



## 1998 Indiana Corn Composition Data

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This fact sheet summarizes the composition data compiled for corn samples collected in Indiana during the 1998 harvest. District results are presented, and composition data from the 1995, 1996, and 1997 crop years are compared.

### Methodology

Whole ear corn samples were taken directly from the field as part of a multi-year survey conducted by the Purdue University Botany and Plant Pathology Department. The Indiana Agricultural Statistics Service in West Lafayette conducted the sampling. Samples were analyzed for fungal damage, and mycotoxin level was quantified. Each ear corn sample consisted of 5-10 ears, which were placed in cotton bags. After the disease analysis, each bag of ears was dried with forced air and subsequently shelled using a stationary sheller. After shelling, the whole kernels were analyzed for moisture, protein, oil, starch, and density using a near-infrared transmittance (NIRT) whole grain analyzer (Infratech 1229) at the Purdue University Grain Quality Laboratory in the Department of Agricultural and Biological Engineering. All results are reported on a 15% moisture content basis (wet).

A total of 302 samples were available for composition analysis from all nine crop-reporting districts. The number of samples from each crop-reporting district was roughly proportional to the corn acreage, although the Southeast District was slightly over-represented this year (Table 1). In comparison to the previous three years, the acres per sample and production per sample were the lowest due to a larger number of available samples.

### Results

The overall state protein average decreased 1.4 percentage points to 6.5% (Table 2) from the 1997

value. This was a significant decrease from previous years, which were almost unchanged. Consequently, about 10% of the samples were sent to another lab to crosscheck the NIRT analyzer. Those results confirmed the state's low protein values. The spread between the minimum and maximum protein content narrowed to 6.3 points, compared to 7.4 points in 1997, but it was still larger than the 5.4 point margin in 1996 and 4.0 points in 1995. Generally, protein content is negatively correlated to starch content. While the protein average decreased in 1998, the starch content increased 2.2 percentage points to 64.1. Starch ranges widened to 10.0 points in 1998, compared to 9.6, 6.2, and 4.9 points for 1997, 1996, and 1995, respectively. The average oil content decreased 0.1 percentage points to 3.2. However, average oil content has essentially remained unchanged for the past four years, although seven high oil corn samples were included in the 1998 survey. Density is considered an indication of kernel hardness. There was a slight decrease of 0.003 g/ml to 1.299 g/ml in density when compared to the 1997 data. The range of points in 1998 showed that the spread narrowed for the second straight year.

Given the low protein values of the 1998 Indiana corn crop, feed manufacturers and producers will need to increase the soybean meal portion in their rations. Cornstarch processors should benefit, although higher starch levels do not necessarily mean higher starch yields. The results in Table 2 only give an indication of the composition values of corn across Indiana. Conditions during the growing season, hybrid selection, and soil fertility significantly affect intrinsic values such as protein, oil, starch, and density. Producers need to have their own samples analyzed to get more precise values.

## Analysis

A statistical analysis was performed on the data collected from the last three years using Statistical Analysis Software (SAS) to uncover differences between years and between districts within a year. All tests used an alpha of 0.05. District summary values for 1996 and 1997 can be found in Grain Quality Fact Sheets 32 and 37, respectively. The results of the analysis can be found in Tables 3 and 4. In Table 3, the years within a district are statistically similar if they have the same letter, while in Table 4, the districts with the same letter are similar within a year.

District trends were apparent in the analysis of data. The NE, SC, and SE districts were the only ones statistically similar in protein content across all three years (Table 3). In 1996, the NE and SE districts were similarly low in protein compared to all other districts (Table 4). In 1997, all districts were statistically similar in protein, while in 1998 the SC district was higher in protein compared to all other districts. The SW and WC districts have a consistently higher protein average. In the past three years they have been in the top three districts. The SW district had the third highest average in 1996 (7.9%), the highest in 1997 (8.2%), and the second highest in 1998 (6.9%). The WC district had the highest average in 1996 (8.2%), the second highest in 1997 (8.2%), and the third highest in 1998 (6.7%). The NE district had the lowest average at 6.6% in 1996, while the EC district had the lowest averages for 1997 and 1998, with 6.9 and 6.0%, respectively. The SE district had the second lowest averages in all three years, with 6.6, 7.4, and 6.0% protein, respectively.

The NC and SW districts were the only ones not statistically similar in oil content across all three years (Table 3). In 1996 and 1998, all districts were similar in oil, while in 1997 the SC district was statistically higher in oil compared to all other districts (Table 4). The SE district had the highest oil content average at 3.4% in 1996, but had the lowest average in 1997 (3.1%). The SC district had the highest averages in both 1997 and 1998, 4.3% and 3.4%, respectively. The NC district had the second highest average in 1996, with 3.4%, while the WC district was second for both 1997 and 1998 with averages of 3.5 and 3.4, respectively. The NE district had the lowest average in 1996 with 3.1%, while the SW district had the lowest in 1998, with a 2.9 average.

