

THE EFFECT OF CLOSING WHEEL AND SEED TUBE CONFIGURATION ON SUGARBEET YIELD AND QUALITY

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Introduction : Uniform seed spacing of sugarbeet plants is important to reduce weed competition and maximize sugarbeet production. The last several years, with the introduction of numerous seed tube configurations and modifications, and closing wheels, growers are asking which seed tube types, seed tube sensors or closing wheel configurations are recommended to best optimize sugarbeet yield and quality in the field and on their farms.

Objectives : With the introduction of John Deere MaxEmerge 2 Planter, many different seed tube sizes and shapes, closing wheel configurations and planter attachments are being marketed. Most were developed or used in corn and soybean growing areas of the United States, but over the year's sugarbeet growers' have adopted these different planter configurations into sugarbeet production as well. Past research has shown that the standard straight sugarbeet tube produced the highest recoverable sugar. Since that research many new and potentially improved seed tubes have been introduced. The objective of this research is to evaluate the affect these new tubes and attachments have on uniformity of seed spacing and yield and quality using various options of these planter attachments or combinations of them. Some of these seed tubes have been evaluated on the planter test stand and have not performed satisfactorily and should be evaluated in the field.

Materials and Methods: One sugarbeet field experiment was established on a Colvin silty clay loam location near Ada, MN in 2017. Planting was arranged in a randomized complete block design with five replications. Individual treatment plots measured 11 feet wide and 30 feet long. A Roundup Ready Regular Pellet sugarbeet variety with a good disease resistance package was planted on May 4/2017 with a John Deere MaxEmerge II planter. Large sugarbeet plates were used and vacuum set as recommended. Sugarbeet was placed 1.25 inches deep with 4.5-inch in-row spacing. A 22-inch row spacing was used. The trial was planted into wheat residue and a fairly wet soil seedbed. Roundup herbicide was applied twice for weed control, plots were not cultivated. Soil nitrogen, Phosphorous and Potassium levels were adjusted with fertilizer to approximately 130 lbs/acre of available residual soil test plus added fertilizer N.

Treatments included in the experiment were (1) Straight tube – reg. closing wheels (2) Straight tube – modified insert regular closing wheels (3) Curved tube - regular closing wheels (4) Curved tube - modified insert - regular closing wheels (5) Precision planting tube – regular closing wheels (6) Straight tube – no insert – spiked wheels (7) Straight tube – 1 schlagel 1 smooth closing wheel. Three fungicide applications, Inspire (July 21 @ 7 fl. oz/A), Supertin/Topsin (Aug 8 @ 6 fl. oz/A & 7.6 fl. oz/A) and Proline (August 22 @ 7 fl. oz/A) were applied for Cercospora leafspot control Total monthly rainfall for April was 1.05 inches, May 1.36 inches, June 2.91 inches, July 2.68 inches, August 1.27 inches, September 5.76 inches and October 0.69inches. The middle two rows were treated and harvested on October 9/2017. Yield determinations were made and quality analysis performed at American Crystal Sugar Quality Tare Lab, East Grand Forks, MN.

Results and Discussion: The field or research plot area, due to nearly 11 inches of rainfall October of 2016 was only tilled once that fall. The plot area was fertilized and tilled with a field cultivator in the spring of 2017. High amounts of wheat residue and fairly wet soil conditions may have affected some germination in certain plots. Since rainfall occurred soon after planting no significant results were observed in the seed tube/planter attachment study in 2017. The measurements between plants (target spacing of 4.5 inches / Regular Pellets) obtained around the four-leaf stage of growth were analyzed and histograms of distance distributions were constructed for each treatment (Figure 1). Generally the inclusion of an insert into any style of seed tube reduces the number of plants at the 4.5 inch target spacing (histograph 3&4), as was observed in past field and grease belt tests, similar treatments with modified inserts seem to produce lower yields and recoverable sugar per acre. In 2017 the root yield was highest on the curved tube with regular closing wheels and the lowest yield treatment was the curved tube with modified insert and regular closing wheels (Table 1). The highest recoverable sugar per acre treatment was the curved tube with regular closing wheels (Table 1). Stand counts were lowest on the precision tube with regular closing wheel whereas the highest stand counts were straight tube with the modified insert although none of the treatments were significantly different.

Use of different styles and combinations of closing wheels had little effect on uniformity of plant spacing. Again there was no significant difference of any of the parameters depending on what closing wheels or combination of closing wheels was used. However the two Schlagel closing wheels together had lower yield and recoverable sugar per acre than did the one smooth regular closing wheel and one Schlagel closing wheel treatment or the treatments where the standard smooth closing wheels were used (Table 1). It seems the standard smooth closing wheels tested are still as good as any other of the newer closing wheels examined in this trial for sugarbeet emergence. It is important to note that closing wheels be properly set at $\frac{3}{4}$ to 1 inch distance apart between wheels for sugarbeets and that the wheels are centered directly over the top of the planted row and also set at a proper down pressure. This is one year and one location of data. Additional research trials both in the field and on the planter test stand comparing seed tube configurations and planter closing wheels with different size pellets should be examined to reinforce current sugarbeet grower recommendations.

Table1. Effect of seed tube and closing wheel combinations on sugarbeet root yield, sucrose percentage, recoverable sugar production, population and gross \$ return. Ada, MN. 2017.

Treatment	Roots yield (Tons/a)	(%) Sucrose	Slm%	RSA (lb/ac)	RST (lb/ton)	Tare %	Gross (\$/acre)	Beet counts /60ft of row
1. Straight tube - regular closing wheels	36.5a	17.6a	0.94a	12161a	333a	3.5a	1526.72a	156a
2. Straight tube - mod. Insert, regular closing wheels	37.2a	17.5a	0.87a	12355a	332a	2.9ab	1547.29a	161.4a
3. Curve tube - regular closing wheels	38.1a	17.5a	0.87a	12628a	332a	3.2ab	1580.18a	161.2a
4. Curve tube - modified Insert regular closing wheels	35.5a	17.6a	0.81a	11905a	335a	2.9b	1506.00a	158.2a
5. Precision tube - regular closing wheels	36.0a	17.3a	0.92a	11764a	327a	3.3ab	1447.79a	152.2a
6. Straight tube - no insert spiked wheels	35.7a	17.5a	0.91a	11879a	333a	3.0ab	1489.81a	159.4a
7. Straight tube - no insert, 1 Schlagel 1 smooth cw.	37.5a	17.6a	0.88a	12558a	335a	3.3ab	1587.11a	158.2a
LSD (P<0.05)	NS	NS	NS	NS	NS	0.6145	NS	NS

Figure 1. Seed spacing as influenced by seed tubes and planter attachments

