

CONNECTICUT AGRICULTURAL EXPERIMENT STATION.

Bulletin 35.—Nov. 8, 1879.

ANALYSES OF MAIZE KERNEL.

- XXXIX. Coe's Prolific, crop of 1878. From W. W. Fowler, Guilford.
 XL. Old Fashioned Yellow, crop of 1878. From Bethuel Brockett, North Haven.
 XLI. Benton, crop of 1878. From G. W. Benton, Guilford.
 XLII. Mammoth Sweet, crop of

1878. From S. D. Woodruff, Orange.
 XLIII. Scioto, crop of 1878. From Rufus Leete, Guilford.
 XLIV. White Ohio, crop of 1878. From F. Johnson, Branford.
 XLV. Wisconsin, crop of 1878. From Rufus Leete, Guilford.
 LXX. White Prolific, crop of 1878. From G. W. Bradley, Hamden.
 LXXI. Extra Early Adams, crop of 1878. From E. B. Clark, Milford.

COMPOSITION OF MAIZE KERNEL.

AIR DRY.

	XXXIX	XL	XLI	XLII	XLIII	XLIV	XLV	LXX	LXXI
Water.....	9.55	10.38	10.70	9.41	10.43	9.70	9.72	10.14	10.94
Ash.....	1.43	1.43	1.57	1.93	1.53	1.70	1.56	1.07	1.73
Albuminoids.....	16.13	9.81	9.97	12.92	9.25	11.28	11.60	9.19	10.81
Fiber.....	2.19	1.59	1.33	2.75	1.89	1.73	2.00	1.34	1.48
Carbohydrates.....	72.70	73.11	71.40	66.09	72.09	71.30	70.17	73.08	70.21
Fat.....	2.98	4.88	5.00	7.48	4.01	4.20	4.80	4.29	4.81

WEIGHT OF CORN AND COB, CURED.

	454	407	509	424	513	407	574	344	335
Corn, weight in grams.....	454	407	509	424	513	407	574	344	335
Cob.....	95	95	87	114	79	111	103	57	80
Relation of cob to corn.....	1:4.6	1:4.9	1:5.9	1:3.6	1:5.9	1:4.2	1:5.5	1:8	1:85
Cob expressed in per cent. of corn.....	21.0	20.1	16.5	27.3	15.1	23.8	18.0	16.3	26.5

COMPOSITION OF MAIZE KERNEL.

WATER FREE.

	Coe's Prolific	Old Fashioned Yellow	Benton	Mammoth Sweet	Scioto	White Ohio	Wisconsin	White Prolific	Early Adams
Ash.....	1.60	1.60	1.70	2.13	1.71	1.88	1.73	1.80	1.97
Albuminoids.....	11.21	10.99	11.15	13.60	10.31	12.50	12.85	10.23	12.14
Fiber.....	2.42	1.57	1.52	3.04	2.01	1.92	2.28	1.49	1.66
Carbohydrates.....	80.30	80.60	79.94	72.97	81.49	78.35	77.72	81.05	78.83
Fat.....	4.41	5.20	5.60	8.20	4.48	4.65	5.43	4.76	5.40
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

DIGESTIBLE NUTRIENTS, ETC., OF MAIZE KERNEL IN PER CENT. OF AIR DRY SUBSTANCE.

Albuminoids.....	9.42	9.93	9.39	11.42	8.68	10.50	10.79	7.35	8.73
Carbohydrates.....	78.40	73.89	75.70	69.72	77.34	74.32	73.90	69.19	63.97
Fat.....	3.33	3.97	4.26	6.28	3.41	3.53	4.13	3.10	3.51
Nutritive Ratio.....	19.2	19.3	19.2	17.5	19.6	17.9	17.8	13.01	18.3
Calculated val. § 100 lb. § 1.25	1.96	1.97	1.97	1.99	1.92	1.98	1.91	1.05	1.11

The impression appears to prevail that there are considerable differences in the quality of different varieties of Indian corn. Some of the popular ideas are certainly erroneous as will appear from the examination of seventeen analyses recently made in the laboratory of the Station, thirteen analyses executed at the Agricultural College of Michigan under

will be seen from the average of 11 Flints and 14 Dents.

Average Composition of Flint and Dent Corn.

	Flint.	Dent.
Ash.....	1.7	1.7
Albuminoids.....	11.7	12.0
Fiber.....	3.0	3.2
Carbohydrates.....	79.4	78.8
Fat.....	5.2	5.3
	100.0	100.0

of 1879, though the history of the seed is unknown.

The average of these is as follows:

Water.....	10.1
Ash.....	1.6
Albuminoids.....	11.0
Fiber.....	1.7
Carbohydrates.....	70.9
Fat.....	4.7
	100.0

It results that these corns, pound for pound, are worth fully as much or slightly more than corn raised at the West.

It should be said here, that the popular idea that western corn is inferior to eastern corn, is probably correct, if by "western corn" is meant the corn as it comes in bulk from the west to be ground for feed.

The samples of western corn whose average composition is given above were no doubt taken from the field or barn to the laboratory, and had been properly cured and stored. But when corn is raised on a large scale for market, at the west, it cannot be as carefully cured as with us. Many times it cannot be put under cover at all, but is stacked in the field, and necessarily deteriorates, from exposure to the weather. A single analysis of such corn, made by Dr. Atwater of Middletown, gave the following result—calculated on a water-free basis:

Ash.....	1.5
Albuminoids.....	10.3
Fiber.....	1.8
Carbohydrates.....	81.8
Fat.....	4.6
	100

It will be seen that it has one and a half per cent. less albuminoids, and six-tenths per cent. less fat than the average of eastern corn, and two and four-tenths per cent. more of carbohydrates, while ash and fiber are approximately the same. Dr. Atwater says the sample contained unsound kernels, bits of cob, fine prairie soil, and other refuse.

