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EXPERIMENTS WITH CORN

J. F. DUGGAR, AGRICULTURIST.

BIRMINGHAM
ROBERTS & SON.
1897.

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Experiments With Corn.

BY J. F. DUGGAR.

SUMMARY.

Seed corn from Illinois gave a slightly larger yield than seed corn grown in the South.

In 1897 the most productive varieties were Mosby Prolific, Cocke Prolific and Renfro.

Kernels from the middle portion of the ear used as seed failed to show any superiority over seed from the tip or butt end of the ear.

Topping, and also cutting corn and curing it in shocks, slightly decreased the yield of grain. The combined value of grain and stalks, valuing the stalks at 25 cents per 100 pounds, was greater by $2.95 per acre than the value of the grain from the plot where only the ears were harvested.

When each plant was allowed 15 square feet of space, narrow rows and wide spacing in the drill gave slightly better average results than wide rows and close planting in the drill. Having regard to convenience of cultivation, as well as to yield, rows practically 5 feet apart, with plants 3 feet apart in the drill, gave most satisfactory results on poor sandy land.

Cotton seed meal alone was the most profitable fertilizer for corn in 1897. Acid phosphate and kainit failed to increase the yield. Cotton seed placed in the ground so late as to germinate had considerable fertilizing value.

The Rainfall During the Growing Season of 1897.

The following is the condensed record of rainfall at Auburn, April to September inclusive, as observed by Dr. J. T. Anderson, of the Chemical Department:

	Rainfall in inches
April	5.82
May	1.09
June	3.46
July	5.01
August	6.37
September	.44

The longest periods of extremely slight rainfall were: (1) The 20 days just preceding June 4, during which period less than one-tenth inch of rain was recorded; (2) the 15 days ending with a moderate and insufficient rain July 19; and (3) the 20 days immediately following the date just referred to. These last two periods may be regarded as forming practically a continuous dry season, extending from July 3 to August 10, when a slight rain fell, or to August 16, when a heavy rainfall was recorded. The drought of September was probably without notable effect on the yield of corn planted in the first half of April.

Variety Test of Corn, 1897.

Fifteen varieties were tested on 20 plots, each one-twentieth acre in area. The distance between rows was five feet, and no cow peas were planted between the corn rows.

The stand of plants was nearly uniform on most plots, but slightly defective on plots 3, 4 and 17.

Experiment Station Yellow corn was planted on four plots as a check on the fertility of the land, which was found to be quite uniform, except on plots 17, 18, 19 and 20, where there was a decline in fertility.

The following table gives the number of pounds of thoroughly dry unshucked corn required to afford 56 lbs. of shelled corn, the percentage of grain in the unshucked corn, and the yield per acre of each variety, arranged in order of productiveness:

Pounds unshucked corn per bushel, per cent. grain and yield of fifteen varieties of corn.

Plot No.	VARIETY.	Unshucked corn per bushel.	Grain in unshucked corn.	Yield of shelled corn per acre.
		Pounds.	*Per cent*	*Bushels.*
11	Mosby Prolific	72.5	77.3	25.4
12	Cocke Prolific	75	74.7	23.7
4	Renfro	74.8	74.8	23.6
6	Cade Prolific	74.3	75.5	23.0
14 and 15	Blount Prolific (av. Ill. & Ga. seed)	75.5	74.1	19.0
5	Farmers' Pride	76.1	73.5	18.6
3, 8, 13, 18	Experiment Station Yellow	78.4	71.4	18.4
1	Shaw Improved	77.9	71.7	18.3
2	St. Charles	74.3	75.4	18.1
10	Jones Prolific	78.2	70.7	17.9
7	Strawberry	80.4	70.3	17.8
16	Welborn Conscience	92.8	73.2	16.1
9	Champion White Pearl	79.2	70.7	14.5
19 and 20	Hickory King (av. Ill. & Ala. seed)	75.7	74.1	13.2
17	Early Mastodon	78	71.9	11.1

In this test Mosby Prolific stood first, followed by Cocke Prolific, Renfro and Cade Prolific. It will be noticed that of the varieties standing near the head of the list, all except Renfro bear the name of "prolific," indicating that they produce several ears to the plant. In partial explanation of this it must be said that the land on which this experiment was conducted was in fairly good condition for upland, having borne a crop of cow peas in 1896, the vines of which were plowed under after the peas were picked. Fertilization, with a complete commercial fertilizer, was more liberal than is our custom with corn. For upland fields in poor condition the writer does not feel warranted in recommending varieties bearing several ears per plant, but regards the results of the test made here in 1896 as more generally applicable. In that test St. Charles afforded the largest yield.

