

EFFECT OF FIELD DRY DOWN AND DELAYED HARVEST ON CORN YIELD AND QUALITY

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ABSTRACT: A study was conducted at three locations: Raymond, Stoneville, and Verona to determine the effect of field dry down and delayed harvest on corn yield and quality. Corn harvest was initiated by hand harvesting sub plots of the test fields to establish a theoretical yield and with a combine at the three locations. Grain moisture initially ranged from 24.9% at Stoneville to 23.3% at Raymond with the grain harvested on the later harvest dates having dried to as low as 14.9%. Each successive week for four weeks, samples were harvested with a combine and determinations made for combine harvested yield, grain moisture, and aflatoxin levels. Sample moistures indicated that field dry down occurred at an average rate of 0.47, 0.25, and 0.22% per day through out the season for Stoneville, Verona, and Raymond, respectively. Verona experienced a loss of 4.5% in the first seven days. Stoneville lost 4.4% in the same time while Raymond only experienced a loss of 1.7% for the first seven days. Combine efficiency varied from a low of 87.8% to a high of over 100%. Machine condition and adjustments were believed to greatly influence harvester efficiency as well as broken kernels and foreign matter. Only low levels of aflatoxin were found in two samples at two locations. Actual yields ranged from 95.9 bu/ac for dryland production at Raymond to 198.5 bu/ac for irrigated production at Stoneville. For this year, delayed corn harvest had a positive effect on corn yield at Stoneville but a negative effect at Verona and Raymond. However, over the four-year life of the project, delayed harvest has had a positive effect on yields and corn grades at all stations.

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MATERIALS AND METHODS: This was the fourth year of an ongoing study conducted at Verona, Stoneville, and Raymond. Soil types were: Stoneville, Bosket very fine sandy loam; Verona, Leeper silty clay loam; Raymond, Loring silt loam. Randomized complete block experiments with 4 harvest dates (treatments) and 4 replications were conducted at all locations. All hand harvested yields, moisture, aflatoxin and plant populations determinations were derived from three sub samples per replication. The center four rows of 8 row plots X 500 to 1000 ft were harvested for yield, leaving a minimum of 4 border rows between harvest dates of adjacent plots.

Stoneville:

Land preparation: The field area was disk harrowed, field cultivated, and hipped on 02/07/01 then planted on 03/21/01.

Fertility/fertilizer: One hundred fifty pounds of nitrogen (liquid, 32%N) applied with six row applicator on 02/08/01. An additional 100 lbs of nitrogen was applied side dress with the cultivator on 04/21/01.

Weed control: Atrazine 4L at 3 pt/ac at planting followed by cultivation on 03/21/01.

Insecticide/fungicide: 2.5 lbs Counter 20CR applied at planting.

Planting date/seeding rate: Planted 03/07/00 in 40 inch rows at 15.75 lbs/ac.

Variety: DKC 6870.

Harvest dates: Hand harvest occurred on 08/08/01 with combine harvesting on 08/08/01, 08/15/01, 08/23/01 and 09/05/01. The four center rows of 8 row x 1000 ft plots were harvested with a combine equipped with a 4 row header. Hand harvesting was performed on 4 rows x 11 ft at three sub plots within the border rows.

Irrigation: Three inches of water applied per application with roll out pipe on 06/18/01, one inch on 06/19/01, and three inches on 06/26/01 and 07/09/01.

Verona:

Land preparation: The field was paratilled on 12/06/00 and bed-rolled on 12/11/00 and 03/27/01.

Fertility/fertilizer: Liquid nitrogen (32% UAN) solution was applied sidedress at 160 lbs N/ac on 05/08/00. The fertilizer was placed 6 inches from the row at a depth of 2 inches with a coulter applicator system.

Weed control: Gramoxone (paraquat) + Atrazine + surfactant at 0.47 + 2 lb ai/ac + 0.4 pt/ac was applied broadcast on 04/11/01. Evik (ametryn) + surfactant at 1.8 lb ai/ac + 1.0 pt/ac was applied broadcast post directed on 05/26/01.

