Management of Volunteer Glyphosate-Resistant Canola in Glyphosate-Resistant Soybeans

Target a soybean seeding rate of 4-6 plants per square foot (ft^2) for optimum net return and improved crop competition against volunteer glyphosate-resistant canola. Pre- and post-emergent herbicides were assessed for control of volunteer glyphosate-resistant canola in soybean.

Limited information exists for the cultural and chemical control of volunteer glyphosate-resistant canola in Roundup Ready® soybeans. To address this issue, four separate experiments were conducted at four locations (Saskatoon, Scott, Indian Head, SK; Carman, MB) in 2014 and 2015. Experiments included a soybean seeding date by seeding rate experiment to determine optimum seeding dates and rates for reducing volunteer canola interference, evaluation of various PRE- herbicides, evaluation of various POST- herbicides, and evaluation of sequential PRE- and POST- herbicide treatments for volunteer canola control.

Seed at 4-6 Plants Per Square Foot

The soybean cultivar P001T34R, a Pioneer HiBred 00 maturity glyphosate-resistant variety was sown in late May, early June, and mid-June at five seeding rates of 1, 2, 4, 8, and 160 seeds/ft^2 (10, 20, 40, 80, and 160 seeds/m^2). These rates were equivalent to 41,250, 82,500, 165,000, 330,000, and 660,000 seeds/acre (ac).

Saskatchewan Pulse Growers indicate that the ideal final plant stand population ranges from 150,000 to 200,000 plants/ac.

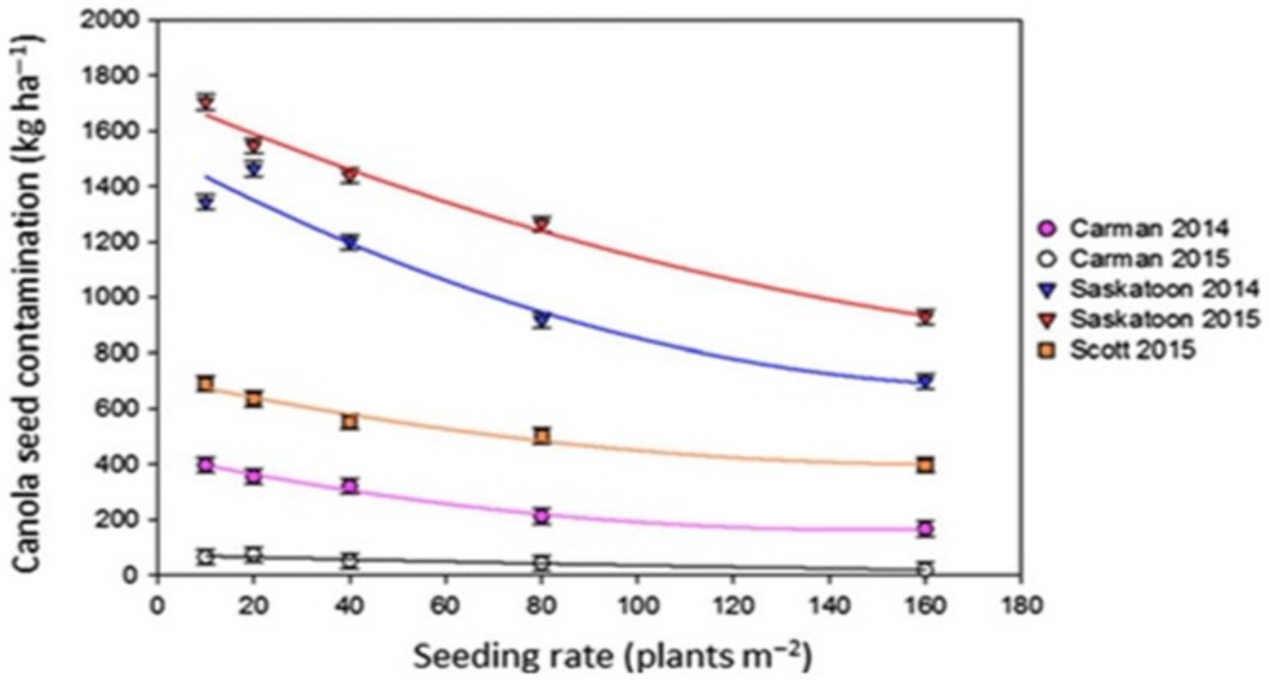
Responses to seeding date were variable and were environment dependent, but the optimal planting date range was from May 20 to June 1.