Doubtless the very different positions which the several varieties take in the two tests is largely due to differences in

the weather conditions. As a rule the medium maturing varieties stood highest in 1896, the late varieties in 1897.

The following table shows the number of ears and nubbins required to yield a bushel of grain, and also shows the chief characteristics of ears and cobs of the varieties tested:

Size and color of ears and cobs of fifteen varieties of corn.

VARIETY.	No. of ears and nubbins per bu.	*EAR			*COB	
		Size	Color	Rough or smooth	Size	Color
Mosby Prolific	146	M	W	R	S	W
Cocke Prolific	153	M	W	S	M	W
Renfro	135	L	W	R	L	W
Cade Prolific	153	L	W	S	M	W
Blount Prolific	204	M	W	S	S	W
Farmer's Pride	133	M	W	R	M	W
Experiment Sta. Yellow	147	M	Y	S	M	W
Shaw Improved	135	L	W	R	L	W
St. Charles	142	M	W	I	M	R
Jones Prolific	138	M	W	S	M	R
Strawberry	106	L	R	R	L	R
Welborn Conscience	186	M	W	R	L	W
Champion White Pearl	173	S	W	R	M	W
Hickory King	220	S	W	S	S	W
Early Mastodon	155	S	Y	R	L	R

*L, large; M, medium; S, small; R, red, except when in column showing whether the ear is rough or smooth; S, smooth; I, intermediate; Y, yellow; and W, white.

SEED CORN FROM DIFFERENT LATITUDES.

In this test were used Blount Prolific corn from Illinois and Georgia, and Hickory King corn from Illinois and from Pickens county, Alabama.

Seed corn from different latitudes.

	SHELLED CORN PER ACRE.	
	Yield.	Increase (+) or decrease (—) with Northern seed.
Hickory King.	*Bus.*	
From Pickens County, Alabama	12.1	.....
From Voorhies, Illinois	14.3	+2.2
Blount Prolific.		
From Voorhies, Illinois	19.1	+0.2
From Herndon, Georgia	18.9	.....

This experiment agrees with a similar test in 1896 in showing a slightly larger yield from the use of Northern seed. With the Hickory King variety the difference in yield seems too great to be attributed to variations in the fertility of the two plots, which lay side by side. With the Blount Prolific variety the difference is so small that we are justified in regarding the yields as indicating no superiority of seed of that variety from either source.

"The results recorded in the preceding table do not confirm the common belief that Northern seed corn is inferior to pure Southern varieties.

"Differences in yield between the same varieties from different latitudes are not wholly due to climate, but also to the kind of soil and culture which produced each strain. Thus seed of the same variety grown on adjacent farms may vary in productiveness—an encouraging fact for one who may desire to improve his corn by good culture and careful selection."—Ala. Sta. Bul. No. 75.

Where to Get Seed.

As the Alabama Experiment cannot offer seed either for sale or distribution, a list is given below of parties from whom our seed corn was originally obtained:

Shaw, Farmers' Pride and Cade's Prolific were donated by H. H. Arrington, Summerville, Ga.

St. Charles, Champion White Pearl, Blount Prolific and Hickory King were from J. C. Suffern, Voorhies, Ill.

Strawberry was supplied by T. A. Whatley, Opelika, Ala.

Jones Prolific and Blount Prolific came from H. P. Jones, Herndon, Ga.

Cocke Prolific and Welborn Conscience were bought of Mark W. Johnson Seed Co., Atlanta, Ga.

One sample of Hickory King was furnished by C. C. L. Dill, Dillburg, Ala.

Butt, Middle and Tip Kernels for Seed.

A number of experiments have been made at different Experiment Stations to determine whether there is any differ-

ence in the crop grown from kernels produced on different parts of the cob. While these results vary considerably with different varieties and in different years, they tend on the whole to show that there is no marked or constant superiority of middle kernels over those from either end of the ear.

In 1897 butt grains were obtained from a space of about one-half inch at the large end of the ear, tip kernels from a similar space at the extreme small end of the ear, and middle grains from near the center of the same ears.

Six plots, each one-sixteenth acre in area, were used, and each kind of seed was planted on duplicate plots, the arrangement of plots being such as to distribute equally to all classes of seed any advantage due to differences in the fertility of the different plots.

Culture and fertilization were identical for all plots. The variety used was Experiment Station Yellow, which, although placed in the dent class, has some qualities which suggest some degree of kinship to the flint varieties.

The yields, on a basis of 80 pounds of unhusked corn per bushel of grain, were as follows:

Yield obtained from planting middle, butt and tip kernels.

