PRELIMINARY STUDIES ON EFFECT OF CLOSING WHEEL PRESSURE SETTINGS ON STAND ESTABLISHMENT, YIELD, AND QUALITY

Norman R. Cattanach/Laura Overstreet

Research Specialist / Assistant Professor
Soil Science Department, North Dakota State University

Introduction/Objection

In order to reach maximum sugarbeet production goals it is imperative that optimal plant population be established at planting in April and May. One of the most important factors in reaching maximum profitability is proper planter maintenance, adjustment and operation. Growers should be diligent in maintenance and providing proper storage for planters if they expect equipment to operate efficiently. Poorly maintained, adjusted or setup planters can cause planting delays or downtime which ultimately reduces stand and overall lost revenue at harvest. With that premise in mind a research trial was established to determine how much variability of downward pressure there was on closing wheels, of individual rows on a John Deere MaxEmergeII vacuum planter then evaluating effects of press wheel pressure in a field study.

Materials and Methods

Field experiments were established at two locations, one on a Beardon Perella silt loam (coarse-silty, fridgid Aeric Calciaquoll) at a research site near Prosper, ND. The trial at Prosper was planted into a smooth, moist, firm, seedbed. Planting was arranged in a randomized complete block design with four replications. Individual treatment plots measured 11 feet wide and 30 feet long. Soil nitrogen levels were adjusted with fertilizer to approximately 130 lbs/acre of available residual soil test plus added fertilizer N.

Eight treatments, comparing high vs. low downward pressure settings on the closing wheels, 2 planting speeds 4 and 6 mph and 2 planting depths 1 ¼ and 1 ¾ inch deep were used in this experiment. Downward pressure on each row was measured in pounds and recorded.

Rhizomania resistant variety, Beta 1305R was planted on May 16, 2007 with a John Deere MaxEmerge II planter. Sugarbeet was planted to stand at a 4 ½ inch targeted in-row seed spacing. A 22-inch wide row spacing was used. Counter insecticide was surface band applied at 10.9 lbs/a, and incorporated with a drag chain at planting. Early, middle and late harvest stand counts were taken. Four post emergence micro-rate herbicides, two cultivations and hand labor was used as needed for weed control. Three fungicide applications, Eminent, Supertin/Topsin and Headline was applied for Cercospora leaf spot control.

Harvest of the middle two rows of each six row plot, was completed on September 28/2007. Yield determinations were made and quality analysis performed at the American Crystal Sugar Quality Lab, East Grand Forks, MN.

Results and Discussion

The main effect of planter speed is shown in table 1. None of the yield factors was significantly different between 4 and 6 mph planter speeds. Differences were very slight indeed for all the yield factors measured during the study. There was about a $21 per acre advantage in revenue per acre for the 4 mph planting speed. Seedbed conditions were warm, smooth and firm at the time of planting. Seedbed moisture was excellant when the study was planted. These conditions were apparently very favorable for the soil type on which this research was conducted in 2007. Results may have been somewhat different under conditions more likely to effect stand establishment.

Table 2 shows the main effect of planting depth averaged across planter operating speed and press wheel pressures. The 1 ¼ inch planting depth is normally recommended for most RRV planting conditions. The deeper planting depth often results in reduced stands when crusting conditions occur. The seedbed conditions at the time of planting this trial must have been near optimum because all of the yield factors were remarkably similar for both planting depths. There was a slight advantage of $13 in revenue per acre at the shallow planting depth.

Table 3 shows the main effect of press wheel pressure, averaged across planting depth and speed on sugarbeet, yield and quality. None of the yield factors measured resulted in significant differences due to planter press wheel pressure. All yield factors were again remarkably similar between both press wheel pressures evaluated. There was a slight but not significant difference of $9 observed for revenue per acre.

Table 4 shows all the individual treatment data for planter speed, depth of planting and press wheel pressure.

Table 5 shows the early, middle and final harvest counts averaged across planting depth, speed and press wheel pressure. Final stands were not significantly different due to planting depth, speed or press wheel pressure. At the first count dates stand counts were higher at the deeper planting depth at both speeds and pressures. At the second count date these differences were smaller. Counts were lower in 3 of 4 treatments at 6 mph. There was no consistent effect of press wheel pressure at this count date. Emergence counts were excellent at the second count.

At harvest the stands were greater at 30 pounds press wheel pressure in three of four treatment comparisons. All harvest stands were at optimum levels thus no treatments for yield and quality were impacted by plant population.

Conclusions

This data would indicate that sugarbeet growers should use those recommendations that have been developed over numerous research trials designed to evaluate factors effecting sugarbeet stand establiashment in the last twenty years by Dr Joe Giles, NDSU and other scientists. Grower personal experience and agriculturists observations of successful planting practices by numerous growers over many years remain excellent guidelines to follow. Under ideal conditions impact of variable planter speed, planting depth and press wheel pressure may have minimal impact on stand establishment.

