Evaluating Organic Acids in Canola-Soybean crop rotation

Project Duration
2019-2021

Objectives
To determine if organic acid products (MX-3, VX-8) have any effect on crop productivity in Canola-Soybeans crop rotation. This was the second year of evaluation and these products were applied to soybean crop.

Collaborators
Kevin Shale, Montra Crop Science

Results
During 2020 crop season, organic acids did not have any effect on plant stand, plant vigor, days to maturity, plant height and grain yield of soybean (Table 1). The use of organic acids did not change protein content in the grains. There was no difference for Calcium, Phosphorous, Magnesium, Potassium, Copper, Iron, Manganese and Zinc content in grains among different treatments and control (data not shown).

Table 1: Effects of organic acids on agronomic traits and yield of soybeans in Arborg.

Treatment	Plant Stand (plant/m^2)	Plant Vigor (1-5 scale)	Days to Maturity	Plant Height (inches)	Yield (bu/ac)	Crude Protein (%)
MX-3 75%	53.5	3.9	113.0	18.8	40.0	35.8
MX-3 100%	60.5	3.9	113.1	19.8	38.7	35.8
VX-8 75%	60.0	3.8	113.0	20.6	39.8	36.1
VX-8 100%	57.8	3.9	113.3	20.9	39.6	35.8
CONTROL	57.0	3.9	113.1	20.0	40.2	35.7
Signi Diff	No	No	No	No	No	No
P	0.568	0.771	0.722	0.308	0.547	0.942
CV%	12.4	5.8	0.3	8.1	4.6	1.8

75 or 100% - denotes the herbicide rate used in crop for the control of weeds.

Project Findings
This was the second year of testing and Organic acids (MX-3 & VX-8) did not have any effect on Canola yield during 2019. Results are similar this year again and soybean yield did not see any increase from the use of organic acids. Both organic acids were applied along with 75 & 100% rates of herbicides (glyphosate in this case) and were compared with control plots. Control soybeans plots got 100% rate of the herbicide. Soybean yield was similar irrespective of whether 75% or 100% of glyphosate rate were applied on the plots.

Background / References / Additional Resources
Humic products improves the field efficacy across ranges of field conditions for improving crop yield and soil health (Olk *et al.*2018). Humic compounds such as fulvic acid and humic acid are formed by chemical and microbial degradation of plant and animal material and are a principal

component of soil organic matter (Canellas *et al*. 2015). In general, the application of fulvic and humic acid fertilizer amendments have been shown to enhance root growth, increase nutrient uptake, alleviate stress, and increase yield in various crops (Canellas *et al.* 2015). However, studies conducted in Ontario on dry bean (*Phaseolus vulgaris* L.) in 2010 and 2011 using fulvic acid (LX7®, MTS Environmental Inc.) or humic acid (Plant XL®, Alpha-Agri) fertilizers showed no response. Twenty fulvic acid field trials and 15 humic acid field trials indicated that these fertilizers were ineffective, as plant vigour, height, 100-seed weight, and yield were similar to a control treatment (Mahoney *et al* 2017).

Broadcast pre-plant or post-plant application of leonardite did not affect the emergence, chemical composition, or yield of wheat or canola in Manitoba (Dilk 2002). The efficiency of phosphorus (P) fertilizer was studied with and without humic acid, derived from leonardite. Application of leonardite in a P fertilizer band significantly increased the P concentration of canola tissue in the early stages of development. However, the increase in P concentration did not result in an increase in yield.

In the current study, product MX-3 did have 5% fulvic acid and it was sprayed in furrows after seeding. Additional sprays of this product were applied during early phase of the crop growth. Another granular product, VX-8 was applied with the seed.

References

Daniel C. Olk, Dana L. Dinnes, J. Rene Scoresby, Chad R. Callaway & Jerald W. Darlington (2018) Humic products in agriculture: potential benefits and research challenges—a review. Journal of Soils and Sediments volume 18, pages2881–2891(2018), DOI: 10.1007/s11368-018-1916-4

KJ Mahoney, C McCreary, D Depuydt, CL Gillard (2017) Fulvic and humic acid fertilizers are ineffective in dry bean. Canadian Journal of Plant Science, 2017, 97(2): 202-205, https://doi.org/10.1139/cjps-2016-0143

Canellas LP, Olivares FL, Aguiar NO, Jones DL, Nebbioso A, Mazzei P, Piccolo A. (2015) Humic and fulvic acids as biostimulants in horticulture. Sci. Hortic. ***196****: 15-27.*

Sean B Dilk (2002). Agronomic evaluation of leonardite on yield and chemical composition of Canola and Wheat. Masters Thesis, Dept of Soil Sciences, University of Manitoba.

Materials & Methods

Experimental Design – Replicated block design with four replications

Treatments:

1) ***Montra MX-3 100%****: Foliar applied liquid organic acid (spray in furrows after seeding on the same day @ 1 L/acre) + 100% herbicide rate applied on the crop + insecticide applied (when needed)
2) **Montra MX-3 75%*** : Foliar applied liquid organic acid (spray in furrows after seeding on the same day @ 1 L/acre) + 75% herbicide rate applied on the crop + insecticide applied (when needed)
3) **Montra VX-8 100%*:** MX-3 bonded to Verxite for dry application (applied with seed @ 6 Kg/acre) + 100% herbicide rate applied on the crop + insecticide applied (when needed)
4) **Montra VX-8 75%** *: MX-3 bonded to Verxite for dry application (applied with seed @ 6 Kg/acre) + 75% herbicide rate applied on the crop + insecticide applied (when needed)
5) **Control** – Herbicides (100% rate) + Insecticide applied (when needed)

*All treatments except Control got two more sprays (June 16 & July 9) of Montra MX-3 during early phase of crop growth.

Variety – S0009-M2

Plot size – 9.12m^2

Data collected – Plant stand, plant vigor, days to maturity, plant height and yield

Agronomic information

Stubble, soil type – Canola, Heavy clay

Fertilizer applied – N 4lbs/ acre, P 20 lbs/acre at the time of seeding.

Pesticides applied – Gyphosate@0.67 L/acre - June 08
Coragen@100ml/acre for grasshoppers-Aug 11
Silencer@ 34ml/acre for grasshoppers- Aug 20

Seeding/Harvesting date – May 18 / Sep 23