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Wisconsin Corn Hybrid Performance Trials

Grain • Silage • Specialty • Organic

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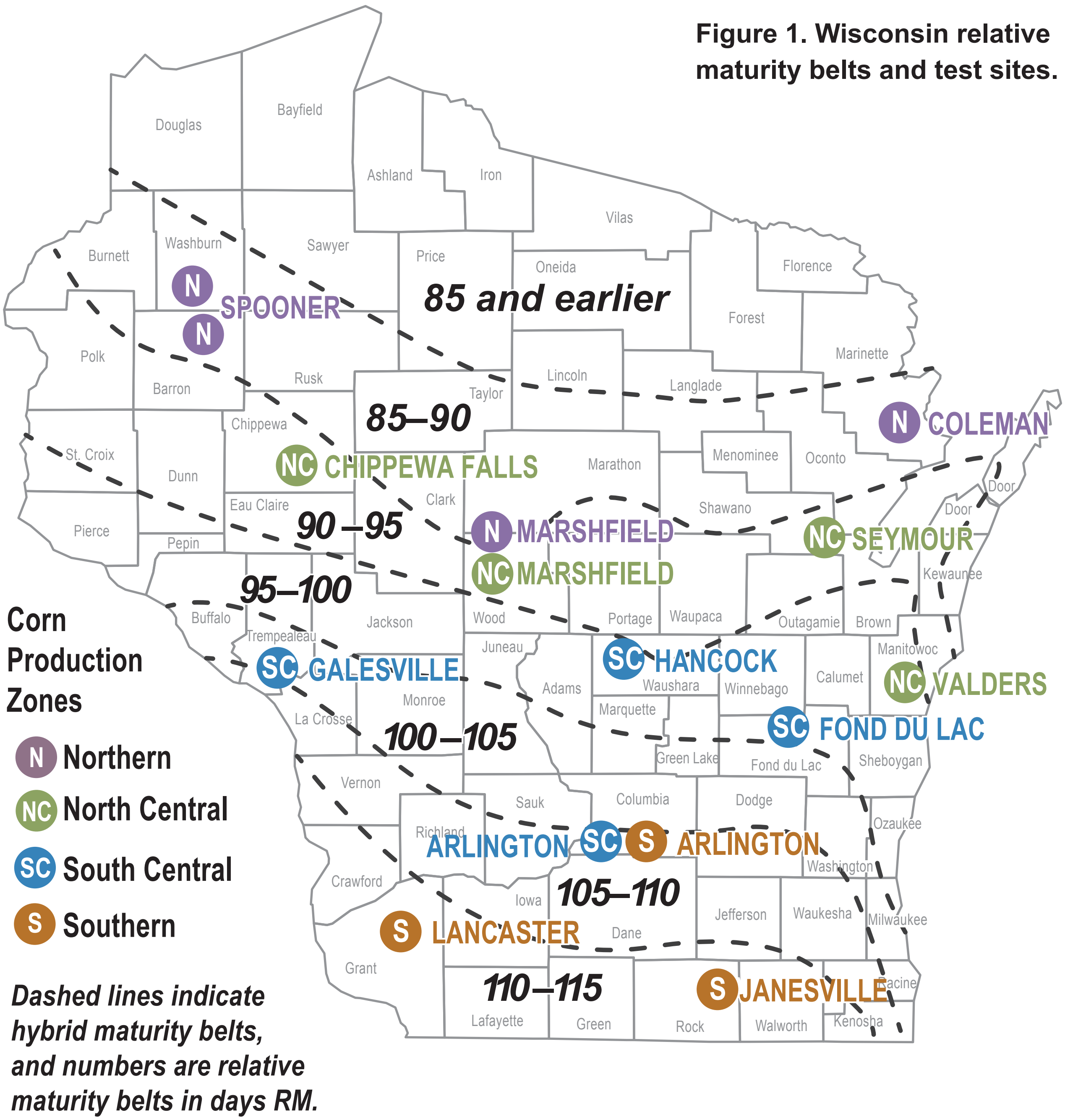
Figure 1. Wisconsin relative maturity belts and test sites.



Trait references

References to transgenic traits in this publication are for your convenience and are not an endorsement or criticism of one trait over other similar traits. Every attempt was made to ensure accuracy of traits in the hybrids tested. You are responsible for using traits according to the current label directions of seed companies. Follow directions exactly to protect the environment and people from misuse. Failure to do so violates the law.

INTRODUCTION

Every year, the University of Wisconsin-Extension and the University of Wisconsin–Madison College of Agricultural and Life Sciences conduct a corn evaluation program in cooperation with the Wisconsin Crop Improvement Association. The purpose of this program is to provide unbiased performance comparisons of hybrid seed corn for both grain and silage available in Wisconsin.

