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CORN VARIETIES FOR CHINCH-BUG
INFESTED AREAS

IN COOPERATION WITH THE NATURAL HISTORY SURVEY,
ILLINOIS DEPARTMENT OF REGISTRATION AND EDUCATION

By W. P. FLINT AND J. C. HACKLEMAN



COMPLETE DESTRUCTION BY SECOND-BROOD CHINCH-BUGS
OF A VERY SUSCEPTIBLE VARIETY OF CORN

URBANA, ILLINOIS, APRIL, 1923

CORN VARIETIES FOR CHINCH-BUG INFESTED AREAS

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EXPERIMENTAL WORK TO DETERMINE VARIETAL RESISTANCE

Results obtained from experimental work conducted in Illinois during the past five years, as well as observations in many farmers' fields, show that several varieties of corn are resistant to chinch-bugs. This experimental work, herein reported, dealt only with resistance to the second brood of chinch-bugs. There is no assurance that the resistant varieties described below will be immune to first-brood attack. It is necessary, therefore, when corn is planted adjacent to fields of small grain, to protect the resistant varieties, as well as others, from first-brood infestation by means of barriers at harvest time.

Prior to 1917 no experimental work had been done to test varieties of corn for chinch-bug resistance. Observations made during the summer of 1916 and 1917 on corn grown in Randolph county showed that a variety known locally as Democrat seemed to be resistant to chinch-bugs. In 1918, experiments to test the varietal resistance of several kinds of corn were conducted in Randolph county under the cooperation of the Randolph County Farm Bureau and the State Natural History Survey. The varieties included in these experiments were the local Democrat, Iowa Silvermine, Boone County White, Sutton's Favorite, St. Charles County White, Reid's Yellow Dent, and Yellow Ninety Day. The field was heavily infested with the second-brood bugs. Early in October the corn was cut and weighed. The yield of Democrat weighed more than three times as much as the yield of the other varieties; in fact it was the only variety that produced corn fit to crib.

In 1919 Democrat and local strains of Reid's Yellow Dent were planted in alternate two-row strips in two different fields, one of fifteen acres located near Centralia in Marion county, and one of twenty acres near Plainview in Macoupin county. The first brood of bugs was kept out of these fields by means of barriers, but there was a heavy infestation by the second brood. By September, the two varieties could be distinguished at a distance of at least 40 rods. Approximately 80 percent of the stalks of Democrat were standing, while nearly all the stalks of Reid's Yellow Dent had fallen as the result of the work of chinch-bugs. The difference in the yields of these fields was practically 10 bushels to the acre in favor of Demo-

erat. The Democrat was well matured and in good condition for cribbing, while the Reid's Yellow Dent* was soft and spongy and practically worthless.

In 1920, the Agronomy Department of the University of Illinois entered into the work and the scope of the experiments was enlarged and a number of new varieties were added to the tests. These varieties were selected because of their known resistance to drouth and their supposed adaptability to the type of soil found in the counties most heavily infested with chinch-bugs. Certain of these varieties of corn were secured from the Office of Corn Investigations of the Bureau of Plant Industry, Washington, D. C.; others were brought from



FIG. 1.—TYPICAL INJURY BY SECOND-BROOD CHINCH-BUGS IN FIELD OF NON-RESISTANT CORN

nearby states. As in previous tests, the first brood of bugs was kept out of the field by barriers, but there was a uniform and heavy infestation by the second brood. By September 6, every stalk of two varieties, Northwestern Dent and Gehu, had been killed. The corn was shucked the latter part of October. Democrat yielded approximately 17 bushels to the acre, and Black Hawk nearly as much. Nine of the varieties made less than 10 bushels to the acre and four of them less than 3 bushels.

During the same year two fields of about twenty acres each, located in the southern part of Macoupin county, where chinch-bugs were very abundant, were each planted one-half to Reid's Yellow Dent and one-half to Democrat. The Reid's Yellow Dent was so badly injured by chinch-bugs that it failed to mature any sound ears and none of it was shucked. The Democrat yielded approximately 21 bushels to the acre in one of the fields and 25 bushels in the other.



