

Agronomic Management of Soybeans in Manitoba: Crop Rotation

Over the short term, crop sequence had limited effect on soybean root rot, crop yield and quality; however, differences among rotations often emerge slowly over time.

SOYBEANS HAVE BECOME a key part of crop rotations on Manitoba farms, but relatively little information is available regarding the effects of preceding crop sequences on soybeans and the effect of soybeans on other crops. In North Dakota, short-term crop sequence research has shown limited effects of preceding crop on soybeans, likely because differences among crop rotations emerge slowly over time. Crop rotation research, however, does provide value over time as the effect of cropping sequence can be measured while keeping environmental factors, such as soil type, constant.

Each crop in a rotation affects the overall economic return by influencing disease levels, weed populations, nutrients and soil conditions. The relative effect of each crop on disease is governed by the frequency and sequence in which it appears. Of particular importance in Manitoba is the root rot complex, including *Fusarium spp.* Surveys have shown root rot to be pervasive to the extent that it has become important to

evaluate the impact of various soybean, wheat, canola sequences on managing root rot and its effect on soybean yield and quality.

The objective of this project was to evaluate the impact of soybean included in cropping sequences with wheat and canola on root rot, seed yield and seed quality in Manitoba. From 2011 to 2016, *crop sequence* studies were conducted at Morden (2011–2013) and Brandon (2013–2015) to assess six, three-year crop sequences (Table 1). A second *crop rotation* study was initiated at Brandon (2014–2016) to assess five rotations (soybean-canola, soybean-wheat, soybean-canola-wheat, soybean-wheat-canola and soybean-soybean-wheat). Soybean root rot was evaluated by rating 60 roots per treatment using a scale of 0 (no disease) to 9 (death of plant).

Crop sequence generally had limited effects on soybean root rot, seed yield and quality. Soybean yield was higher following wheat than canola at two of four site-years (Table 1). Root rot ratings,

although differing by site and year, were similar across preceding crop treatments. One explanation for the superiority of wheat preceding soybean is the mycorrhizal associations both crops form to assist with nutrient uptake. It is well-known that canola does not form these associations. Therefore, the preceding canola may have reduced mycorrhizae populations prior to the soybean crop. Preceding crop sequence had no influence on the yield of wheat or canola.

In the crop rotation study, root rot severity tended to increase in the soybean-canola rotation compared to the more diverse soybean-wheat-canola rotation. In the final year of the study (2016), wheat and soybean yields were similar regardless of the preceding crop, but canola yields were highest after wheat-soybean and lowest after canola-soybean. Crop sequence also had no effect on oil or protein content for canola and wheat, respectively. Protein levels in soybeans, however, were higher after soybean-wheat (34.3%) and canola-wheat (34.4%) compared to soybean-canola and wheat-soybean (both 33.5%).

To date, this study suggests that manipulating the order of the “big three” crops would not buffer root rot in soybeans. Moreover, if the canola timeline is managed wisely, factors other than crop rotation are likely to be more important to the success of soybeans. Since these studies looked at crop sequence effects over a relatively short duration, it is not surprising that few differences emerged. To better understand the long-term performance of soybean rotations under typical Manitoba conditions, the crop rotation study at Brandon will continue until 2021. ■

Table 1. Mean yield and root rot ratings for the soybean year of the crop sequence in Brandon (2013–2015) and Morden (2011–2013).

Crop Sequence			Soybean Root Rot Ratings			Soybean Yield (bu/ac)	
			Brandon		Morden	Brandon	Morden
Year 1	Year 2	Year 3	Year 2	Year 3	Year 3		
Canola	Soybean	Wheat	2.6	–	–	24.0	22.0
Wheat	Soybean	Canola	3.1	–	–	23.4	28.0*
Soybean	Wheat	Canola	–	–	–	–	–
Soybean	Wheat	Soybean	–	3.6	2.3	27.3*	41.7
Soybean	Canola	Wheat	–	–	–	–	–
Soybean	Canola	Soybean	–	3.9	2.3	15.6	42.0

*Soybean yield following wheat was statistically higher (p<0.1) than following canola.