

and at this time are very promising. In these it is hoped to preserve the many excellencies of the Zimmer Spanish and to improve the smoking value, but as stated at the outset the results at this time are not available for 1907. The selections of Zimmer Spanish have not resulted in very marked improvement up to this time, although we believe some gains have been made.

In conclusion, our experience for the season of 1907 has shown the necessity as well as the great desirability of proper field characters. As it has been with the Cuban so it will be with any other variety or hybrid with strong tendency to sucker and with inconvenient habit of growth; even though the yield of the sort be good, such objectionable sorts cannot make headway in replacing the Zimmer Spanish in the Ohio filler district.

#### REPORT ON TOBACCO BREEDING WORK IN KENTUCKY AND TENNESSEE FOR 1907.

By W. H. SCHERFFIUS, *Lexington, Ky.*

The tobacco work in these States, and especially Kentucky, has a greater significance than it has in any other section of the country. This statement is substantiated by the following facts:

1st. Kentucky stands far in the lead in production, growing an amount equal to the combined production of the three next leading tobacco-producing States—Virginia, North Carolina, and Ohio.

2nd. The Kentucky and Tennessee product supplies in a large measure the tobacco markets of the world.

3rd. Tobacco is the principal "money crop" of this State; thousands of her tobacco growers depend almost exclusively on the tobacco crop for their sustenance.

We are undertaking, in this section, to improve the quality and quantity of the kinds of tobacco, which are now being grown here and which have an established market. In our efforts to accomplish this, we have been following the plan which has been in operation for some years in the Bureau of Plant Industry—that of selecting the best individual plants, bagging the seed heads with paper bags to prevent cross-pollination, and finally grading the seed, by means of the Shamel machine, into light chaffy ones and heavy vigorous ones, planting only the heavy seeds. In connection with our work a fertilizer experiment with tobacco was conducted on a farm in Christian County, Kentucky.

#### SOILS AND FERTILIZERS.

Samples of soil had been previously taken from this farm, and chemically analyzed. The analyses showed this soil to be very deficient in phosphoric acid. The results obtained from these tenth-acre plats were very interesting for the reason that heretofore we have always regarded a tobacco fertilizer as being incomplete without a liberal supply of potash. But in this experiment we found

that on every plat where phosphoric acid was used alone or in connection with potash or nitrogen, by far the best results were obtained, while in the case of potash or nitrogen without phosphoric acid the tobacco was little better than that grown on the blank plats. These results demonstrate the importance of knowing the needs of the soil as well as the chief elements that enter into the growth of the plant.

Tobacco work in Kentucky and Tennessee deals with two markedly different types of tobacco as regards production and consumption. The eastern section of Kentucky is devoted to raising a light-colored air-cured product called Burley tobacco that is adapted for a domestic pipe and cigarette smoker and plug trade.

#### THE BURLEY TOBACCO DISTRICT.

The west Kentucky and Tennessee article is known to the trade world as dark tobacco. It is a coarse, heavy, elastic, fire-cured product, adapted for exportation to "Regie countries." Work relating to these different types will be considered separately.

#### PLATS FOR GROWING TOBACCO.

This is the first year that the Bureau has established plats for the growing of Burley tobacco. Three different localities were selected for the work, namely Mason, Shelby, and Fayette counties, Kentucky. The plat grown in Fayette County was grown under the supervision of the Kentucky Agricultural Experiment Station.

During the season of 1906 numerous fields throughout the Burley district were visited and select seed heads were bagged. From these selections, representing a range of types, were obtained most of the varieties grown in 1907. In other instances farmers noted for growing the best quality of tobacco contributed seed to be used in our experiments. By this means 22 collections were accumulated, representing several strains of Red Twist Bud, White Twist Bud, White Burley, Broad-Leaf Standup Burley, and Narrow-Leaf Standup Burley.

#### FOREIGN TOBACCOS TRIED.

Foreign tobaccos, as Havana, Sumatra, Brazilian, and Philippine types, were procured and tried. Success has not yet been achieved in growing these types. It should be said that methods of cultivation and handling are not well understood and it will take more work to demonstrate their possible usefulness. No fermentation experiments have been conducted on cigar tobaccos in this locality, hence it is unfair to draw final conclusions.

