

that bore an extraordinary number of leaves and were so late in maturing that the plants did not bloom in the field. These plants, after transplanting to the greenhouse in the fall, grew to a height of 8 feet and bore 101 leaves each, while the normal number of leaves to the plant is about 23. The plants bloomed in December in the greenhouse and the seed was sowed February 25, 1907, later being potted and re-potted, until time to transplant them to the field, having at that time attained an average height of one foot. These plants were at all times in the growing state much taller than the other plants of the Maryland or hybrid types and when the other selections were harvested were still growing and showed no signs of blooming. Five plants were again transplanted to the greenhouse, where they bloomed in December. The greenhouse grown seed was again planted, but as yet not one of these plants has bloomed in the field, but producing from 75 to 100 leaves in the field. The leaves of this type are very dark, round pointed, about 30 inches long, 15 inches wide. The internodes are very short and none of the plants has as yet produced any suckers. Last year plants of this mammoth type of tobacco were grown in Connecticut, Kentucky, Virginia, Florida and Texas, and in every trial grew to an enormous size, yielding not less than 75 leaves, and failed to bloom during the usual crop growing season. In order to obtain a further supply of seed it was necessary to remove the stumps to the greenhouse, seed being obtained from the suckers sent out under these conditions.

#### REPORT ON TOBACCO BREEDING IN KENTUCKY AND TENNESSEE FOR 1908.

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It has been found in the tobacco breeding work in Kentucky and Tennessee that the scope of the breeder's observations must necessarily extend into other lines of investigation instead of being restricted to the one problem of breeding.

The good beef cattle breeder must also be a good feeder, a good groom, he must know something of veterinary science and be a good interpreter of market classes and grades of beef cattle. So it is with the tobacco breeder. The successful man must know how to cultivate tobacco, when to select and how to select the best individuals in the field, how to house and cure the crop—in other words, he must know tobacco. With this idea before us, we have attempted to carry along with our breeding work, a well rounded procedure of operations for the general

improvement of the tobacco crop. The attempt has been to improve the quality and quantity of the kinds of tobacco which are being grown in this section and which have an established market. In order to do this, we have followed the general plan outlined by the Bureau of Plant Industry, and have taken up new lines of investigation that have presented themselves in the development of the work. Briefly stated, our work for the past year has consisted of—

1. The grading of the seed and planting only the heavy, well matured ones.
2. The growing of a large number of varieties side by side for comparison, and for use in making selections for inbreeding and cross-breeding.
3. Introduction of new varieties.
4. A comparison of cultural methods.
5. Fertilizer experiments.

The first aim of the animal breeder who has an established herd is to grade out and get rid of the young animals in the herd which have serious hereditary imperfections. We follow the same plan in our tobacco work. By the use of the tobacco seed grader, devised by Mr. A. D. Shamel, of the Bureau of Plant Industry, United States Department of Agriculture, Washington, D. C., we get rid of all light immature and imperfect seeds. This line of work has become so popular with the tobacco farmers of these states that the machine installed in the laboratory of the experiment station at Lexington, Ky., and another operating in one of the warehouses at Clarksville, Tenn., are kept running pretty steadily to grade all of the seed sent in for that purpose.

Does it pay to have the seed graded before sowing? In the White Burley District of Kentucky an experiment comparing the vitality of heavy seeds with that of light ones gave an early growth of plants in favor of the heavy ones by about ten days, and a more even growth was had in the field after they had been transplanted. In 1906, the crop from heavy seed gave 1959 pounds of tobacco to the acre. The crop from light seed gave 1644 pounds to the acre, showing a difference of 315 pounds to the acre in favor of the heavy seed. This crop was sold for \$13.00 per hundred pounds. By calculation, it is seen that a crop from the heavy seed sold for \$40.95 per acre more than the crop from the light seed. In 1907, in a similar experiment the heavy seed gave 2074 pounds to the acre, while the mixed or ungraded seed gave 1796 pounds to the acre, making a difference of 278 pounds to the acre in favor of the heavy seed. This crop was sold at \$15.65 per hundred pounds.

