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

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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 delays planting, reduces stand, and results in 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 MaxEmerge II vacuum planter and what impact it could have on stand establishment and sugar production.

Materials and Methods

Field experiments were established at two locations, one on a Beardon Perella silt loam (coarse-silty, frigid Aeric Calciaquoll) at a research site near Prosper, ND, and the second on a Glyndon silt loam (silt loam, very fine sandy loam) near Glyndon, MN. The trial at Glyndon was planted into a smooth, moist, firm, seedbed whereas at Prosper a rougher, cloddier, but moist seedbed was present. 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 120 lbs/acre of available residual soil test plus added fertilizer N.

Four treatments, first, second, third, and fourth notch setting of downward pressure on closing wheels, were tested in this experiment. Downward pressure on each row was measured in pounds and recorded.

Rhizomania resistant variety Beta 1305, was planted on May 16, 2006 with a John Deere MaxEmerge II planter. Sugarbeet seed was planted to stand at a 5 inch spacing at 1.25 inches deep at both sites. The standard 22-inch wide row spacing was used. Counter insecticide was surface band applied at 11.9 lbs/A, and incorporated with a drag chain at planting. Stand counts were taken on May 26 and June 8 and a final harvest stand count was taken at both locations. Three post emergence micro-rate herbicide applications, two cultivations, and hand labor was used as needed for weed control. Three fungicide applications, Eminent, Supertin, and Headline were applied for Cercospora leaf spot control.

Harvest of the middle two rows of each six row plot was completed on September 29, 2006. Yield determinations were made and quality analysis performed at the American Crystal Sugar Quality Lab, East Grand Forks, MN.

Results and Discussion

Initially, only stand counts were to be taken and compared among the treatments at both locations. However, with some favorable early emergence counts, it was determined that at least one of the two experiments should be taken to harvest. Prosper was chosen as the location to be harvested. Above average yield and sugar production was realized due to excellent germination, adequate moisture in the soil profile, and above average number of growing degree days.

Stand counts can be effected by many factors including seedbed preparation, soil moisture content, seed vigor, crop residue, soil type, planter speed, and planter settings. Table one data shows the wide variability in downward pressure on the press wheels between the 6 planter units at each setting on the North Dakota State University MaxEmerge II sugarbeet research planter. At the first notch setting, variability was 13 pounds from high to low between the six rows and the differences were 11, 12, and 15 pounds for the second, third, and fourth setting, respectively. Stand count data for both early and late counting dates for each row and pressure setting is shown in tables 2 and 3. From 87 to 94 % of the final stand established by June 8 had emerged by the May 26 count at both locations. Stand counts at the Prosper location were higher but not significantly different at both early count dates and final harvest (table 4) with the second notch setting and always lowest at the first notch setting. This would suggest that downward pressure on press wheels in the first notch setting was insufficient to provide adequate seed to soil contact. Counts at the Glyndon location (table 5), while not statistically different, were lowest at the second notch setting and highest for the fourth notch setting. This indicates a need to consider a change in press wheel settings as a grower moves from one field to another with changing seedbed conditions.

There was no significant difference for any yield parameter at the Prosper location. However, the data indicates that the second notch setting showed a strong trend for higher stands and produced higher recoverable sugar per acre than the first, third, or fourth notch. This would indicate that at this location and on this particular soil type and seedbed condition, that the second notch setting for downward pressure on the closing wheels provided optimum stand establishment and yields over the other treatment settings (Table 6). Although no significant differences between treatments were observed, there were 2.1 tons per acre more yield, 462 lbs. more recoverable sugar, and $40 more gross dollar return per acre with the second pressure setting versus the next best setting for each yield factor. Additional treatments and further research is needed to help make further conclusions. Data presented is based on only one year of research.

