

# Hybrid Test Reports

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## Pennsylvania Corn Silage Hybrid Evaluation Report

In 2002 a new program to evaluate both the yield and forage quality of commercial corn hybrids offered to Pennsylvania corn silage producers was initiated. This program is a collaborative effort among Penn State, the Professional Dairy Managers of Pennsylvania and Forage Data, Inc. The objective of the program is to evaluate corn hybrids and provide unbiased information to producers and the seed industry on the yield performance and forage quality of corn hybrids for silage production in Pennsylvania.

The tests were conducted at three locations in Pennsylvania: Red Knob Farm in Peach Bottom in Lancaster County, Slate Ridge Dairy in St. Thomas in Franklin County and the Penn State Russell Larson Research Farm in Rock Spring, Centre County. Two maturity groups of hybrids were evaluated at each location these trials. Each group was limited to a 5-day relative maturity (RM) range. The early group consisted of 107-111 day RM hybrids and the late group consisted of 112-116 day RM hybrids. Our original intent was to plant all of the evaluation tests on commercial dairy farms, but planting problems related to the wet spring forced us to use a backup site at the Penn State Research Farm. Our goal in these trials is to evaluate hybrid performance over multiple sites and conditions as this is always the best indicator of a hybrid's future performance.

### Procedures

This testing program was open to all hybrid seed corn producers in the state. Hybrids were planted in paired row plots equal to 1,500 of an acre. Each hybrid was replicated three times at each location. Planting was done with a vacuum precision planter which minimized the number of plants needed to be removed to obtain a final population of 28,000 plants per acre. The planter was set to drop 30 kernels per row. When the corn was 12 to 18 inches tall, extra plants, primarily doubles and end plants, were removed to reach to final population.

Prior to harvest, the dry matter concentration of several hybrids in each test was monitored and the harvests were targeted to achieve dry matter concentrations of 30 to 35% dry matter. Rapid drooldown caused by the dry conditions resulted in the Franklin test and the early hybrids at Lancaster to be slightly drier than desired. All hybrids in each group were harvested on the same day. At Rock Springs, the harvest of the late group was seven days later than the early group. At the other two locations, both groups were harvested on the same day. Because of the hot dry conditions, harvest was early at all locations: August 21 at Franklin, August 22 at Lancaster, September 4 for the early hybrids in Centre and September 11 for the late hybrids in Centre County. Plots were harvested with a single row custom designed forage chopper. One row was harvested from each plot. The forage from each plot was weighed and then thoroughly mixed. Harvest samples were collected from the mixed chopped silage in the field.

At harvest samples were collected immediately after the plot was harvested, chilled on dry ice, and then frozen at the end of the day. Samples were then sent to the Dairy One Forage Lab in Ithaca, NY for analysis. The samples were analyzed for crude protein, acid detergent fiber (ADF), neutral detergent fiber (NDF), starch, sugars, non fiber carbohydrates (NFC), ash, fat, lignin, 30-hour in vitro true digestibility (IVTD), 30-hour fiber digestibility (NDFD), neutral detergent insoluble crude protein (NDICP) and lignin. These results were used to calculate the Net Energy for Lactation (NEL). Milk yield per ton and milk yield per acre were then estimated from the CP, NDF, NDFD, starch, ash, NDICP and yield using the Milk 2000 (version 7.4) spreadsheet from the University of Wisconsin.

All data was analyzed with analysis of variance procedures and least significant difference (LSD) values were calculated at the 0.10 level for each variable where the differences were statistically significant. When the difference between two hybrids exceeds the LSD (0.10) level, there is a 90% probability that the difference is not due to random variation. Small differences that are less than the LSD value may be the result of random variation that occurs in these field trials. We also calculated a coefficient of variation (CV) for each variable. This is a relative measure of the uncontrolled variation associated with that variable in that test. For yield, a CV of 10% or less is usually considered good. For the tests that were combined over locations, we tested for a hybrid-by-location interaction. Where a hybrid-by-location interaction is significant, this indicates that hybrid performance was not consistent across the locations for that variable.

### Results

Conditions at each of the three sites were abnormally hot and dry. At the Franklin County location, conditions were exceptionally dry resulting in corn that was approximately six feet tall with little ear development. At the other two locations, plant height was less than average with ear development average to below average. Because the Franklin County site was so severely stressed, it was not included in the combined analyses averages. When evaluating hybrids for silage or grain, it is always best to rely on multilocation averages if possible, not on the data from a single site.

### Early Hybrid Tests

#### Combined Analyses

Analysis of the combined data from the Centre and Lancaster County sites are shown in Table 1. Hybrids varied in dry matter concentration at harvest by approximately 10 percentage units. This could have an impact on forage quality traits. Hybrids with higher dry matter concentrations are likely earlier in maturity. Ideally, hybrid comparisons should be made within a 3 to 4 percentage point range in dry matter to minimize maturity effects.