However under a wide range of environmental and seedbed conditions recommended planting speed of 4 to not more than 5 mph, a 1 ¼ planting depth, and 40 to 50 pounds of press wheel pressure will usually result in the best possible stand establishment.

Table 1. The main effect of planter speed averaged across planting depth and press wheel pressure. 2007.

Speed	HARVEST BEETS /100 FT	ROOT YIELD Tons/A	SUGAR %	SLM %	NET SUGAR %	REC SUGAR Lbs/Acre	REC SUGAR Lbs/T	GROSS RETURN $/T	GROSS RETURN $/A
4	209	32.2	16.1	.68	15.4	9906	307.7	34.02	1096.00
6	203	31.8	16.0	.69	15.4	9736	307.2	33.91	1075.00
LSD (0.5)	9	1.51	.43	.10	.51	598	10.0	2.30	95.00
	NS	NS	NS	NS	NS	NS	NS	NS	NS

Table 2. The main effect of planting depth averaged across press wheel pressure and speed on sugarbeet yield and quality. 2007.

Depth	HARVEST BEETS /100 FT	ROOT YIELD Tons/A	SUGAR %	SLM %	NET SUGAR %	REC SUGAR Lbs/Acre	REC SUGAR Lbs/T	GROSS RETURN $/T	GROSS RETURN $/A
1 1/4	206	31.8	16.1	.67	15.5	9826	309	34.34	1092.00
1 3/4	206	32.1	16.0	.70	15.43	9816	306	33.60	1079.00
LSD (0.5)	9	1.51	.43	.10	.51	598	10.0	2.30	95.00
	NS	NS	NS	NS	NS	NS	NS	NS	NS

Table 3. The main effect of press wheel pressure, averaged across planting depth and speed on sugarbeet yield and quality. 2007.

Pressure	HARVEST BEETS /100 FT	ROOT YIELD Tons/A	SUGAR %	SLM %	NET SUGAR %	REC SUGAR Lbs/Acre	REC SUGAR Lbs/T	GROSS RETURN $/T	GROSS RETURN $/A
30	208	31.88	16.1	.66	15.4	9830	308	34.14	1090.00
50	205	31.99	16.0	.71	15.3	9812	307	33.80	1081.00
LSD (0.5)	9	1.51	.43	.10	.51	598	10.0	2.30	95.00
	NS	NS	NS	NS	NS	NS	NS	NS	NS

Table 4. Effect of planting depth, planter speed, and press wheel pressure on sugarbeet yield and quality 2007.

Speed	depth	pressure	Rep	Sugar %	SLM	Yield Ton/A	RSA	RST	Beets 100ft	gross ton	Gross acre
4	1	30	1	16.50	0.7	33.50	10600	317	233	36.04	1206.8
			2	16.01	0.7	34.05	10405	306	225	33.58	1142.4
			3	15.71	0.6	26.50	8009	302	172	32.74	868.09
			4	16.19	0.7	31.70	9871	311	198	34.88	1104.8
		50	3	15.50	0.7	32.80	9672	295	207	31.19	1021.7
	2	30	1	16.74	0.7	31.90	10272	323	218	37.42	1190.2
			2	16.51	0.6	33.80	10756	318	216	36.46	1232.5
			3	15.55	0.8	30.65	9073	296	185	31.33	961.64
			4	15.87	0.6	29.40	8963	305	198	33.31	980.35
		50	4	14.96	1.0	35.30	9904	280	220	27.76	981.29
6	1	30	3	15.05	0.8	32.60	9262	284	213	28.73	935.53
		50	1	17.12	0.6	32.05	10621	332	209	39.44	1263.5
			2	16.18	0.7	31.65	9786	309	216	34.42	1088.1
			3	15.59	0.7	27.00	8074	299	167	31.93	863.74
			4	16.08	0.7	31.90	9817	308	190	34.09	1085.8
	2	30	4	15.54	0.6	30.40	9102	299	192	32.05	975.57
		50	1	15.80	0.9	32.35	9687	299	208	32.12	1039.1
			2	16.34	0.7	32.45	10190	314	226	35.45	1150.3
			3	16.12	0.6	32.95	10207	310	190	34.52	1137.2
			4	15.23	0.8	30.10	8723	289	205	29.86	899.94
Ave.				*16.05*	*0.7*	*31.94*	*9821*	*307*	*206*	*33.97*	*1085.3*

Table 5. Mean of early, middle and final harvest counts, (beets per 100 feet of row) JD MaxEmergeII planter. Press wheel Study 2007. Prosper, ND.

Depth	Speed	Pressure	First Count May 26	Second Count June 8	Harvested Beets /100 FT
1	4	30	26	238	213
1	6	30	22	220	212
2	4	30	53	223	217
2	6	30	51	227	197
1	4	50	41	230	195
1	6	50	43	226	195
2	4	50	65	238	201
2	6	50	54	222	221