

### Foliar insecticides for the control of curly top in Idaho sugar beet, 2017.

Seven insecticide foliar treatments and three check treatments were evaluated for the control of curly top on the commercial sugar beet (*Beta vulgaris* L.) cultivar C-204 (approved for commercial production in Idaho, but this cultivar contains a low level of resistance to *Beet curly top virus* [BCTV]). The trial was conducted at the USDA-ARS North Farm in Kimberly, ID which has Portneuf silt loam soil and had been in barley in 2016. In the spring, the field was plowed and fertilized (90 lb N and 110 lb P<sub>2</sub>O<sub>5</sub>/A) and roller harrowed on 11 Apr. The plots were planted (density of 142,560 seeds/A) on 15 May. Plots were four rows 34 ft long with 22-in row spacing and arranged in a randomized complete block design with eight replications. The field was managed based on the 2017 grower guide book (Amalgamated Sugar Co. LLC, Boise, ID). Plant populations were thinned to approximately 47,500 plants/A on 9 Jun. The foliar treatments were applied on 7 Jun in a volume of 18.48 gal/A with a CO<sub>2</sub> powered sprayer at 30 PSI using a boom with a 8002VS spray nozzle (Teejet Technologies, Wheaton, IL) centered over each row. Plants were inoculated at the eight-leaf growth stage on 14 Jun with approximately six viruliferous (contained the following BCTV strains: California/Logan and Severe) beet leafhoppers per plant. Plots were rated for foliar symptom development on 31 Jul and 21 Aug using a scale of 0 to 9 (0 = healthy and 9 = dead), with the scale treated as a continuous variable (Plant Dis. 90:1539-1544). The center two rows were mechanically topped on 22 Sep and harvested with a small plot harvester. During harvest two eight-beet samples per plot were collected and submitted to the Amalgamated Sugar Co. Tare Lab in Paul, ID for sucrose analysis. Percent sucrose and estimated recoverable sucrose (ERS) were determined as described previously (Plant Dis. 98:1075-1080). Data were analyzed in SAS using the general linear models procedure (Proc GLM), and Fisher's protected least significant difference (LSD;  $\alpha = 0.05$ ) was used for mean comparisons.

Curly top symptom development was uniform and no other disease problems were evident in the plot area. The non-treated check was severely infected based on visual ratings, root yield, and ERS even though a cultivar with enough BCTV resistance to be approved for commercial production was utilized for the study. These data clearly show that what is considered an acceptable level of host resistance to BCTV in commercial sugar beet in Idaho is inadequate to provide acceptable yield when under disease pressure provided by approximately six viruliferous beet leafhoppers per plant. However, when the insecticide seed treatment Poncho Beta was used with this cultivar, disease control was considerably better and normal yield was achieved. The foliar insecticide check, Asana, was intermediate in disease control based on visual ratings, but still led to unacceptable root yield and ERS. Asana could be used to extend control provided by the neonicotinoid seed treatment, but would be unacceptable as a stand-alone treatment. All seven foliar insecticide treatments evaluated in the study provided little or no influence on the control of BCTV as visual ratings, root yield, and ERS indicated the plants were devastated. Additional evaluations with other insecticides will be needed if an alternative to the neonicotinoid seed treatments for BCTV control is to be identified.

Treatment and amount/A <sup>z</sup>	Curly top ratings <sup>y</sup>		Root yield (t/A)	Sucrose content (%)	ERS (lb/A) <sup>x</sup>
	31 Jul	21 Aug			
<b>Non-sprayed Poncho Beta check</b>	3.7 f	4.0 d	36.64 a	14.48	9,004 a
<b>Asana 9.6 fl oz (foliar check)</b>	5.4 e	6.5 c	14.83 b	15.16	3,830 b
<b>Non-treated check</b>	7.4 a-c	8.4 ab	5.42 c	15.51	1,386 c
Clouser SC 5.75 fl oz					
Radiant SC 10 fl oz	7.0 d	8.1 b	5.18 c	15.22	1,303 c
Harvanta 16.4 fl oz	7.1 cd	8.2 ab	4.57 c	15.67	1,217 c
Torac 21 fl oz	7.3 a-d	8.4 ab	4.03 c	14.92	1,020 c
Avuant 6 oz	7.1 b-d	8.4 ab	3.83 c	15.42	999 c
Clouser SC 5.75 fl oz	7.4 a-d	8.5 ab	3.39 c	15.61	886 c
Agri-Mek 0.15 EC 16 fl oz	7.5 ab	8.6 a	3.25 c	15.09	826 c
Radiant SC 10 fl oz	7.6 a	8.6 a	3.28 c	14.62	817 c
$P > F^w$	<0.0001	<0.0001	<0.0001	0.0634	<0.0001
LSD ( $\alpha = 0.05$ )	0.4	0.5	3.35	NS	832

<sup>z</sup>The foliar treatments were applied at the eight-leaf growth stage 7 days prior to inoculation with viruliferous beet leafhoppers. The check treatments are in bold. The non-treated and non-sprayed Poncho Beta (insecticide seed treatment with clothianidin at 2.1 oz a.i. and  $\beta$ -cyfluthrin at 0.3 oz a.i. per 100,000 seed) checks received no foliar treatments.

<sup>y</sup>Curly top ratings = curly top was rated using a scale of 0 to 9 (0 = healthy and 9 = dead), with disease index (DI) treated as a continuous variable.

<sup>x</sup>ERS = estimated recoverable sucrose.

<sup>w</sup> $P > F$  was the probability associated with the F value. Within a column, means followed by the same letter did not differ significantly based on Fisher's protected least significant difference (LSD;  $\alpha = 0.05$ ) value. NS = not significant.