Insect control: Lorsban 15G (chlorpyrifos) at 1.3 lb ai/ac was applied in-furrow at planting.

Planting date/seeding rate: Planted (no-till) 04/11/01 in 30 inch rows at 28,000 seed/ac.

Variety: Pioneer 3223.

Harvest: The 4 center rows of 8 row x 500 ft plots with a combine with a 4 row corn header on 08/16/01, 08/23/01, 08/29/01, 09/05/01, and 09/21/01. Hand harvesting of 3 sub plots in the border rows was completed on 8/16/01.

Raymond:

Land preparation: Field operations included disking, chiseling, and do-alling prior to planting with a JD 7100 equipped with double-disk openers and ripple coulters. Row width was 38".

Fertility/fertilizer: Corn was fertilized with approximately 150 lb Nitrogen per acre using 32% N-sol applied side-dressed with coulters injection units.

Weed control: Herbicide applications included Dual 8E @ 1.0 qt/acre and atrazine @ 1.0 qt/acre applied preemergence broadcast behind the planter. Two application of Roundup at 1.0 qt/acre when corn was approximately 15-16 inches tall. All herbicide applications were delivered in 20 gallons water per acre.

Planting date/seeding rate: Planted on 05/26/00 in 38 inch rows at 21,000 seeds/ac.

Variety: Asgrow 770RR.

Harvest dates: Hand harvested on 08/20/01, 4 rows x 11.5 ft, 3 sub plots at random from each block and machine harvested on 08/21/01, 08/28/01, 09/14/01 and 10/01/01 the center 4 rows of 8 row plots of varying length.

All Locations:

Weather: Stoneville received normal rainfall from April to July but received nearly 3 2 times the normal rainfall in August with September about normal. Verona received above normal rainfall in August but below normal for September and October. Raymond experienced below average rainfall for the months of August and September but above normal for October. Rainfall at Raymond was about average for June and July. The Stoneville location was the only plot equipped for irrigation.

Test and sampling: All combine harvested plots were measured and weights determined with a weigh buggy at the time of the harvest. Three sub samples from each plot were taken for moisture and aflatoxin determinations from the grain flow as the combine emptied into the weigh buggy. The ear corn that was hand harvested from the 3 sub plots was shelled and grain weights calculated on a per acre basis. All grain weights were adjusted to 15 percent basis for reporting purposes. Aflatoxin samples were analyzed with a Vicam Mycotoxin Testing System with Series-4 Fluorometer (immuno-assay) in the Ag. and Bio. Engineering Dept. All samples that indicated aflatoxin were re-run a second time for verification. All moisture samples were weighed, oven dried at 120 degrees F for 24 hours, weighed again for moisture loss and gravimetric moisture (wet basis) determined. All data in this report are averages. Corn grade, broken kernels and foreign matter determinations were performed by the Mississippi Department of Agriculture and Commerce. Some statistical analysis have been performed but are not reported.

RESULTS AND DISCUSSION: Yield and plant count were highly correlated within and across locations. The highest yield was at Verona, however, the yields across all harvest dates was higher at Stoneville which was irrigated. This data may suggest that population may have limited the other locations with the water that was available in 2001 (Table 1). Machine harvested yields, corrected for moisture (15.0%), ranged from a low of 95.9 bu/ac at Raymond to a high of 200.6 bu/ac at Verona. For Verona and Raymond the highest yields were at the second harvest date, however, Stoneville=s highest yield was the last harvest date.

Harvest efficiency ranged from 77.6 to 88.7% at Stoneville with the highest efficiency being at the last harvest date and a moisture content of 18.8%. Generally, as yield increases, harvest efficiency improved or there appeared to be a direct relationship between yield and combine efficiency. Harvester efficiency also seemed to improve with decrease in moisture content. Yield ranged from 173.6 to 198.5 bu/ac for the four harvest dates.