Recommendations

Planter operation is critical to establishing optimum plant populations that emerge quickly and uniformly. The fact that large differences in downward pressure on press wheels exists between rows on any given planter suggests improvements in stand establishment could be achieved by adjusting downward pressure on all planter units to the same level. Table 1 shows the wide variability in pressure on closing wheels on the North Dakota State University 6-row JD MaxEmerg II planter. Variability on a 12 or 24 row grower planter is likely to be even greater. Closing wheel pressure can be easily measured using a digital fish scale attached between the press wheel assembly and the supporting frame for the seed and insecticide hoppers. Growers that consistently use only one pressure wheel setting should select that position and then adjust tension on individual rows units to equalize pressure. Too much downward pressure may push seed upward, thereby effectively reducing planting depth. Too little pressure may result in poor seed to soil contact. Planter settings should be reviewed each time a grower moves from one field to

another field that may have different seedbed conditions. American Crystal Sugar Company grower practices database history shows each 10 beet per 100 foot of row decrease in plant population from the optimum will reduce revenue per acre by $36.

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Table 1. Variable measurement of downward pressure on closing wheels of each individual planter row unit on a JD MaxEmerg II planter. 2006.

Row	First Notch Measured Wt in lbs	Second Notch Measured Wt in lbs	Third Notch Measured Wt in lbs	Fourth Notch Measured Wt in lbs
Row 1	27	36	45	51
Row 2	30	40	48	53
Row 3	19	29	37	44
Row 4	32	40	49	55
Row 5	26	34	43	47
Row 6	26	30	38	40

Table 2. Individual row emergence counts at different pressure on closing wheel settings on a JD MaxEmerge II planter, 2006. Prosper, ND.

Setting	Date (Count)	Row 1	Row 2	Row 3	Row 4	Row 5	Row 6	Mean
First Notch	1	37	39	41	45	38	43	40
	2	45	44	44	47	46	50	46
Second Notch	1	43	39	44	53	48	47	45
	2	45	43	47	56	51	51	49
Third Notch	1	43	42	38	49	44	50	44
	2	47	46	47	51	47	52	48
Fourth Notch	1	42	45	44	47	45	44	44
	2	45	47	50	52	49	47	48

Table 3. Individual row emergence counts at different pressure on closing wheel settings on a JD MaxEmerge II planter, 2006. Glyndon, MN.

Setting	Date (Count)	Row 1	Row 2	Row 3	Row 4	Row 5	Row 6	Mean
First Notch	1	66	67	66	66	59	62	64
	2	68	70	69	70	71	65	69
Second Notch	1	57	66	62	65	60	60	63
	2	61	71	68	69	70	67	68
Third Notch	1	64	64	59	67	71	62	65
	2	67	68	63	70	75	69	69
Fourth Notch	1	62	65	68	69	68	59	65
	2	69	68	69	76	72	66	70

Table 4. Mean of emergence counts, (beets per 100 feet of row) JD MaxEmerge II planter press wheel study, 2006. Prosper, ND.

Treatment	First Count May 26	Second Count June 8	Harvested Beets /100 FT
First Notch	144	164	134
Second Notch	159	171	161
Third Notch	152	165	143
Fourth Notch	155	168	147
LSD (.05)	NS	NS	NS

Table 5. Mean of emergence counts, (beets per 100 feet of row) JD MaxEmerge II planter press wheel study, 2006. Glyndon, MN.

Treatment	First Count May 26	Second Count June 8

First Notch	214	229
Second Notch	209	226
Third Notch	215	229
Fourth Notch	217	233
LSD (.05)	NS	NS

Table 6. Effect of closing wheel pressure on sugarbeet root yields, sucrose percentage, recoverable sugar production, harvest population and gross dollar return. Prosper, MN. 2006.

Treatment	Root Yield Tons/A	Net Sucrose Percent	Rec Sugar Lbs/A	Rec Sugar Lbs/T	Harvest Beets /100 ft	Gross Return $/A	Gross Return $/T
First Pressure Setting	36.1	15.2	10983	304	145	1444	39.89
Second Pressure Setting	38.2	15.0	11445	299	161	1484	38.83
Third Pressure Setting	34.4	15.3	10510	306	143	1388	40.39
Fourth Pressure Setting	33.9	15.5	10477	310	147	1396	41.40
LSD (.05)	NS	NS	NS	NS	NS	NS	NS