KIND OF SEED.	Yield per acre
	Bus.
From middle kernels (average of 2 plots)	17.2
From butt kernels (average of 2 plots)	17.4
From tip kernels (average of 2 plots)	19.2

The yield was largest when tip kernels were planted. In so far as this indicates that sound tip kernels are equally as valuable for seed as those from other parts of the cob, it accords with last year's results and with the average results of numerous tests compiled by the writer in Bulletin 75.

A similar experiment with the variety Renfro was begun, in 1897, but the stand was so poor that the results of the test with Renfro corn were valueless.

Taken as a whole, the experiments thus far made in sev-

eral widely separated states fail to show any decided advantage in planting kernels from any special portion of the cob. This has been true even when the tip, butt and middle kernels planted had been propagated for several generations from tip, butt and middle kernels respectively.

Methods of Harvesting Corn.

This is a repetition of a similar experiment conducted in 1896. It was conducted on the same piece of branch bottom land, and the same variety, Mosby Prolific, was employed in both tests.

Corn was planted April 12 in rows 4½ feet apart. Equal weights of a complete home mixed commercial fertilizer were used on all plots.

August 24 on a portion of the field the tops were cut just above the ear. At that date the lower leaves had "fired" too much to make good fodder.

August 30 on other rows the entire stalks were cut, put into large shocks and left until September 24.

A third set of rows remained undisturbed until September 24. On this last date the ears were pulled from all three classes of plants, viz: (1) Those not previously disturbed; (2) those plants which had been topped, and (3) those stalks which had been cut near the ground and shocked.

Weather conditions were favorable to the curing of the stalks.

The following table gives the yield per acre both of grain and forage in 1897 on the plots differently treated:

Yield per acre of corn and forage from different methods of harvesting.

METHOD OF HARVESTING.	Corn per acre.	Forage per acre.
	Bus.	*Lbs.*
Only ears harvested	31.0	00
Tops cut and ears harvested	29.2	509 (tops)
Entire stalks cut and ears afterwards harvested	29.5	1355 (stalks)

Apparently both topping and cutting the stalks before pulling the ears slightly decreased the yield of grain, the loss being 1.8 bushels per acre with topping and 1.5 bushels with cutting.

We have next to consider whether the forage gained by harvesting tops or stalks exceeds in value the grain which seems to have been lost by these processes.

With corn at 45 cents per bushel, tops at 50 cents per 100 lbs., and entire stalks with adhering blades at 25 cents per 100 lbs., and assuming that the different plots were uniform in fertility, we obtain as the average for two years the following results:

Average results of two years' test of methods of harvesting corn.

METHOD OF HARVESTING	YIELD PER ACRE		VALUE PER ACRE		
	Corn	Forage	Corn	Forage	Total Product
	Bus.	*Lbs.*			
Only ears harvested.....	33.0	....	$14 85	....	$14 85
Ears and tops harvested.		411	13 36	$2 05	15 41
Ears and entire stalks	29.7				
harvested.....	29.4	1,829	13 23	4 57	17 80

At the prices assumed above, the highest average value was secured by cutting and curing the entire stalks, this process showing a gain of $2.95 per acre over harvesting only the ears. "Will this amount cover the cost of handling a weight of fresh stalks sufficient to produce about one ton of cured stalks? That is a local question the answer to which is largely dependent on the price and efficiency of labor. The value assumed for entire stalks, or stover, is necessarily only an estimate.

The low price of 25 cents per 100 lbs. of stalks has been assumed because of the immense waste in feeding the coarse forage, a waste which is inevitable unless one purchases a shredding machine and expends considerable labor in preparing shredded forage. Chemical analysis shows that even the

butt of the stalk, the part which, unless shredded, is rejected by cattle, has some feeding value." (Ala. Sta. Bul. 75.)

Distance for Upland Corn.

This experiment occupied 6 plots, each one-twelfth acre in area. It was located on the same land as a similar experiment made in 1896. The location of the separate plots, however, was so changed that the thicker planting of 1897 occurred on the plots which had been most thinly planted the preceding year. This tends to equalize inequalities of soil and to make the average results for two years more reliable than those for either year taken alone.

The land was sandy, and very poor. Fertilization was the same for all plots, viz:

50 lbs. nitrate of soda per acre.
80 lbs. cotton seed meal per acre.
160 lbs. acid phosphate per acre.
30 lbs. muriate of potash per acre.

Total, 320 lbs. complete fertilizer per acre.

All plots received the same cultivation, and all were planted March 27, 1897, with Champion White Pearl, an early variety with small stalk, which in the variety test of the present year took a low rank.

