the 3 years when all planting dates could be compared. The exception was 1981 when extremely high amounts of moisture fell during the germination and emergence period.

It is quite interesting to note how well the no-till yields held up with the later planting dates. The yield decreases between early May and early June were much greater for the conventional than the no-till plantings. The no-till yields from the early June plantings were just as

good as the conventional mid-May plantings, and the no-till mid-May plantings are better than the conventional early May plantings. This indicates that the planting dates for no-till on these soils are not nearly as critical as conventional plantings and that no-till would be the preferred planting method during years of late planting.

Effect on Stand. Final plant populations were generally lower for no-till corn than conventional, but the differences were not great. Stands were always greater with conventional planting for the last planting date. The comparison varied for the first two planting dates. During the wetter years (1979 and 1981) the conventional stands were better. The no-till stands were better during the dryer years (1980 and 1982). Final stands were not closely related to final yields.

TABLE 2. EFFECT OF TILLAGE AND PLANTING DATE ON CORN YIELDS AND STANDS

Planting Date	Corn Yield (bu/a) Tillage CT	NT	Plants/acre (x1000) Tillage CT	NT
		1979		
1	-	-	-	-
2	134	104	18.4	16.0
3	133	127	21.8	20.1
		1980		
1	87	91	19.9	20.0
2	57	104	20.1	22.0
3	44	63	21.3	19.9
		1981		
1	150	134	17.4	16.0
2	100	112	13.9	13.8
3	112	128	19.5	17.6
		1982		
1	127	143	19.8	19.2
2	123	175	18.3	19.4
3	42	90	18.9	16.1
		SUMMARY (1980-82)		
1	121	121	19.0	18.3
2	91	130	17.4	18.4
3	68	94	20.0	17.9

CT - Conventional Tillage NT - No-tillage

SUMMARY AND CONCLUSIONS

1. Although it varies with the year, no-till planted corn will yield as well as or better than conventionally planted corn on moderately to somewhat poorly drained soils. No-till performed better during dryer years and conventional tillage performed better during wetter years.

2. Planting dates are not as critical on these soils for no-till as they are for conventional plantings. Yields from conventional plantings decreased rapidly with each planting date after early May. The yields for the no-till planting actually increased as the planting date progressed from early to mid-May and decreased more slowly after that time.

3. It appears that the optimum planting date on these soils for no-till is about 2 weeks later than that for conventional tillage. The optimum planting date was early May for conventional tillage and mid-May for no-till.

4. No-till planting is clearly superior to conventional methods for delayed planting dates. The no-till yields from the early June planting are as good as the conventional mid-May plantings and the no-till mid-May plantings are better than the conventional early May plantings.

5. It appears that the planting date for no-till corn on these soils can be delayed to improve the chances of better stands and yields.

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