Photoperiod, day length, sensitivity, heat units, maturity grouping — these are today’s buzzwords surrounding the process of how soybeans reach maturity. In this article I will describe the factors involved, attempt to establish consensus among industry and convince you that all we really need is calendar days.

The role of photoperiod

Several factors affect the rate at which crops develop — heat, moisture, fertility and photoperiod. Photoperiod is the length of time that organisms receive sunlight, or in other words, day length (these terms are often used interchangeably).

Soybeans are considered short-day plants, meaning that physiological development is accelerated by short days. This is important for soybean adaptation in northern growing regions where photoperiod increases with latitude, potentially delaying maturity. For example, within Manitoba, latitude increases 2° from Morden to Roblin. As a result, photoperiod/day length is longer in Roblin compared to Morden during midsummer. The longer days can delay maturity of soybean and increase risk in northern regions with fewer frost-free days.

Thus, soybeans face two challenges as they move north — less heat and longer days. This is in contrast to wheat and canola, both long-day plants, where moving north to less heat is generally offset by the speeding effect of long days.

To encompass the influence of photoperiod, the term “maturity groupings,” also known as “relative maturity” is used in North America to group soybean varieties within certain latitudes. Each grouping defines soybean cultivars that are adapted to the photoperiod within a range of latitude across an east-west belt. Maturity groups range from 000 in northern growing regions of Canada to VIII in the southeastern U.S. This classification system is new to Manitoba, and we began to include it in variety trial data starting in 2014.

CHUs — fine for corn, but...

When we first began growing soybeans in Manitoba, corn heat units (CHUs), also referred to as “crop” and “company” heat units, were used to...
describe their adaptability. The CHU system is based solely on the daily accumulation of heat throughout the growing season, with no influence of photoperiod. This works well for corn, which is day neutral (not affected by photoperiod), but due to the influence of photoperiod on soybean development, the use of the CHU system to describe soybean adaptation has potential flaws.

With funding from Manitoba Pulse Growers Association, a research study was undertaken by Aaron Glenn (AAFC Brandon) from 2011-13 investigating three soybean varieties, each with different maturity groupings and CHU ratings, at multiple sites throughout the province. One objective of the study was to relate CHUs, calendar days and photoperiod to soybean developmental stages.

A major finding was that the early soybean variety, with a low CHU rating (2325 CHU), was able to mature and yield well at Roblin despite only accumulating 85 per cent of the required heat units. Observations of soybean varieties reaching maturity earlier than predicted by CHUs have previously been made by farmers and agronomists. Roblin is a high-latitude site with longer days, which would normally delay maturity (recall that soybean maturity normally progresses with short days); so why did the variety perform so well?

Developments over the past 30 to 40 years have identified soybeans that are “photoperiod insensitive,” meaning that soybean maturity is not delayed by short days. We believe that this understanding has been vital to the expansion and success of soybeans into Manitoba.

Significant research is underway to fully understand the genetic basis for photoperiod sensitivity (or insensitivity) in soybeans. The ability to optimize the photoperiod response of soybean cultivars to particular environments will be vital to enabling further increases in productivity.

**Varieties differ in response**

Another major finding is that days to maturity for the two earlier varieties was similar at Morden and Roblin, while as expected, the third variety reached developmental stages earlier at Morden (warmer) compared to Roblin. These results demonstrate that current varieties differ in the way they reach maturity (likely due to varying photoperiod sensitivity).

The inconsistent relationship between CHUs, yield and maturity supports the move away from classifying soybean varieties solely by company heat units, to including maturity grouping. In Manitoba, maturity groupings are primarily within the 00 area, with subgroups from 00.1 to 00.9, with each 0.1 equating to about one day’s difference in maturity. Maturity groupings appear more accurate compared to CHUs but are not the complete solution yet. For example, in the Roundup Ready soybean table of Seed Manitoba, several varieties have the same maturity grouping (00.7) but their relative days to maturity ranges from -4 to +6 days compared to the check variety.

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It takes several years of study to accurately determine maturity groupings for particular varieties, which is why it’s important to focus on calendar days when evaluating soybeans regionally.

**The bottom line — it’s calendar days**

After this (complex) explanation of soybean maturity, the bottom line is that it comes down to calendar days. Heat and photoperiod are the two primary factors influencing soybean maturity, but we still don’t fully understand the relative importance of these factors for all varieties in Manitoba. Both factors are reflected in the actual days to maturity as seen in *Seed Manitoba*.

If varieties are well suited to a region based on heat units, photoperiod and/or moisture, it will be reflected positively in days to maturity and yield. As growers and agronomists, we don’t need to concern ourselves with the complexities of heat units and maturity groupings.

In *Seed Manitoba*, varieties are listed from early season to long season, based on relative days to maturity averaged across multiple locations in eastern and western Manitoba. The first step is to identify which zone you are in (long, mid, short) then choose a variety within the zone based on yield and other attributes (iron chlorosis rating, plant architecture, etc.).

Yield performance of soybean varieties among zones varies by an average 10 to 20 per cent, so variety selection is critical to optimizing farm profitability.

The soybean industry has made remarkable strides over the past few years in bringing high-yielding, short-season varieties adapted to Manitoba. Further collaboration and transparency from breeding groups on varietal response to photoperiod and CHUs will be key to achieving further gains in productivity.

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*A research study from 2011-13 investigated three soybean varieties, each with different maturity groupings and CHU ratings, at multiple sites throughout the province.* PHOTO: MPGA