In 2014, grain and silage performance trials were planted at 14 locations in four production zones: the southern, south central, north central, and northern zones. Both seed companies and university researchers submitted hybrids. Companies with hybrids included in the 2014 trials are listed in Table 1. Specific hybrids and where they were tested are shown in Table 2. A summary of the transgenic traits tested in 2014 is shown in Table 3. In the back of the report, hybrids previously tested over the past three years are listed in Table 25. At most locations, trials were divided into early and late maturity trials based on the hybrid relative maturities provided by the companies. The specific relative maturities separating early and late trials are listed in the tables.

Growing Conditions For 2014

Seasonal precipitation and temperature at the trial sites are shown in Table 5. The 2014 planting season, like the 2013 season, was one of the longest ever recorded in Wisconsin. Frequent rains caused delays, with many growers in north eastern Wisconsin not planting until the mid-June. Delayed planting at Coleman, Marshfield, Seymour, and Valders combined with a cool growing season delayed harvest producing grain that was higher in moisture and lower for test weight than average. Over the entire growing season, growing degree-day accumulation was below the 30-year normal in both northern and southern Wisconsin. During May and June precipitation was significantly above average throughout Wisconsin. Cold weather and snow occurred during early November affecting grain dry down at Coleman, Marshfield, and Seymour. Little insect or disease pressure was observed in the trials. Grain and silage yields were above normal compared to the 10-year average at early planted sites.

Cultural Practices

The seedbed at each location was prepared by either conventional or conservation tillage methods. Seed treatments of hybrids entered into the trials are described in Table 4. Fertilizer was applied as recommended by soil tests. Herbicides were applied for weed control and supplemented with cultivation when necessary. Corn rootworm insecticide was applied when the previous crop was corn. Information on cultural practices for each location is summarized in Table 6.

Planting

A precision vacuum corn planter was used at all locations except Spooner. Two-row plots, 25 feet long, were planted at all locations. Plots were not hand-thinned. Each hybrid was grown in at least three separate plots (replicates) at each location to account for field variability.

Harvesting

Grain: Two-row plots were harvested with a self propelled corn combine. Lodged plants and/or broken stalks were counted, plot grain weights and moisture contents were measured, and yields were calculated and adjusted to 15.5% moisture. Test weight was measured on each plot.

Silage: Whole plant (silage) plots were harvested using a tractor-driven, three-point mounted one-row chopper. One row was analyzed for whole-plant yield and quality. Plot weight and moisture content were measured, and yields were adjusted to tons of dry matter per acre. A sub-sample was collected and analyzed using near infrared spectroscopy.

PRESENTATION OF DATA

Yield results for individual location trials and for multi-location averages are listed in Tables 7 through 24. Within each trial, hybrids are ranked by moisture averaged over all trials conducted in that zone during 2013. Yield data for both 2012 and 2013 are provided if the hybrid was entered in the 2012 trials. Starting in 2009, a nearest neighbor analysis of variance for all trials as described by Yang et al. (2004, *Crop Science* 44:49–55) and Smith and Casler (2004, *Crop Science* 44:56–62) is included. A hybrid index (Table 2) lists relative maturity ratings, specialty traits, seed treatments, and production zones tested for each hybrid.

Relative maturity

Seed companies use different methods and standards to classify or rate the maturity of corn hybrids. To provide corn producers a "standard" maturity comparison for the hybrids evaluated, the average grain or silage moisture of all hybrids rated by the company's relative maturity rating system are shown in each table as shaded rows. In these Wisconsin results tables, hybrids with **lower** moisture than a particular relative maturity average are likely to be **earlier** than that relative maturity, while those with **higher** grain moisture are most likely **later** in relative maturity. Company relative maturity ratings are rounded to 5-day increments.

The Wisconsin Relative Maturity rating system for grain (GRM) and silage (SRM) compares the harvest moisture of a grain or silage hybrid to the average moisture of company ratings using linear regression. Each hybrid is rated within the trial and averaged over all trials in a zone. Maturity ratings (company, GRM, and SRM) can be found in Table 2.

Grain performance index

Three factors—yield, moisture, and standability—are of primary importance in evaluating and selecting corn hybrids. A **performance index (PI),** which combines these factors in one number, was calculated for multi-location averages for grain trials. This index evaluates yield, moisture, and lodged stalks at a 50 (yield): 35 (moisture): 15 (lodged stalks) ratio.

The PI was computed by converting the yield, moisture (dry matter), and upright stalk values of each hybrid to a percentage of the test average. Then the PI for each hybrid that appears in the tables was calculated as follows:

Performance Index (PI) =

[(Yield x 0.50) + (Dry matter x 0.35) +

(Upright stalks x 0.15)] / 100

Silage performance index

Corn silage quality was analyzed using near infrared spectroscopy equations derived from previous work. Plot samples were dried, ground, and analyzed for crude protein (CP), acid detergent fiber (ADF), neutral detergent fiber (NDF), in-vitro cell wall digestibility (NDFD), in-vitro digestibility (IVD), and starch. Spectral groups and outliers were checked using wet chemistry analysis.

