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## MPSG ANNUAL EXTENSION REPORT

PROJECT TITLE: Volunteer canola in soybean production

PROJECT START DATE: May 1, 2012  
PROJECT END DATE: January 15, 2017  
DATE SUBMITTED: March 15, 2016

### ***PART 1: PRINCIPAL RESEARCHER***

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### ***PART 2: EXECUTIVE SUMMARY***

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Volunteer canola is a common weed in canola growing areas. Volunteer canola originates from high harvest losses and a large seedbank that, through developing seed dormancy, can persist for several years in rotation. A limited number of herbicides are available to manage this weed effectively in soybean production and a number of studies have been initiated to better understand the impact of volunteer canola on soybean production and how to manage it. These studies are answering the following questions:

- 1) How effective are soil disturbance practices at reducing the persistence of volunteer canola seedbank after canola harvest?
- 2) What cultural control methods can be used to improve the competitiveness of soybean with volunteer canola?
- 3) What is the action threshold for managing volunteer canola in narrow- and wide-row soybean?
- 4) What tankmix partners are required to manage volunteer canola in dicamba and 2,4-D resistant soybean?
- 5) How does soil nitrogen affect competition between volunteer canola and soybean?

### **PART 3: PROJECT ACTIVITIES AND PRELIMINARY RESULTS**

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In 2015, field studies evaluating the impact of volunteer canola in soybean were initiated at the Ian Morrison Research Farm in Carman and at CMDC at Portage la Prairie. The studies included i) a continuation of the threshold work to confirm and firm up these data, ii) based on results from a previous study in this project, a new study that evaluated the effect of soil nitrogen on soybean competition with volunteer canola, and iii) evaluations of volunteer canola control in dicamba and 2,4-D resistant soybean varieties that will soon be available to producers in western Canada. Research trials were initiated in the spring of 2015 and maintained throughout the summer. The herbicide trials on new generation soybean with multiple herbicide resistance traits were terminated at the initiation of flowering as mandated by the suppliers of the seed. All other field experiments were taken to harvest and sample evaluation and data analysis continues.

An initial analysis of the combined data from the action threshold experiments showed that volunteer canola is quite competitive with soybean, and interestingly, soybean yield loss in response to competition was more variable in wide-row (30") soybean than narrow row soybean (7.5" row spacing) (Table 1). Despite this apparent greater variation in wide-row soybean, the 5% action threshold on average appeared to be lower than in the narrow-row production system. These results indicate that the outcome of volunteer canola-soybean competition is more predictable in narrow-row soybean production systems and that soybeans produced in narrow row production systems appear to be more competitive with volunteer canola. The same level of soybean yield loss was observed at more than twice the volunteer canola density in narrow-row soybean than in wide-row production systems. The more even spatial plant arrangement in narrow-row soybean providing more complete light capture earlier in the season likely played a significant role in these observations.

To further evaluate the impact of soil nitrogen on the outcome of interference between volunteer canola (2 hybrid and 2 op lines) and soybean was examined over a nitrogen gradient (0-160 kg/ha) at two separate seeding dates at Carman. Among site-years, two accessions (one hybrid and one open pollinated variety) of volunteer canola decreased soybean yield as the rate of nitrogen supplementation increased while this effect for two other volunteer canola varieties (accessions) tended to be similar, but less pronounced and was not statistically significant (Figure 1). Soybean yield of the control, absent of volunteer canola, was not affected significantly by spring applied nitrogen. This study showed that the level of residual soil nitrogen may affect the competitive balance between soybean and volunteer canola, although this appears to be specific to canola variety. What caused these differences between varieties is not yet known. Additionally, results from this study show that nitrogen banded prior to seeding soybean did not have an effect on soybean yield in the absence of weed pressure.