FIG. 2.—HIGHLY RESISTANT VARIETY GROWING IN SAME FIELD AS THAT SHOWN ON THE COVER PAGE

In 1921, experiment plots to test chinch-bug resistance were planted in Wabash, Randolph, Macoupin, and Piatt counties. On these plots the different varieties of corn were planted in four-row strips one hundred hills long, and the plots were duplicated. The first brood of bugs was kept out of the fields by barriers where necessary. In Piatt county the plots were only very slightly infested. In Randolph county the infestation was moderate, while in Macoupin county the bugs were very abundant. The crops on the plots in Wabash county were destroyed by hail.

As in previous experiments, Democrat, Black Hawk, and Champion White Pearl stood up much better and matured better than any of the other varieties. In Macoupin county, Democrat yielded 25 bushels of sound, marketable corn to the acre, as compared with $4\frac{1}{2}$ bushels



FIG. 3.—COMPARATIVE YIELDS OF REID'S YELLOW DENT (AT THE LEFT) AND CHAMPION WHITE PEARL (AT THE RIGHT) UNDER HEAVY CHINCH-BUG INFESTATION. NOTE DIFFERENCE IN QUALITY AS WELL AS IN QUANTITY

of sound corn yielded by Reid's Yellow Dent. On the plots in Randolph county, Democrat, Black Hawk, and Champion White Pearl were about equal in yield, with the other varieties producing about one-half as much per acre.

In 1922 another series of experiments similar to those of 1921 was carried on in Cass, Macoupin, Macon, and Crawford counties. The crops on the Crawford county plots were destroyed by hail and wind. In Cass county the infestation was slight, while in Macoupin and Macon counties bugs were present in moderate numbers. Under these conditions, as in previous tests, Democrat, Black Hawk, and Champion White Pearl showed their superiority, both in production of stalks and in yield of sound corn.

SUMMARY OF EXPERIMENTS

In Table 1 is shown the percentage rating, as regards yield under moderate to severe chinch-bug infestation, of the varieties of corn tested in these experiments, the yield of Democrat being taken as 100 percent. In Table 2 is shown the percentage rating of a number of these same varieties under slight infestation.

A study of Table 1 shows clearly that in these experiments in which moderate to severe chinch-bug infestation was present, Champion White Pearl, Democrat, Black Hawk, and with one year's exception, Golden Beauty, far outyielded all the other varieties included in these tests.

From observations made in the field during the course of these experiments, the greater yield of certain corn varieties seems to be due to vigor of the plants as indicated by certain varietal character-

TABLE 1.—CORN VARIETIES GROWN UNDER MODERATE TO SEVERE CHINCH-BUG INFESTATION, SHOWING PERCENTAGE RATING WITH RESPECT TO YIELD: EXPERIMENT PLOTS IN SOUTHERN ILLINOIS (Based on the yield of Democrat as 100 percent)

Variety	1918	1920	1921		1922	
	Ran- dolph county	Ran- dolph county	Mac- ou- pin- county	Ran- dolph county	Mac- ou- pin county	Macon county
	<i>percent</i>	<i>percent</i>	<i>percent</i>	<i>percent</i>	<i>percent</i>	<i>percent</i>
Democrat.....	100.00	100.00	100.00	100.00	100.00	100.00
Iowa Silvermine.....	31.07					
Reid's Yellow Dent.....	20.75		20.61	60.96	68.23	
Boone County White.....	18.86		25.19			
Sutton's Favorite.....	¹					
St. Charles County White ²	¹			106.74		
Funk's Ninety Day.....	¹					
Black Hawk.....		87.27	76.73	111.56	117.37	119.79
St. Charles County White.....		75.75	3.98			
Arlington Prolific.....		66.66	20.61	42.65		
Pride of Saline.....		56.36				
U. S. Selection No. 77.....		45.45				
Freed White Dent.....		40.00				
Colby Bloody Butcher.....		30.30				
Lancaster Surecrop.....		20.00	18.32	46.98		
U. S. Selection No. 133.....		15.15				
Minnesota No. 13.....		13.33				
Northwestern Dent.....		0				
Gehu.....		0				
Champion White Pearl.....			90.47	113.37	127.56	118.25
Commercial White.....			50.38	82.41		
Golden Beauty.....			34.35		105.80	114.64
Hickory King.....			29.77	50.36		
Pride of the Prairie.....			21.75	55.90		
Printz Yellow Dent.....					77.90	47.12
Mohawk.....					93.64	100.73
Funk's Yellow Dent.....						72.20

¹By inspection, yield was estimated to be less than that of Boone County White, which ranked 18.86 percent.

²Specially selected seed.

istics, such as large and sturdy stalks, a well-developed root system, and a large leaf surface.