When calculated, we find a difference of \$43.50 to the acre in favor of the graded seed.

To obtain the best varieties for breeding work, it has been desirable to continue the variety test in a side-by-side plat scheme. By this plan we have been able to make comparisons of the many varieties having a local importance. From these varieties we have kept up a system of selecting the best plants and by covering them with paper bags we have controlled the breeding and improved the type. From these improved types we have endeavored to combine them, by crossing in such a manner as to group the most striking and desirable qualities in both varieties and at the same time modify and improve the less desirable features of the parent plants.

In the White Burley district we have grown some of these crosses for two seasons. They have given quite promising results. Hybrid No. 23, sucker of Hanna's White Burley x Standup Burley; Hybrid No. 25 (Standup Burley x Connecticut Havana) x sucker of Hanna's White Burley; Hybrid No. 26, Standup Burley x Hanna's White Burley. These hybrids were perhaps the best types grown in the plats for the past two years. They were uniform in appearance, their chief characteristics were erect position of the leaves, light color of leaves, cream colored stalks and freedom from disease.

The number of crosses between White Burley and foreign varieties such as Philippine, Sumatra and Brazilian have been grown for several years, but so far, from a cigar tobacco standpoint the crosses are inferior to the foreign parent, and from a plug tobacco standpoint they are inferior to the White Burley parent.

In the Dark Tobacco district a number of hybrids that had been created in 1907 were grown for the first time this past season. Some of them displayed a vigor and growth that attracted considerable attention, as in the cases of Boyd x One-sucker and the reciprocal, and Canter x Boyd.

While these hybrids seem to be quite promising, it will take a number of years' growth to determine and establish their merit. Last season we introduced only two or three new varieties into our plats, preferring to further develop those with which we had already been experimenting.

The exceptionally dry season of 1908 necessitated a somewhat different plan of cultivation to that usually carried out in the average season. The plant breeder will always find ample room for study in the cultural methods best adapted for the highest development of the plant obtainable under the existing conditions.

Some of the cultural methods to which we gave attention last year were the plowing under of a heavy crop of green rye before transplanting time; a comparison of close, medium and wide setting in the drill, and deep as compared with shallow cultivation. The indications were that for a dry season it is best to have the rye plowed under early, before it gets too large a growth. If the season remains good throughout the growing period, the rye will not be harmful even though it gets considerable growth before it is turned under.

For the average season and soil, about 18 inches in the [drill and three and one-half feet apart for the rows gives the best results.

In connection with the breeding plat in Christian County, Ky., a fertilizer experiment was made which is a continuation of the work done in this section in former years. The 1908 results agree with those obtained the previous year. The tenth acre plats receiving phosphoric acid either alone or in combination with potash and nitrogen, or both, gave good results, while the plats which received potash, nitrogen, or both, without phosphoric acid, were but little better than the check plats. We had previously found by chemical analysis that this soil was deficient in phosphoric acid. These results are mentioned to illustrate the importance of the plant breeder knowing the needs of the soil, and the chief elements that enter into the growth of the plant in order that he may get the highest development of the plant under all conditions whether favorable or otherwise.

## THE PRODUCTION OF A NEW STRAIN OF TOBACCO AND ITS DEVELOPMENT.

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The word strain in plant breeding is used to designate a plant and its progeny, which has some special feature that distinguishes it from the variety to which it belongs.

The feature which sets a plant apart and makes it a strain may pertain to either the foliage, flower or fruit, but not to all of them; for then the plant would be a new variety instead of a strain.

The word strain is also applied to a certain feature in a variety that makes it especially adapted to local conditions.

A new strain of any variety may be produced either by selection or hybridization. In most varieties of plants strains are easily produced. In fact, they are continually producing themselves by natural selection, which adapts the variety to local soil and climate conditions.