At Verona, machine harvested yield ranged from 88.4 to 102.3% of hand harvested yield. The Verona data showed that harvester efficiency was highest at the first harvest date and dropped off as the corn dried below 15%. Yield ranged from 173.4 to 200.6 bu/ac for the five harvest dates. This was the first year that the highest harvest efficiency was associated with the highest moisture content and the efficiency decreased with decreasing moisture content. Harvester efficiency at Raymond ranged from 74.1 to 77.4% of the hand harvested yield. This was the lowest of all the efficiency data. The harvester evidently was not adjusted properly. However, the same trend was seen as in the Verona efficiency data, that is, the efficiency was highest with the highest moisture content and decreased with the moisture content. Yield ranged from 98.2 to 126.7 bu/ac for the four harvest dates.

Field drying progressed more slowly this year than in previous years with the drying rate being 0.63, 0.64 and 0.24% moisture per day at Stoneville, Verona, and Raymond, respectively, between the first and second harvest dates. The average moisture loss for all locations was 0.31% per day. Drying rate was generally higher for the higher moisture content corn when sampling was initiated and decreased as the grain reached the equilibrium moisture.

Aflatoxin was not a problem at any of the locations, however, there was one sample for the third harvest date at Stoneville and one sample at the fifth harvest date at Verona that contained small amounts of aflatoxin. None of these samples contained levels of aflatoxin above 20 ppb.

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Table 1: Corn Yield, Moisture and Harvest Data for All Locations

| | Stoneville | | 40 Inch Rows | | 38 Inch Rows | |
|-----------------------------|-------------------|---------|---------------------|--------|---------------------|---------|
| Harvest Dates | 8/8/01 | 8/15/01 | 8/23/01 | 9/5/01 | 8/24/00 | 8/30/00 |
| Yield, bu/ac | 173.6 | 197.8 | 198.1 | 198.5 | 77.2 | 76. |
| Hand Harvested Yield, bu/ac | 223.8 | | | | | |
| Combine Efficiency, % | 77.6 | 88.4 | 88.5 | 88.7 | 106.3 | 104.8 |
| Moisture, % | 24.9 | 20.5 | 17.8 | 18.8 | 14.6 | 13.7 |
| Drying Rate, %/day | | 0.63 | 0.34 | +0.08 | | |
| Aflatoxin Level, ppb | 0 | 0 | 15.7 | 0 | 24.1 | 49.8 |
| Samples With Aflatoxin, No. | 0 | 0 | 1 | 0 | 8 | 11 |
| Plants/Ac, plants/ft | 32500 | 2.5 | | | | |

| | Verona | | 30 Inch Rows | | |
|-----------------------------|---------------|---------|---------------------|---------|---------|
| Harvest Dates | 8/16/01 | 8/23/01 | 8/29/01 | 9/05/01 | 9/21/01 |
| Yield, bu/ac | 200.6 | 195.6 | 189.2 | 180.9 | 173.4 |
| Hand Harvested Yield, bu/ac | 196.1 | | | | |
| Combine Efficiency, % | 102.3 | 99.7 | 96.5 | 92.2 | 88.4 |
| Moisture, % | 24.1 | 19.6 | 18.1 | 15.2 | 14.9 |
| Drying Rate, %/day | | 0.64 | 0.25 | 0.41 | 0.02 |
| Aflatoxin Level, ppb | 0 | 0 | 0 | no data | 9.3 |
| Samples With Aflatoxin, No. | 0 | 0 | 0 | no data | 1 |
| Plants/ac, plants/ft | 23100 | 1.4 | | | |

| | Raymond | | 38 Inch Rows | |
|-----------------------------|----------------|---------|---------------------|----------|
| Harvest Dates | 8/21/01 | 8/28/01 | 9/14/01 | 10/01/01 |
| Yield, bu/ac | 126.7 | 120.6 | 95.9 | 98.2 |
| Hand Harvested Yield, bu/ac | 171.1 | | | |
| Combine Efficiency, % | 74.1 | 70.5 | 56.1 | 57.4 |
| Moisture, % | 23.3 | 21.6 | 20.4 | 14.7 |
| Drying Rate, %/day | | 0.24 | 0.07 | 0.21 |
| Aflatoxin Level, ppb | 0 | 0 | 0 | no data |
| Samples With Aflatoxin, No. | 0 | 0 | 0 | no data |
| Plants/ac, plants/ft | 29900 | 2.2 | | |