No district was statistically similar in starch content across all years, although most were similar for two out of three years. The NC, C, and EC districts were different every year (Table 3). In 1996, the NC and WC districts were statistically lower in starch than all other districts, while the NE and SE districts were statistically higher than all other districts (Table 4). In 1997, there was not significant difference among districts in starch content, while in 1998, the SC district was significantly lower compared to all other districts. The SE district was in the top three districts in overall starch content average all three years, while the NE and SC districts were in the top three, two out of the three years. In 1996, the NE district had the highest average, with 62.2%, followed by the SE and SC districts (61.6 and 61.4%, respectively). The EC district had the highest average in 1997, with SE district second (62.4%), and the NE district third (62.1%). The SE district had the highest average of 64.5% in 1998, while the EC and C districts were second and third, respectively (64.4 and 64.3%). The WC district had one of the two lowest averages in all three years of the survey. The WC district had the lowest average in 1996 (60.9) and second lowest in 1997 and 1998, with a 61.5 and 63.6 average, respectively. The C district had the third lowest average in 1996 and 1997, with 61.1 and 61.9%, respectively.

For density, the WC, SC, and SE districts were the only ones statistically similar across all three years (Table 3). In 1996 and 1997, all districts were similar in density values, while in 1998 the SW district was significantly higher and the WC, EC, and SE districts were lower compared to all other districts (Table 4). The SW district was in the top three districts in all three years, being third in 1996 (1.276), second in 1997 (1.308), and first in 1998 (1.315). The NC district had the third highest average in 1997 and the second highest average in 1998 (1.306 and 1.305, respectively). The SE district was in the bottom two each of the three years. It had the lowest average in 1996 and 1998, with averages of 1.253 and 1.289, respectively, and had the second lowest average in 1997, with 1.286.

Table 1. Summary of the 1998 Indiana corn acres, yields, and production.

District	Harvested Acres (1000's)	Acres per Samples	Yield (Bu/ac)	Production (1000 Bu)	Production (1000 Bu) per Sample
NW	914	20,772	144	131,585	2,991
NC	746	15,872	147	109,366	2,327
NE	544	21,760	141	76,442	3,058
WC	686	18,052	132	90,712	2,387
C	1,189	17,746	137	163,307	2,437
EC	435	15,535	137	59,510	2,125
SW	698	23,267	128	89,456	2,982
SC	170	21,250	118	20,087	2,511
SE	168	11,200	118	19,885	1,326
<b>State</b>	<b>5,550</b>	<b>18,377</b>	<b>134</b>	<b>760,350</b>	<b>2518</b>
<b>1997</b>	<b>5,850</b>	<b>36,792</b>	<b>123</b>	<b>719,550</b>	<b>4,525</b>
<b>1996</b>	<b>5,600</b>	<b>26,794</b>	<b>123</b>	<b>670,350</b>	<b>3,207</b>
<b>1995</b>	<b>5,400</b>	<b>35,762</b>	<b>113</b>	<b>598,900</b>	<b>3,966</b>

Table 2. Summary of the 1998 Indiana corn composition survey (15% moisture basis).

District	Samples	Protein (%)		Oil (%)		Starch (%)		Density (g/ml)	
		Avg.	Range	Avg.	Range	Avg.	Range	Avg.	Range
NW	44	6.6	4.5-9.4	3.1	2.3-5.5	64.2	59.0-67.0	1.302	1.219-1.355
NC	47	6.7	4.5-9.6	3.1	2.4-3.9	64.1	61.8-66.6	1.305	1.256-1.344
NE	25	6.6	3.8-8.8	3.1	2.6-3.8	64.0	61.4-66.6	1.304	1.250-1.339
WC	38	6.7	4.1-8.8	3.4	2.1-6.9	63.6	58.0-67.4	1.290	1.224-1.342
C	67	6.1	3.5-9.3	3.2	2.4-6.8	64.4	59.4-67.1	1.296	1.221-1.346
EC	28	6.0	3.3-8.1	3.1	2.5-3.9	64.4	62.3-66.6	1.293	1.251-1.340
SW	30	6.9	4.7-9.3	3.0	2.2-3.6	64.1	62.1-66.6	1.315	1.273-1.338
SC	8	7.8	6.1-9.1	3.4	2.8-4.1	62.6	61.4-64.0	1.296	1.270-1.329
SE	15	6.0	3.5-8.3	3.1	2.4-3.4	64.5	61.9-68.0	1.289	1.257-1.318
<b>State</b>	<b>302</b>	<b>6.5</b>	<b>3.3-9.6</b>	<b>3.2</b>	<b>2.1-6.9</b>	<b>64.1</b>	<b>58.0-68.0</b>	<b>1.299</b>	<b>1.219-1.355</b>
<b>1997</b>	<b>159</b>	<b>7.9</b>	<b>4.5-11.9</b>	<b>3.3</b>	<b>2.5-7.2</b>	<b>61.9</b>	<b>55.3-64.9</b>	<b>1.302</b>	<b>1.200-1.339</b>
<b>1996</b>	<b>209</b>	<b>7.8</b>	<b>5.4-10.8</b>	<b>3.3</b>	<b>2.5-4.6</b>	<b>61.2</b>	<b>57.3-63.5</b>	<b>1.27</b>	<b>1.17-1.33</b>
<b>1995</b>	<b>151</b>	<b>7.7</b>	<b>5.7-9.7</b>	<b>3.3</b>	<b>2.6-4.9</b>	<b>61.7</b>	<b>59.9-64.8</b>	<b>1.26</b>	<b>1.20-1.31</b>