Field observations have shown no marked difference in the number of bugs present on the different varieties of corn when growing together. It would be supposed, if it were merely a matter of preference on the part of the bugs, that when resistant and non-resistant varieties were growing together the bugs would be found in greater numbers on the non-resistant varieties. This, however, is not the case, which fact indicates that some varieties are resistant to injury, and not merely distasteful to the bugs.

PRACTICAL RESULTS OBTAINED BY FARMERS

As a result of this experimental work, farmers in the chinch-bug infested area in the west and west-central part of the state during

TABLE 2.—CORN VARIETIES GROWN UNDER SLIGHT CHINCH-BUG INFESTATION, SHOWING PERCENTAGE RATING WITH RESPECT TO YIELD: EXPERIMENT PLOTS IN CENTRAL ILLINOIS
(Based on the yield of Democrat as 100 percent)

Variety	1921	1922
	Piatt county	Cass county
	<i>percent</i>	<i>percent</i>
Democrat.....	100.00	100.00
Black Hawk.....	104.68	95.54
St. Charles County White.....	90.08	.....
Champion White Pearl.....	97.32	97.73
Golden Beauty ¹	122.12	104.41
Northwestern Dent.....	0	.....
Pride of the Prairie.....	109.25	.....
Lancaster Surecrop.....	100.08	.....
Arlington Prolific ²	138.42	.....
Commercial White ¹	134.29	.....
Reid's Yellow Dent.....	112.94	91.91
Long John (Local variety).....	116.61	.....
Sheffer's White Corn (Local variety).....	109.25	.....
Printz Yellow Dent.....	.....	94.00
Funk's Yellow Dent.....	.....	92.26
Mohawk.....	.....	95.74

¹First class in quality.

²Immature, poor quality.



FIG. 4.—STALKS AND EARS FROM TEN HILLS OF DEMOCRAT (AT THE LEFT), IOWA SILVER MINE (CENTER), AND REID'S YELLOW DENT (AT THE RIGHT) GROWN UNDER HEAVY CHINCH-BUG INFESTATION

The relative productivity of resistant varieties is as marked in their yields of forage as in their yields of ear corn. This fact makes them especially desirable for silage purposes under chinch-bug infestation.

the last two years have widely grown the varieties of corn which gave the highest yields under infestation. Democrat, or Champion White Pearl, has been most generally grown. The results on the whole have been very good. Increases in yield ranging from 2 to 27 bushels to the acre have been reported as the result of using these varieties.

ORIGIN AND DEVELOPMENT OF SOME OF THE VARIETIES TESTED

It is impossible to give a complete account of the origin and development of all the varieties of corn studied in these trials because of the fact that of some varieties nothing is known regarding their early history. A few brief statements follow, however, concerning the origin of a number of the varieties. Such common varieties as Reid's Yellow Dent, Boone County White, and Silvermine, are not included, since most farmers are doubtless familiar with their history. In some cases, where no records were available, it has been necessary to piece together a description from accounts given by the older farmers, who were obliged to depend largely upon their memories.

Champion White Pearl originated thru the crossing and recrossing of several varieties of dent corn from different states. Mr. James Suffern of Piatt county, Illinois, states that he used for the cross Hickory King, Ohio White Dent, Wisconsin White Dent, White Normandy (from Missouri), and about ten other varieties from Iowa, Indiana, Pennsylvania, New Jersey, Kansas, Kentucky, and Nebraska. This crossing process was followed by about twenty years of continuous systematic selection. *Champion White Pearl* matures in about 110 to 115 days.

Democrat is a local strain of a pearly white dent corn. It is grown extensively in southwestern Illinois in Randolph, Perry, and Washington counties. The first seed for these trials was secured from Amos Glen of Randolph county, but the original source of the variety is not known. When the Randolph County Farm Bureau was organized in the summer of 1917, the first farm adviser, Mr. J. J. Doerschuk, found many farmers, especially in the northern part of the county, growing a corn which they called Democrat. In ear character, habit of growth, and general adaptability, Democrat is not distinguishable from *Champion White Pearl*. It would seem logical, therefore, to conclude that the so-called Democrat corn is probably a strain of *Champion White Pearl* which has been grown in Randolph county for a period of at least thirty years. The time of maturity of Democrat is the same as that of *Champion White Pearl*.

