



Comparing early soybean maturity groups

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Environmental factors and location affect soybean phenology, seed yield and seed quality for early maturity groups in northern environments. Baseline environmental and phenological trends with established yield and seed quality components were developed for early maturing soybean that will support the optimization of soybean breeding and production in the Canadian Prairies.

Commercialization of short season cultivars has led to expanded soybean production on the Canadian Prairies. Environmental conditions and location influence soybean phenology, seed yield and seed quality, and are important components for developing appropriate cultivars for the Canadian Prairies.

The objective of this study was to examine three key components - soybean phenology, seed yield and seed quality - in ten soybean cultivars differing in maturity group (MG) rating between 000.9 and 1.3 in two different growing environments, eastern Ontario and southern Manitoba.

Field experiments were conducted in Manitoba at the Agriculture and Agri-Food (AAFC) Research and Development Centre at Morden in 2008, 2009 and 2010, and the University of Manitoba Research Station at Carman in 2017 and 2018. In Ontario, field experiments were conducted at the AAFC Research and Development Centre in Ottawa during the same years.

The experiments were managed with recommended crop and agronomic management practices for each location. Target plant densities were achieved by adjusting the planting rate for individual cultivar germination percent and 20 per cent mortality. A seeding rate of 222,675 seeds/ac (550,000 seeds/ha) was used in Manitoba, and 202,430 seeds/ac (500,000 seeds/ha) in Ontario, with a seeding depth of approximately 1 inch (2.5 cm) below the soil surface.

The ten cultivars used in the study were selected from the same source and representative of the two locations. Soybean development stages were recorded for each plot in all site-years, including the calendar date of planting (PL), emergence (VE), beginning bloom (R1), beginning seed (R5), and full maturity (R8). Climate and phenological data were collected to investigate relationships between temperature, precipitation, and time with seed yield and seed quality components.

In 2017 and 2018, temperature requirements were achieved for optimal plant growth in both Manitoba and Ontario. However, in Manitoba, the longer photoperiod is expected to have resulted in delayed flowering and seed set, with more time spent in vegetative growth. More leaves were produced on the main stem at flowering in Manitoba than in Ontario. The warm temperature and shorter photoperiod in Ontario resulted in a greater rate of phenological development in the vegetative stage. Seed yield and temperature were positively correlated with precipitation at all growth stages in Manitoba, while in Ontario increasingly warmer temperature during reproductive development had the greatest relationship with seed yield.

Baseline environmental and phenological trends for early MG soybean

From the study, researchers found significant differences among cultivars, site-years, and between locations for seed yield, thousand seed weight (TSW), and seed protein and oil concentration. The results also showed significant cultivar × location interactions for these factors.

The ten cultivars tested in this experiment ranged 25 MG decimal subgroups and the number of days in the total crop growth duration of PL-R8 ranged 20 days from the earliest MG subgroup to the latest MG. This indicates these cultivars have been assigned an accurate MG relative to each other in both Manitoba and Ontario.

In MB phenology among cultivars were equal until R5, but significantly different from R5 to R8 stages. The later MG cultivars slowed in development after reaching R5 and achieved R8 later than the earlier MG cultivars. These differences among MG were negligible in Ontario.

The study showed that soybean seed yield was greater for cultivars rated with later MG in both Manitoba and Ontario. For the three earliest rated MG cultivars, seed yield was equal for Manitoba and Ontario, however the remaining cultivars tested had greater yield in Ontario.

Researchers have established a baseline for soybean phenology, seed yield and seed quality components for early MG soybean in northern environments. This will support the optimization of soybean breeding and production in the Canadian Prairies to meet the high global demand for soybean. Additional research is required to gain a greater understanding of genetics, environment, and management practices that influence seed yield and various quality factors for early MG soybean.

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Photo by Nate Ort, University of Saskatchewan