6. Unripe maize, so far as its composition is illustrated by three analyses of the same kind of sweet corn, is richest in albuminoids—the rarest and most costly element of food.

These samples of sweet corn, harvested by Mr. Gold Aug. 9, Aug. 25 and Sept. 25, 1877, respectively, had

the direction of Prof. Kedzie and eight analyses made by Dr. Atwater of Middletown.

So far as can be judged from these analyses the following conclusions are correct, viz:

1. From the point of view of chemical composition, there are, broadly speaking, two kinds of Indian corn, the common and the sweet.

2. The average composition of these two kinds in the water free condition is as follows:

	Sweet.	Common.
Ash.....	2.2	1.7
Albuminoids.....	14.0	11.9
Fiber.....	2.7	2.1
Carbohydrates (starch, sugar, gum).....	73.1	70.0
Fat.....	9.0	5.3
	100.0	100.0

The sweet corn contained on the average 9.0 per cent. of water and the common contained 11.7 per cent. but the samples were unequally dried, and the analyses probably do not show the proportions of water that exist in corn in bulk as found in the crib or in market.

The figures above given for *Common corn* are the average of 28 analyses and may be considered as substantially correct; those given for *sweet corn* are the average of only 3 analyses and will need revision as analyses accumulate, but the greater richness of sweet corn in albuminoids and fat is very decided and indicates a higher nutritive value than that of common corn.

3. The range of variation in the several ingredients is shown by the following statement of the lowest and highest percentages as found in these analyses:

	Sweet.	Common.
Ash.....	2.1 - 2.3	1.4 - 2.0
Albuminoids.....	12.5 - 15.9	10.2 - 13.9
Fiber.....	2.1 - 3.0	0.9 - 3.5
Carbohydrates.....	60.6 - 73.9	76.2 - 82.3
Fat.....	8.3 - 10.1	4.4 - 6.3

Sweet corn in all the analyses contains more ash, more fat and less carbohydrates than common corn.

4. Flint and Dent Corns have practically the same composition as

The average water content of Flint corn was found to be 11.7 per cent. that of Dent corn 11.4 per cent.

5. Western corn has about the same nutritive value as Eastern corn. Below is the average composition of 15 samples of corn raised at the East and 10 samples of corn raised at the West.

	Eastern.	Western.
Ash.....	1.7	1.6
Albuminoids.....	11.8	12.3
Fiber.....	1.9	2.5
Carbohydrates.....	79.4	78.2
Fat.....	5.2	5.4
	100.0	100.0

The Eastern corn averaged 10.7 per cent. of water and the Western 13 per cent. To institute a strict comparison any constant difference in water content should be taken into the account. It is not certain that the differences shown by the analyses are true of corn in bulk, but if they do represent a real difference, 100 pounds of shelled corn contain:

	Eastern.	Western.
Water.....	10.7	13.0
Ash.....	1.5	1.4
Albuminoids.....	10.5	10.7
Fiber.....	1.7	2.2
Carbohydrates.....	71.0	67.9
Fat.....	4.6	4.8
	100.0	100.0

The slightly higher content of albuminoids and fat in the corn raised at the West, if it should be shown by further analyses to be constant, is due either to difference in climatic conditions and the methods of cultivation, or to difference in the chemical composition of the varieties most commonly cultivated in the two sections.

We have no analyses of varieties known to be identical, raised in the East and also at the West, except of Tuscarora, which makes a third kind, intermediate in composition between common and sweet corn. The analysis by Prof. Kedzie, and that made at the Station are fairly accordant. Among those analyzed in this laboratory are three, Ohio Dent, White Ohio, and Wisconsin which were raised in Connecticut, whose names suggest a western

the subjoined composition:

	Aug. 9.	Aug. 25.	Sept. 25.
Water.....	10.1	10.1	9.5
Ash.....	2.2	2.1	2.1
Albuminoids.....	14.5	15.3	14.4
Fiber.....	2.6	2.5	1.9
Carbohydrates, starch, etc.....	62.7	61.8	63.0
Fat.....	7.9	8.2	9.1
	100.0	100.0	100.0

The albuminoids found in the earliest are indeed scarcely more than those of the latest corn. But the earliest cut sample was very small and immature, and was shelled from a cob that contained 8.6 per cent. of albuminoids, while the others were from cobs of 3.0 and 2.7 per cent. albuminoids, respectively. The comparison is therefore properly between the corn of Aug. 25 and that of Sept. 25.

The mature corn contains a less percentage of albuminoids than the immature because, in the later stages of growth, starch and sugar, as well as fat (oil), are formed in the seed at a more rapid rate than albuminoids. The percentage of fat increases from 7.9 to 9.1.

7. The ripe grain, as a crop, contains absolutely more of every ingredient than the unripe. The yield of vegetable matter per acre in the three crops is not known; but the relative yield of the two later crops is as follows per 1,000 pounds of total harvest, reckoned water-free:

	Corn.	Cob.	Fodder.	Total.
August 25.....	304	88	608	1,000
September 25.....	356	94	550	1,000

Doubtless 1,000 pounds of the dry matter of the standing crop on Aug. 25 would have increased to 1,250 pounds, more or less, by Sept. 25, so that the acreage yield of total vegetable substance, as well as the relative proportion of grain, would increase to the time of full ripeness, while the cob and stover would increase absolutely, but not so rapidly as the grain, and relatively to grain would appear to diminish. In fact the grain increases at the expense of stover and cob as well as of roots, while the entire plant gains by growth as long as the leaves are green and unshriveled.

S. W. JOHNSON, Director.