

### Foliar insecticides for the control of curly top in Idaho sugar beet, 2018.

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 B-57 (low level of resistance to *Beet curly top virus* [BCTV]). The three check treatments included a non-treated check, an Asana foliar spray check, and a Poncho Beta seed treatment check. The trial was conducted at the USDA-ARS North Farm in Kimberly, ID which has Portneuf silt loam soil and was used to grow barley in 2017. In the spring, the field was plowed and fertilized (60 lb N and 110 lb P<sub>2</sub>O<sub>5</sub>/A) and then roller harrowed on 5 Apr. The plots were planted (density of 142,560 seeds/A) on 23 Apr. Plots were four rows 34-ft long with 22-in row spacing and arranged in a randomized complete block design with eight replications. Fertility and weed management followed recommendations from the 2018 Sugar Beet Grower's Guide Book (Amalgamated Sugar Co. LLC, Boise, ID). Plant populations were thinned to approximately 47,500 plants/A on 25 May. The foliar treatments were applied on 12 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 (4 nozzles spaced 22 in. apart). Plants were inoculated at the eight-leaf growth stage on 19 Jun with approximately six beet leafhoppers (*Circulifer tenellus*) per plant from a colony that tested positive for the following BCTV strains: California/Logan and Severe. Plots were rated for foliar symptom development on 24 Jul and 5 Sep 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). On 24 Jul, the percentage of plants with a natural infestation of black bean aphids (*Aphis fabae*) was determined among the two center rows of each plot. The center two rows were mechanically topped on 1 Oct 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. The foliar rating data were rank transformed prior to analysis, but the non-transformed means are reported.

Curly top symptom development was uniform and no other disease problems were evident in the plot area, but a natural infestation of black bean aphids did occur. The non-treated check was severely infected based on curly top ratings and yield variables even though a commercial cultivar with enough BCTV resistance to be approved for 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 and yield were significantly better. The foliar insecticide check, Asana, was not significantly different from Poncho Beta, but always ranked worse than the seed treatment for all variables. Asana could be used to extend control provided by the neonicotinoid seed treatment. All seven foliar insecticide non-check treatments evaluated in the study provided little or no influence on the control of BCTV as Sep visual ratings, root yield, and ERS indicated the plants were devastated. The Poncho Beta treatment provided the best aphid control, but Truvia and Asana were also better than the non-treated check. 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>		Aphids (%) <sup>x</sup>	Sucrose (%)	Root yield (t/A)	ERS (lb/A) <sup>w</sup>
	24 Jul	5 Sep				
<b>Non-sprayed Poncho Beta check</b>	2.5 d	4.4 d	4 e	17.56 a	26.5 a	8,050 a
<b>Asana 9.6 fl oz (foliar check)</b>	3.3 d	5.1 d	26 cd	17.14 ab	25.5 a	7,604 a
Beleaf 2.8 oz	4.5 bc	7.1 bc	49 a	16.46 bc	13.0 b	3,701 b
Endevor 5 oz	4.4 c	6.9 c	33 bc	16.01 c	12.0 bc	3,308 bc
BotaniGard 64 fl oz	4.6 c	7.6 a-c	36 a-c	16.07 c	11.8 bc	3,254 bc
Sultan 13.7 fl oz	4.6 c	7.1 c	48 a	16.42 bc	11.2 b-d	3,154 b-d
Aza-Direct 24 fl oz	4.8 a-c	7.6 a-c	40 a-c	16.20 c	10.4 b-d	2,870 b-d
Truvia 703 oz	5.2 a	7.8 a	18 de	16.10 c	9.4 cd	2,549 cd
<b>Non-treated check</b>	5.3 ab	7.7 a	42 ab	15.66 c	9.5 cd	2,541 cd
Rycar 3.2 fl oz	5.5 a	7.8 ab	42 ab	15.81 c	9.0 d	2,350 d
<i>P</i> > <i>F</i> <sup>v</sup>	<0.0001	<0.0001	<0.0001	0.0010	<0.0001	<0.0001
LSD ( $\alpha = 0.05$ )	Trans	Trans	15	0.88	2.8	861

<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.

Trans = the foliar rating data were rank transformed prior to analysis, but the non-transformed means are reported.

<sup>x</sup>The percentage of plants in the center two rows with a black bean aphid colony in the crown.

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

<sup>v</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.