Black Hawk is a medium-maturing, yellow-capped, red dent variety which has been grown in the vicinity of Red Bud, Monroe county,

Illinois, for a number of years. This section of the county has been more or less infested with chinch-bugs for a period of twelve years. Black Hawk is said to have given uniformly better yields than other varieties under this infestation. It requires about 115 days to mature.

Golden Beauty is a medium-late maturing, orange-yellow, dent corn which has been grown in Jackson county near Carbondale for at least forty-six years. The exact origin of this strain is unknown. The first seed was purchased by Mr. F. P. Parrish of Carbondale, from an Indiana seed firm, the name and location of which Mr. Parrish was unable to recall. In ear and stalk characters, this corn resembles a well-known variety, called Golden Beauty, which is grown more or less generally in Pennsylvania and other eastern states. Samples of Golden Beauty seed, secured from a Pennsylvania seed company and seeded in Illinois in 1922, produced a crop of corn which, in general appearance, was not distinguishable from that grown from seed secured in Jackson county. These facts would seem to warrant the belief that this is a local strain of the variety Golden Beauty.

Mohawk is a medium-late maturing, local variety found in Madison county. Its origin is unknown, altho old residents state that this variety was the one most commonly grown in Madison county during the late forties. This corn was known also in the county as Indian Blue. According to a local tradition, it was being grown by the Indians when the first settlers located in Madison county, altho no reliable historical evidence has been found to confirm this story. Several farmers who are able to recall the chinch-bug damage of the years 1882 to 1888, state that this was the only variety which never failed to produce at least a partial crop during those years. During the recent outbreak of chinch-bugs, farmers growing Mohawk corn have continued to produce fair crops.

St. Charles County White, also known as St. Charles White, is a native Missouri variety which was developed in St. Charles county. It is grown extensively thruout southern Missouri. The ears are relatively small, rather smooth, with a medium broad to broad kernel of good depth. This corn is rather distinctive because of its pearly white kernels and blood-red cob. It is generally recognized as a hardy corn. It is a rather late variety, requiring approximately 125 to 130 days to mature.

U. S. Selection No. 200 is a selection from St. Charles White.

Commercial White, also a native Missouri variety, was originated in Barton county, southwestern Missouri. This corn was developed by selecting from St. Charles White the ears with white cobs. The time required for maturity is approximately the same as that for St. Charles White.

U. S. Selection No. 77 is a selection which was made by the U. S. Department of Agriculture, in 1902, from Woodburn White Dent. The latter is one of the old, established varieties which has been grown in the Scioto river bottoms near Piketown, Ohio, for nearly fifty years.

Silver King is a variety which was developed near Ft. Atkinson, Iowa, and is generally recommended and grown in the northern part of that state. It is a white corn, medium-early maturing, with an ear medium in size and rather rough in type.

Pride of Saline, a white dent corn, is a native of western Kansas which was developed by Mr. C. H. Kellogg of Russell county. This variety is rather smooth, having a medium-shallow kernel of rather flinty type. It matures in about 120 days.

Freed White Dent is also a native of western Kansas. It was developed by selection from a local corn by Mr. J. K. Freed of Scott City.

Colby Bloody Butcher is another Kansas variety grown rather generally in Thomas county of that state. This is a red, early maturing corn, popular where it is grown in western Kansas.

Lancaster Surecrop was developed by Mr. John E. Hershey of Lancaster county, Pennsylvania, from seed sent to him by the U. S. Department of Agriculture about 1868. This same selection was maintained until 1903 by three generations of the Hershey family.

Printz Yellow Dent is a local strain found growing in eastern Effingham and western Cumberland counties, Illinois, where it was reported to be resistant to chinch-bugs. It is not regarded as a well-established variety.

Northwestern Dent is a very early maturing red dent variety, commonly grown in northern Minnesota. The ears are medium smooth with medium to shallow, yellow-capped kernels.

Minnesota No. 13 is an early variety developed at Minnesota Experiment Station from seed secured in 1893. This is a yellow corn, with a kernel of medium depth, having a rather smooth indentation.

GENERAL ADAPTATION OF VARIETIES

Obviously not all the varieties included in these studies are equally well adapted to the area under consideration. It is of interest, therefore, to compare the yields of some of these varieties where they have been grown for a considerable number of years on several of the University experiment fields.

