Development of non-GMO food soybean for Western Canada

Dr. Tom Warkentin
University of Saskatchewan – CDC

SPG Contributions	Project Status	Duration/Timeline of Project (Year to Year)	Total Project Cost
$57,500.00	Completed	November 2012 – October 2013	$57,500.00

Project Description

While most expansion of pulse acreage in Saskatchewan has come in the form of lentil and pea, crops with less history in the prairie provinces can also provide diversification and profitability. Non-GMO soybean is in high demand for specialty food purposes such as soy milk, tofu, natto and miso, as well as non-GMO feed and oil, and commands a premium of $1 to $3 a bushel. Non-GMO soybeans have been expanding in Manitoba and into east and southeast areas of Saskatchewan. However, soybean is traditionally a longer-season crop needing high heat units, and may be less suited to the lower heat units and long days found in this area. Work was needed to identify the most useful lines for prairie conditions, and whether new varieties from the Ottawa breeding program can perform well in the west.

Extra-early soybean germplasm from the AAFC, Ottawa program will mature and produce competitive grain yield when grown in Saskatchewan.

Two studies were carried out to identify non-GMO soybean varieties which are useful for the prairie provinces. An Adaptation trial examined the growth of new candidate varieties under these conditions, to identify the best new material developed in the Ottawa soybean breeding program. For this trial, the standard method developed for soybean mini-trials in Saskatchewan was used, with four locations in 2013. Known check cultivars with good performance in short-season areas in eastern Canada and Manitoba, as well as new lines from the AAFC Ottawa program were tested. This funding covered the 2013 year, but the data include the results from 2011 and 2012.

An isoline trial looked at whether known earliness genes or markers held up under the different conditions of growth in Saskatchewan – cooler temperatures than further east or south, and long days in the summer. These lines were sets of isolines, with one common parent line being compared to progeny lines which had different earliness genes crossed into them. Each set of isolines was developed by crossing one parent line with a series of other lines carrying different maturity genes, then backcrossing until they reached nearly pure parental type with the exception of the added maturity genes.

For the isoline trial, two sets of isolines were compared to their parents. In one set, the parent, Harasoy, was of Maturity Group II, which is late-maturing for western conditions, and the backcrossed lines contained different earliness genes. In the other set the parent line was Maple Presto, which was of Maturity Group 000, the earliest available, and the backcrossed lines had a range of maturity genes.

Outcome

The Adaptation trial showed a range of responses, with some cultivars in some years widely out-yielding the control, but in other years having little or no advantage. Averaged over the three years presented, however, several lines out-yielded the control by more than 10%, indicating their potential. The earlier varieties matured in 105 days in 2012 but several days later in other years, while later varieties came off in 115-121 days, varying with year and location. While later-maturing cultivars are generally expected to be higher yielding, this effect was not observed. Instead, the cultivars fell into two groups, early and later, with some high-yielding cultivars in each.

In the isoline trial, there was a range of maturity from 108 to 125 days. Generally, longer days to maturity provides higher yield, as was found for these lines when grown at Ottawa. However, when grown in Saskatchewan, the early to medium maturity lines provided the best yield and the late maturing lines were poor. About 115 days to maturity was optimal for yield in Saskatchewan, and the earliest and medium maturity lines yielded better in Saskatchewan than Ottawa. However, all the lines were several (about 15) days slower than the same lines grown in Ottawa. As well, one site-year was lost entirely to frost.

New soybean lines with earlier maturity are producing improved yields for prairie conditions, but still have a growth season that is longer than what is found in Ottawa for the same lines. Stacking earliness genes can help provide lines that are able to thrive in Manitoba and southeast Saskatchewan growing areas.

Soybean lines may need to be selected in Manitoba or Saskatchewan to ensure suitability for the growing conditions. They need to be well adapted to the long days, lower heat units, and cool nights, as well as having good field qualities and early maturity. This project led to another, now in progress, which is going on to develop and test further early-maturing non-GMO soybean.

Non-GMO soybean can increase profitability for farmers in Saskatchewan and Manitoba, if varieties with a shorter growing season, which can cope with a slightly cooler temperature and longer day, can be identified.

Research Objective

OBJECTIVE 1
To conduct the soybean Adaptation and Isoline trials at four locations in Saskatchewan in 2013.

OBJECTIVE 2
To compare the results with data collected in 2011 and 2012, in order to make recommendations regarding yield/maturity relationships for soybean production in Saskatchewan.

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