The combined analyses indicated that for many of the variables the hybrid-by-location interaction was significant. This indicates that hybrid performance was different in Centre and Lancaster County. This may have resulted because the backup Centre County location was a shorter season area than the Lancaster site. The original Centre County on-farm site was in a longer season area. As a result, despite our intentions to use combined data, the results suggest that this year, for most variables, hybrid evaluations are best made at the individual sites for the early group. Producers should decide which site is more representative of their conditions and use that as a guide in interpreting the data. For some of the forage quality variables without hybrid-by-location interactions (NS), like NEL, IVTD, NDFD, and Milk/ton, the results were consistent across sites, with significant differences occurring among hybrids.

### Lancaster County

At this site (Table 2) we encountered a wide range in dry matter concentration and the average dry matter concentration was slightly higher than our target of 35% dry matter. These hybrids dried down much more rapidly than anticipated during the hot dry conditions of late August. Yields at this site were about 60% of expected values and differences among the hybrids were not significant. Many of the quality traits exhibited differences among the hybrids. Dairy One average values in 2001 for NDF, Starch and NDFD were 44.7%, 30.5%, and 55.7%, respectively. Relative to those values, hybrids at this site had lower NDF, higher starch and slightly lower NDFD than average.

### Centre County

At this site (Table 3), the range in dry matter concentrations was less than at Lancaster, but the dry matter concentration were also lower than Lancaster as well. Yields were approximately 65% of average yields at this site. Yield differences were not significantly different here as well, probably because one of the three replications had to be discarded because of early season flooding. Many of the quality traits exhibited differences among the hybrids. Milk/ton and Milk/acre differences existed among the hybrids. Relative to the average Dairy One values, hybrids at this site had lower NDF, similar starch and slightly lower NDFD than average.

### Franklin County

Dry matter concentrations at this site (Table 4) also tended to be higher than desired and hybrids here also exhibited a wide range in dry matter concentrations at harvest. Significant differences existed among hybrids for most of the traits measured here. As expected, NDF levels were higher than the Dairy One average. Starch was lower and NDFD slightly above average. Despite the drought stress, the average energy content of this corn predicted using the NEI was 92% of the average of the other sites and the estimated milk/ton was 96% of the average of the other two sites. Since this site was extremely drought stressed, the results from this trial may only have limited value in predicting future performance at this location.

### Late Hybrid Tests

#### Combined Analyses

The late hybrid combined data analysis (Table 5) also showed significant hybrid-by-location interactions for nearly every variable, similar to the situation with the early hybrid group. This interaction indicates that at least some hybrids performed differently at the two locations. After viewing a hybrid's performance in this table, it would be wise to see if it performed similarly at the two locations. Often hybrids with above average yields or forage quality at one location also had above average data at the other location. It is interesting to note that the late hybrid group yields were not greater than the early group (Table 1) as is often the case. This was likely due to the late season stress that occurred during this season.

### Lancaster County

Hybrids at this site exhibited a wide range in dry matter concentration, but the bulk of the hybrids were in the 32 to 37% range. Significant differences existed for all traits measured. Large ranges in yield, NDFD, Milk/ton and Milk/acre were evident. This test had the highest average Milk/ton and NDFD ratings of all the 2002 tests. Relative to the average Dairy One values, hybrids at this site had lower NDF, higher starch and higher NDFD concentrations.

### Centre County

Hybrids had a similar wide range of dry matter concentrations (Table 7) here as at the Lancaster site. Significant differences occurred for most variables except yield, lignin and Milk/acre. These were likely not significant because one of the three replications had to be discarded at this location. For some hybrids, yield and forage quality performance was consistent with the Lancaster location, for others it was not. Similar results were obtained in a 2001 Cornell test located at the following web address (<http://www.css.cornell.edu/extension/NewYorkCornSilageHybridTests2001.pdf>)

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## Weather Website Provides Crop Production Insight

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For those of you who like review recent weather information in your area, you might want to visit the Pennsylvania State Climatologist Website at <http://pasc.met.psu.edu/PA-Climatologist/cityform.html>.

This site provides not only recent weather data but historical information back as far as the early 1960s, in some cases. Once on the Website, you can view weather data from one of more than 50 locations throughout Pennsylvania. Some of these locations even provide climatic conditions on an hourly basis.

One way this site became useful to us was during the spring of 2002. The later half of May was extremely cold in some places, and many growers were worried about their corn crop.

At Penn State's Agronomy Research Farm in Centre County, some of the corn was at the V2-V3 stage and had experienced three consecutive nights of 28-degree temperature. The corn was uniformly frosted to ground level and the concern was that the corn would not recover, even though corn often exhibits a remarkable ability to bounce back after a frost.

Hourly weather data from the State Climatologist site indicated that the low temperatures of 28 degrees Fahrenheit (F) lasted for less than two hours each night. One theory is that the temperature needs to stay below 28 degrees F for four continuous hours to kill young corn plants. Since the corn survived with only minimal stand loss, the information from the State Climatologist Website helped support this theory and ultimately will help in evaluating early season frost damage in the future.



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