Higher seeding rates resulted in higher soybean biomass and yield and lower canola biomass and seed production. Results generally displayed a consistent trend in which soybean biomass and soybean yield increased steadily with increasing seeding rates, while canola biomass and canola seed production showed an opposite trend, decreasing with increasing seeding rates.

Based on an economic analysis, during years with low or average ($11.85/bushel) market prices for soybeans, 4 plants/ft^2 (165,000 seeds/ac) is likely the best option for growers, because lower seeding rates had very high levels of volunteer canola. However, when market prices are higher, growers will see a benefit to increasing the seeding rate to 5-6 plants/ft^2 (206,250 to 247,500 seeds/ac) because this will potentially increase soybean yield by 15% to 30% and offset seed costs, while minimizing volunteer canola competition. Seeding rates higher than 7 plants/ft^2 (288,750 seeds/ac) are generally not economic for growers because the yield benefits are not great enough to offset the high seed costs.

Improving crop competition with higher seeding rates will also decrease the contribution of canola seed to the seedbank and therefore decrease volunteer canola populations in crop over the following years.

Figure 1. Volunteer Canola Contamination Response to Seeding Rate at Five All Site-Years



Source: Mierau et al. 2019

Herbicide Treatments

Plots were established on existing Roundup Ready® canola stubble, with volunteer canola established by cross seeding canola at 40 plants/m^2 to ensure the existence of a volunteer canola stand before seeding soybeans. Soybeans were seeded 3-5 days after PRE-herbicide application at a rate to meet a target population of 180,000 plants/ac. Ten different pre-emergent treatments were applied.

Pre-emergence applications containing cloransulam-methyl (First Rate®) and florasulam were the most consistent in controlling volunteer Roundup Ready ® canola and increasing soybean biomass and yield.

All post-emergent herbicide treatments were applied at the 1-2 trifoliate crop stage and were tank-mixed with glyphosate. Ten different post-emergent herbicide treatments were applied.

Most of the POST- herbicides evaluated (Basagran®, First Rate®, Odyssey®, Reflex®, Solo®, and Viper ADV®) provided acceptable control of volunteer canola and resulted in increases in soybean biomass and yield more than 40% of the time. Fluthiacet-methyl (Cadet®) was not as efficacious in controlling volunteer canola as the other treatments.

Layering Pre- and Post-Emergent Herbicides

Fifteen pre/post sequential herbicide treatments were applied in a tank-mix with glyphosate. PRE- herbicide treatments were applied prior to seeding. POST- herbicide treatments were applied at the 1-2 trifoliate stage of soybean.

Treatments containing tribenuron PRE- and imazamox + bentazon POST- were generally ranked highest in terms of volunteer canola control and low soybean phytoxocity in the sequential PRE and POST experiments. There was also some indication that 2,4-D PRE- may result in phytoxocity to soybeans. Treatments containing saflufenacil PRE- and cloransulam-methyl, fomesafen, or bentazon POST- also provided satisfactory weed control and crop safety.

The use of cloransulam-methyl (FirstRate®) with Roundup WeatherMAX® increased Roundup Ready® soybean yield and biomass, decreased Roundup Ready® canola biomass, and provided the adequate Roundup Ready® canola control in both pre- and post-emergence applications. These results suggest this product could be registered for use on Roundup Ready® canola in Roundup Ready® soybean in Western Canada.

Funding was provided by Saskatchewan Pulse Growers, Saskatchewan Agriculture Development Fund, Western Grains Research Foundation, Pioneer Hi-Bred, and Monsanto.

Mierau A, Johnson EN, Gulden RH, Weber JD, May WE, Willenborg CJ (2019) Minimizing competition between glyphosate-resistant volunteer canola (Brassica napus) and glyphosate-resistant soybean: impact of soybean planting date and rate. Weed Technol. doi: 10.1017/wet.2019.97