SOUTHERN ILLINOIS

The University of Illinois experiment field, located at Alhambra in Madison county, offers perhaps the best opportunity for compar-

ing the adaptability of these varieties to the chinch-bug infested region of the state, since this field is located near the center of the present chinch-bug outbreak and on a soil type which is fairly representative of a considerable portion of the land under infestation. All the varieties of corn grown on this field have been affected to a greater or less degree by chinch-bugs. During three of the four years 1919 to 1922 in which the experiment field has been in operation, the second brood of chinch-bugs has been very destructive. In the year 1920, both the first and the second broods caused considerable damage. The yields, therefore, should be considered as influenced by chinch-bug damage. Of the thirteen varieties which have been tested during the four years, Champion White Pearl, as an average of this four-year period, has given higher yields than any of the other varieties tested. With the fourth season, two new varieties were added, Black Hawk and Mohawk. Mohawk was the highest yielding corn for the year on this field.

On the experiment field located in Wayne county at Fairfield, chinch-bug damage has not been serious. No first-brood injury whatever has been experienced. While some second-brood infestation has occurred during the years 1920, 1921, and 1922, the damage was not so serious as that incurred at Alhambra. During the seven-year period 1916 to 1922, thirteen varieties have been included in the trials on this field. As an average of the seven years, Champion White Pearl has given the highest yield. Democrat has been included in the trials since 1919 only. Taking the four-year period 1919 to 1922, there is practically no difference in the yields of Champion White Pearl and Democrat. Black Hawk was not grown in this field until 1922, but in that one year it gave the highest yield.

An eight-year test ending in 1915, during which time no chinch-bugs were present, showed Funk's Ninety Day and Reid's Yellow Dent to average somewhat higher yields than Champion White Pearl. Notations made at harvest time, however, indicate that notwithstanding the apparently greater total yield of corn produced by these two yellow varieties, their quality on this poor soil was very low, whereas Champion White Pearl was noted for its large percentage of well-matured, sound, marketable corn.

CENTRAL ILLINOIS

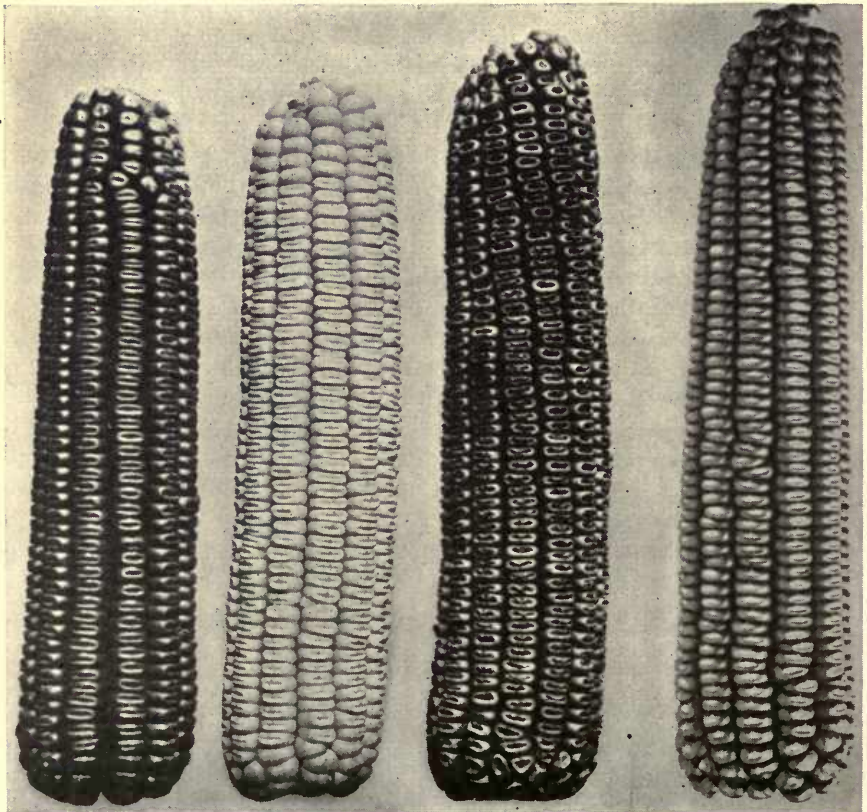
The corn variety trials in central Illinois which have been conducted at the Urbana field since 1888 have included, for a period of years, only one of the chinch-bug resistant corns, Champion White Pearl. This variety was included in the first trials and has remained as one of the established varieties.