A single plant was left in each hill and the stand was regular. On plots 1, 2 and 3, the distance between the rows was the same, 5 feet, but the distance between the plants in the drill varied from 4 to 2 feet, affording wide variations in the number of plants per acre. On the other hand the thickness of planting was the same on each of plots 4, 5 and 6, but the distribution or arrangement of plants was different.

The following table gives the number of stalks and the yield of corn per acre when the plants stood at different instances apart:

Yield of corn when plants stood at different distances apart.

DISTANCE		Number of plants per acre	YIELD PER ACRE		
Between rows	Between plants		1896	1897	Average 2 years
			Bus.	*Bus.*	*Bus*
5 feet	4 feet	2,178	12.4	15.3	13.9
5 feet	3 feet	2,904	12.9	15.7	14.3
5 feet	2 feet	4,356	9.8	16.7	13.3
6 feet	2 feet 6 in.	2,904	13.1	15.5	14.3
4 feet 10 in.	3 feet 1½ in.	2,904	15.6	16.7	16.7
4 feet	3 feet 9 in.	2,904	16.9	17.8	17.4

In both seasons the yield was largest when the constant area devoted to each plant approached a perfect square in shape. In other words, a plant having 15 square feet of space was most productive when so planted that the distance in the drill nearly equaled the distance between rows.

This distance of 4 feet by 3 feet 9 in. affords the largest average yield for two years, but for cheapness of cultivation rows 5 feet wide, with plants about 3 feet apart, are to be preferred to narrower rows on such soil as that used for this test. On poor land a row of cow peas should usually be planted between the corn rows, which was not done in this experiment. With a row of cow peas between the corn rows the distance should be at least 5 feet on such lands as this.

Fertilizer Experiments With Corn.

The soil used for this purpose contained more clay than most of the fields on the station farm. It was a piece of nearly level, rocky upland, adjoining and similar to that used for testing fertilizers with cotton. (See Bulletin No. 89.) It was apparently quite uniform in fertility. The soil is reddish, and the surface is nearly covered with flint stones. It was decidedly richer than the average hill land of this locality.

Preceding crops were: In 1895, corn; in 1896, wheat; and in the winter of 1896 and early spring of 1897 it was in rye, which was grazed off with cattle during the early part of March.

Commercial fertilizers, consisting largely of acid phosphate, had been regularly used on this field for a number of

years, the average annual quantity being estimated at about 300 pounds per acre. When, in previous years, corn had occupied this field, cow peas had been planted between the rows.

After grazing off the rye the tall stubble was turned under April 5, leaving the land too loose and open. This condition and the depredations of bud worms made it impossible to get a good stand of corn, even after replanting. An effort was made to leave the same number of plants on all rows, but exact uniformity of stand was not obtained.

April 7 rows 4 feet 8 inches apart were marked off with a shovel plow and the fertilizer drilled. A scooter plow was then run in this drill to mix the fertilizers with the soil. Seed of Experiment Station Yellow Corn was dropped and covered with a double-foot plow. Planting was done on a level.

The following table gives the yields in bushels of shelled corn per acre:

Yield of corn per acre with different fertilizers.

FERTILIZERS.		Yield per acre.
Amount per acre.	Kind.	
Lbs.		*Bus.*
434	Green Cotton Seed (germinated)	26.0
240	Acid Phosphate	
200	Kainit	
200	Cotton Seed Meal	26.4
240	Acid Phosphate	20.1
00	No Fertilizer	17.8
200	Kainit	17.6
200	Cotton Seed Meal	22.6
240	Acid Phosphate	
200	Cotton Seed Meal	22.3
200	Kainit	
240	Acid Phosphate	17.9
200	Kainit	
00	No Fertilizer	19.3
200	Cotton Seed Meal	21.8
240	Acid Phosphate	
200	Kainit	
200	Cotton Seed Meal	22.0
240	Acid Phosphate	
100	Kainit	

Apparently neither acid phosphate nor kainit was beneficial to corn. Cottonseed meal increased the yield in every instance whether applied alone or in combination. The increase was sufficient to pay a profit when cottonseed meal was used alone. Apparently unrotted cottonseed were quite effective, notwithstanding the fact that they germinated in the soil. Doubtless rotted cottonseed are preferable for use as a fertilizer whenever the date of application is so late that unrotted seed would germinate.

The failure of acid phosphate to increase the corn crop in this exceptional season and on soil which for years past had been liberally fertilized with this material, should not influence farmers to omit acid phosphate on poorer soils used for corn.

It should be stated here that in a similar experiment with cotton conducted on land adjacent to that used for the test of fertilizers under corn, kainit alone and cottonseed meal applied alone were the most profitable fertilizers, and that acid phosphate was not beneficial.