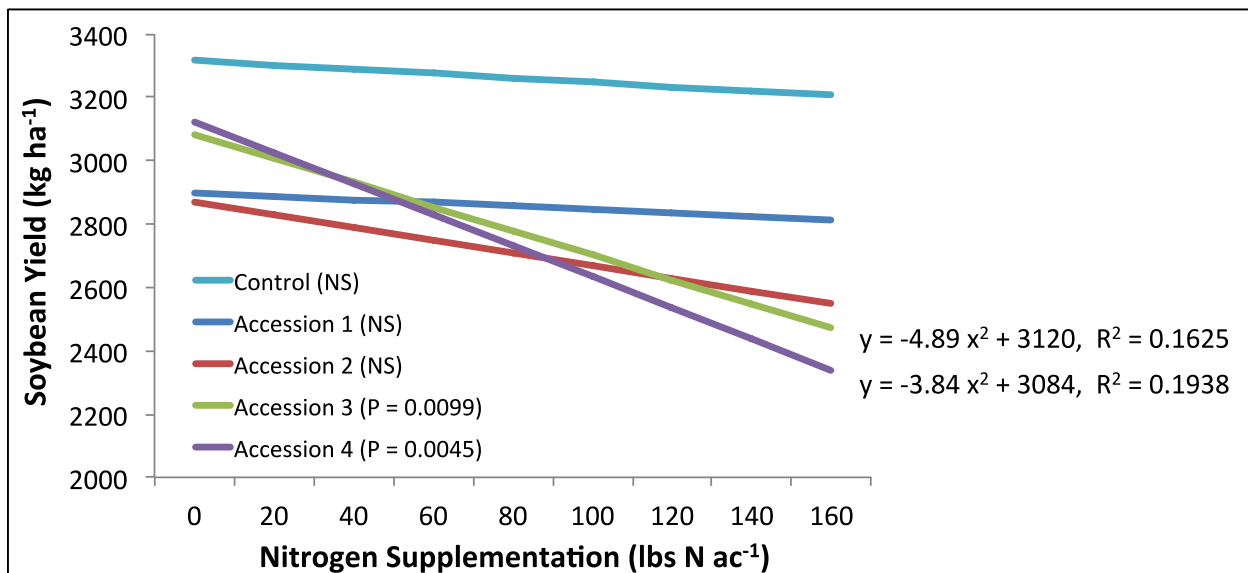
Results from the herbicide work are still being evaluated. Initial results from a study that investigated the tankmix partner options to improve volunteer canola control in dicamba-resistant soybean. Preliminary results suggest that faster acting in-crop herbicides (some members from groups 6 and 14) tended to cause to lower volunteer canola and higher soybean biomass accumulation at flowering when this study was terminated (data not shown). More detailed analysis of this study and analysis of the herbicide efficacy study with tankmix partners and pre-applied herbicides with 2,4-D resistant soybean continues. Final analysis of the integrated management studies conducted by graduate student, Charles Geddes, continues and a model to determine the most effective management strategies for volunteer canola in a canola-wheat-soybean rotation is being built by Charles at this time. Seedbank management research is ongoing and the data collected in 2016 will be added to the model. A number of publications on the individual studies are expected to be prepared in 2016 and a comprehensive analysis of all experiments will be initiated as data collection in these studies comes to an end.



**APPENDIX**

**Table 1.** Individual and combined analysis for the action thresholds (volunteer canola plants m<sup>-2</sup>) required for 5% yield loss in narrow (7.5") and wide-row (30") soybean.

| Site Year   |          | Action Threshold<br>Plants m <sup>-2</sup> |            |
|-------------|----------|--|------------|
| Year        | Location | Narrow                                     | Wide       |
| 2012        | Carman   | -  | -          |
|             | Kelburn  | 3.3  | 2.6        |
|             | Melita   | 1.1  | 1.8        |
| 2013        | Carman   | 3.2  | 12.5       |
|             | Kelburn  | 3.9  | 1.6        |
|             | Melita   | 2.0  | 9.7        |
| 2015        | Carman   | 1.4  | 3.1        |
|             | Portage  | 2.9  | 0.3        |
| <b>MEAN</b> |          | <b>2.8</b>                                 | <b>1.2</b> |



**Figure 1.** The effect of pre-seeding urea application on soybean yield under volunteer canola interference at two sites near Carman, MB, 2015. Accessions delineate volunteer canola varieties or hybrid generations, whereas the control was absent of volunteer canola.