Table 3. Statistical analysis within districts across years.

District	Year	Protein	Oil	Starch	Density
NW	1996	A	A	A	A
	1997	A	A	B	B
	1998	B	A	B	B
NC	1996	A	A	A	A
	1997	A	B	B	B
	1998	B	B	C	B
NE	1996	A	A	A	A
	1997	A	A	A	B
	1998	A	A	B	B
WC	1996	A	A	A	A
	1997	A	A	A	A
	1998	B	A	B	A
C	1996	A	A	A	A
	1997	A	A	B	B
	1998	B	A	C	C
EC	1996	A	A	A	A
	1997	B	A	B	B
	1998	C	A	C	B
SW	1996	A	A	A	A
	1997	A	A, B	A	B
	1998	B	B	B	B
SC	1996	A	A	A	A
	1997	A	A	A, B	A
	1998	A	A	B	A
SE	1996	A	A	A	A
	1997	A	A	A	A
	1998	A	A	B	A

Table 4. Statistical analysis across districts within a year.

District	Protein	Average	Oil	Average	Starch	Average	Density	Average
<b>1996</b>								
NW	A	7.52	A	3.39	A, B	61.22	A	1.267
NC	A	7.86	A	3.44	B	60.96	A	1.272
NE	B	6.60	A	3.15	A	62.22	A	1.257
WC	A	8.16	A	3.34	B	60.94	A	1.281
C	A	8.02	A	3.34	A, B	61.11	A	1.273
EC	A	7.82	A	3.33	A, B	61.24	A	1.276
SW	A	7.91	A	3.35	A, B	61.14	A	1.276
SC	A	7.62	A	3.38	A, B	61.49	A	1.281
SE	B	6.64	A	3.45	A	61.66	A	1.253

District	Protein	Average	Oil	Average	Starch	Average	Density	Average
<b>Table 4 continued 1997</b>								
NW	A	7.79	A	3.36	A	61.87	A	1.309
NC	A	8.05	A	3.14	A	62.01	A	1.306
NE	A	7.37	A	3.37	A	62.07	A	1.285
WC	A	8.19	A	3.52	A	61.52	A	1.294
C	A	7.84	A	3.28	A	61.94	A	1.306
EC	A	6.89	A	3.32	A	62.67	A	1.301
SW	A	8.22	A	3.18	A	61.80	A	1.308
SC	A	8.11	B	4.27	A	60.40	A	1.289
SE	A	7.37	A	3.13	A	62.40	A	1.286
<b>1998</b>								
NW	A	6.58	A	3.06	A	64.22	A, B	1.302
NC	A	6.69	A	3.07	A	64.07	A, B	1.305
NE	A	6.62	A	3.10	A	64.05	A, B	1.304
WC	A	6.75	A	3.36	A	63.60	B	1.290
C	A	6.11	A	3.19	A	64.38	A, B	1.296
EC	A	5.96	A	3.11	A	64.41	B	1.293
SW	A	6.87	A	2.99	A	64.13	A	1.315
SC	B	7.80	A	3.41	B	62.64	A, B	1.296
SE	A	5.97	A	3.07	A	64.53	B	1.289

Purdue University's Grain Quality Laboratory continues to offer composition analysis for whole corn, soybeans, and soybean meal. This service is offered at no charge to Indiana producers, elevators, and processors thanks to a Value-Added Grant from the Office of Indiana's Commissioner of Agriculture and a grant from the Mary S. Rice Farm Estate. 450 g (about 1 lb.) may be sent to

Grain Quality Laboratory  
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For further information, call (765) 494-2285, or send e-mail to [grainlab@ecn.purdue.edu](mailto:grainlab@ecn.purdue.edu), or visit us on the World Wide Web at <http://pasture.ecn.purdue.edu/~grainlab>, where data from a number of county test plots are summarized.

Grain Quality Fact Sheets can be accessed on-line through the World Wide Web at:  
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