The average yield of Champion White Pearl for the first eight years ending 1895, was 71.2 bushels per acre, compared with 71.8 bushels for Boone County White and 68.6 for Leaming. Reid's Yel-

low Dent did not appear in the early trials. For the twelve-year period ending in 1915, during which Champion White Pearl and Reid's Yellow Dent were compared, Reid's Yellow Dent averaged 61.0 bushels per acre and Champion White Pearl, 57.6 bushels.

In tests conducted during the last four years, 1919 to 1922, on this field, Champion White Pearl and Democrat were both found to occupy much the same relative position with reference to Reid's Yellow Dent as had Champion White Pearl during the twelve-year period ending in 1915.

During the season of 1922, Black Hawk was included in the variety trials at Urbana and gave a greater yield than either Champion White Pearl or Democrat, standing approximately at 85.8 per cent when compared with the standard, Reid's Yellow Dent.



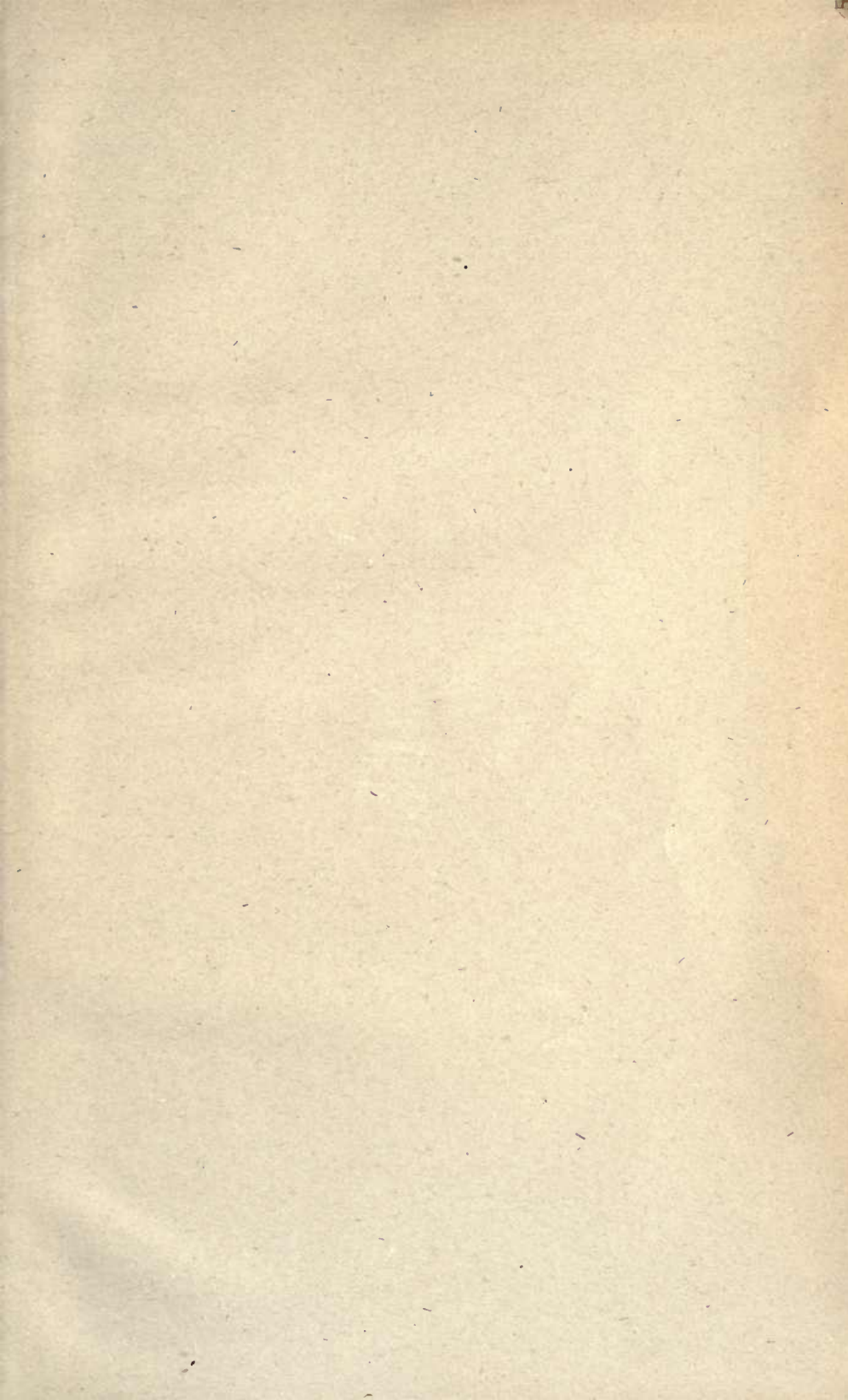
Golden Beauty

Champion White Pearl.
or Democrat

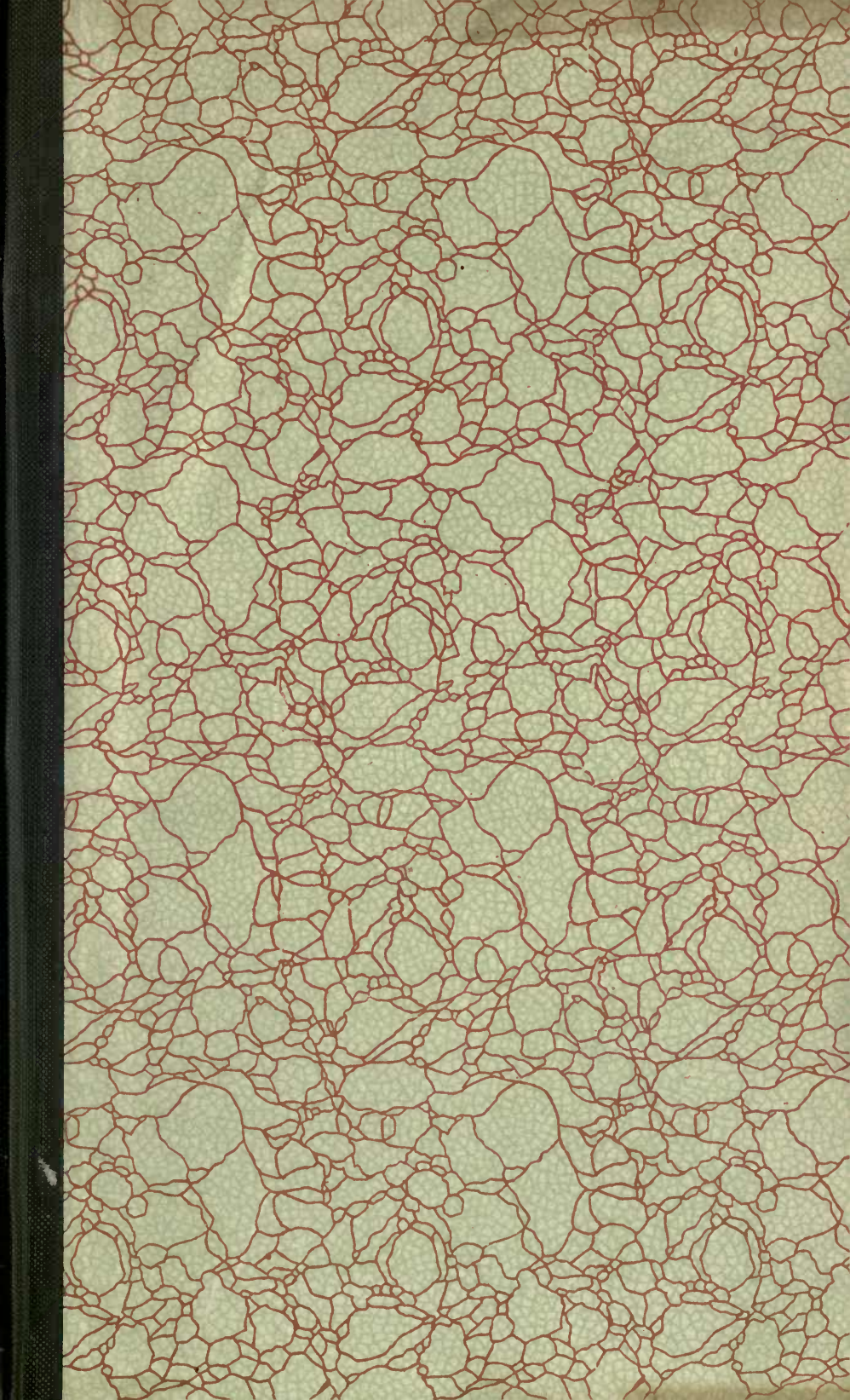
Mohawk

Black Hawk

FIG. 5.—TYPICAL EARS OF FOUR RESISTANT VARIETIES OF CORN







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