The **MILK2006** silage performance indices, milk per ton and milk per acre, were calculated using an adaptation by Randy Shaver (UW–Madison Department of Dairy Science) of the MILK91 model (Undersander, Howard, and Shaver; *Journal Production Agriculture* 6:231–235). In MILK2006, the energy content of corn silage was estimated using a modification of a published summative energy equation (Weiss and coworkers, 1992; *Animal Feed Science Technology* 39:95–110). In the modified summative equation, CP, fat, NDF, starch, and sugar plus organic acid fractions were included along with their corresponding total-tract digestibility coefficients for estimating the energy content of corn silage. Whole-plant dry matter content was normalized to 35% for all hybrids. The sample lab measure of NDFD was used for the NDF digestibility coefficient. Digestibility coefficients used for the CP, fat, and sugar plus organic acid fractions were constants. Dry matter intake was estimated using NDF and NDFD content assuming a 1,350-pound cow consuming a 30% NDF diet. Using National Research Council (NRC, 2001) energy requirements, the intake of energy from corn silage was converted to expected **milk per ton. Milk per acre** was calculated using milk per ton and dry matter yield per acre estimates (Schwab, Shaver, Lauer, and Coors, 2003; *Animal Feed and Science Technology* 109:1–18).

Least significant difference

Variations in yield and other characteristics occur because of variations in soil and growing conditions that lower the precision of the results. Statistical analysis makes it possible to determine, with known probabilities of error, whether a difference is real or whether it might have occurred by chance. Use the appropriate least significant difference (LSD) value at the bottom of the tables to determine true differences.

Least significant differences at the 10% level of probability are shown. Where the difference between two selected hybrids within a column is greater than or equal to the LSD value at the bottom of the column, you can be sure in nine out of ten cases that there is a real difference between the two hybrid averages. If the difference is less than the LSD value, the difference may still be real, but the experiment has produced no evidence of real differences. Hybrids that were not significantly lower in performance than the highest hybrid in a particular test are indicated with an asterisk (*).

HOW TO USE THE RESULTS

The results provide you with an independent, objective evaluation of the performance of unfamiliar hybrids that seed company sales representatives are promoting, as well as a comparison of these unfamiliar hybrids with competitive hybrids. Below are suggested steps to follow for selecting top performing hybrids for next year using these trial results:

1. **Use multi-location average data in shaded areas.** Consider single location results with extreme caution.
2. Begin with trials in the zone(s) nearest you.
3. Compare hybrids with similar maturities within a trial. You will need to divide most trials into at least two and sometimes three groups with similar average harvest moisture—within about a 2% range in moisture.
4. Make a list of five to 10 hybrids with highest 2013 performance index within each maturity group within a trial.
5. **Evaluate the consistency of the performance of the hybrids on your list** over the years and in other zones.
    a. Scan the 2012 results. **Be wary** of any hybrids on your list that had a 2012 PI of 100 or lower. Choose two or three of the remaining hybrids that have relatively high PIs for **both** 2012 and 2013.
    b. Check to see if the hybrids you have chosen were **entered in other zones.** (For example, some hybrids entered in the Southern Zone Trials, Tables 7 and 8, are also entered in the South Central Zone Trials, Tables 9 and 10.)
    c. **Be wary** of any hybrids with a PI of 100 or lower for 2012 or 2013 in any other zones.
6. Repeat this procedure with about three maturity groups to select top-performing hybrids with a range in maturity in order to spread weather risks and harvest time.
7. Observe the relative performance of the hybrids you have chosen based on these trial results in several other reliable, unbiased trials and be wary of any with inconsistent performance.
8. Consider including the hybrids you have chosen in your own test plot, primarily to evaluate the way hybrids stand after maturity, dry-down rate, grain quality, or ease of combine shelling or picking.
9. Remember that you don't know what weather conditions (rainfall, temperature) will be like next year. Therefore, the most reliable way to choose hybrids with greatest chance to perform best next year on your farm is to consider performance in both 2012 and 2013 over a wide range of locations and climatic conditions.

Note: You are taking a tremendous gamble if you make hybrid selection decisions based on 2013 yield comparisons in only one or two local test plots.

FOR MORE INFORMATION

Current and past versions of *Wisconsin Corn Hybrid Performance Trials* (A3653) are available in Microsoft Excel and Acrobat PDF formats at the Wisconsin Corn Agronomy website: corn.agronomy.wisc.edu. To obtain a printed copy, visit UW-Extension's Learning Store at learningstore.uwex.edu, where the most current version of *Wisconsin Corn Hybrid Performance Trials* (A3653) can be ordered or downloaded. For more information on the Wisconsin Crop Improvement Association, visit: wcia.wisc.edu.