Several crosses representing blendings of Havana and Sumatra types with our native tobaccos, and crosses between various types of Burley tobacco were made at the Kentucky Experiment Station in 1905 and 1906. Some of these crosses were grown on the Bureau's plats and interesting results were obtained: Hybrid 23—Sucker of

Hanna's White Burley X Standup Burley; Hybrid 25—(Standup Burley X Connecticut Havana) X Sucker of Hanna's White Burley; and Hybrid 26—Standup Burley X Hanna's White Burley, are of particular interest.

#### THE BEST TYPES GROWN.

The two last mentioned were perhaps the best types that were grown on the plats this year. They were uniform in their characteristics, the pronounced features being erect position of leaf, light color, white stalk, and freedom from disease. It remains to be seen what a second generation of these crosses will do; perhaps there will be more irregularities than were encountered this year.

The crosses of Standup Burley X Connecticut Havana and Standup Burley X Sumatra were obtained from the Kentucky Experiment Station where they had been grown for one generation. The resemblance to both parents is very decided. The features of Havana and Sumatra are most marked in the green color of the leaf and stalk, long internodes, height of stalk, fineness of vein and shape of leaf. The Standup Burley features are prominent in the erect position and size of leaf, reduced height of stalk and increase in yield.

#### GREATEST DEFECT IN CURING.

The greatest defect of these tobaccos occurs in the curing process, a "green cast" with decidedly green spots mar the appearance of the leaf. There is a lack of uniformity in the color of the leaf, making it difficult to grade. A gradual improvement is going on in the particulars mentioned and they may perhaps make desirable tobaccos in time.

The Standup Burley and Twist Bud types seem to be the most popular with farmers, especially for growing on new land. The former is occasionally condemned on account of "house burning" badly and its coarseness of fiber. Whether these criticisms are justified is doubtful. Observations of several varieties cured in the same barn and under the same conditions, does not justify the conclusion that Standup Burley "house burns" worse than any other variety, though some farmers claim to have discarded it on this account.

#### WITH REFERENCE TO FIBER.

With reference to the fiber, it has been our experience that the fiber is better than is ordinarily found. Methods of curing as well as type exert a decided influence on the quality of fiber. The broad-leaf type of White Burley is usually preferred for growing on old land. A greater yield is secured, but with some diminution in quality. It is very difficult to get the fine quality from old land at any rate. When fine quality is particularly sought, narrow leaf is usually preferred to broad-leaf types. When hanging in the barn the narrow leaves do not overlap so much as broad leaves, causing different shades of color on the same leaf. Broad leaves stick together in their overlapping and more house-burn is produced.

## MAIN OBJECT TO BE SOUGHT.

The main objects to be sought in the Barley district are seed of greater vitality and trueness to type; greater yield of leaf per acre; system of rotation; suckerless and disease-resisting types; better methods of curing and selection with reference to a more elastic and "oily" plug wrapper, and to a finer colored cigarette wrapper.

## DARK-TOBACCO DISTRICT.

Two experimental fields were located for dark tobacco, one in Christian County, Kentucky, and the other in Montgomery County, Tennessee. These experiments were in the hands of careful farmers and were well handled. The best strains of Yellow Pryor, Blue Pryor, Maccadoo, Madole, Little Yellow, One Sucker, Sumatra, Havana and Philippine tobaccos were tested.

## LITTLE YELLOW MOST PROMISING.

It seems that one of the strains of Little Yellow is the most promising, though several other varieties did well. The foreign varieties did about what could be expected the first year under new conditions. A final report cannot be submitted at this time because none of the plats in either the Burley or Dark Tobacco districts have been stripped.

Attention should be called to several crosses between one-sucker and other types of tobacco. These crosses will be tested the coming year. The object is to get a variety having the quality and yield of the Little Yellow and Pryor types, but free from all but one growth of suckers. "Suckering" is one of the hardest and costliest of cultural operations, and if it could be dispensed with in a measure, it would greatly cheapen production.

## ERECT TYPES ECONOMICAL.

Erect instead of drooping types would be economical, as less difficulty would be experienced in worming, suckering, and priming. The latter operation consists in removing three or four bottom leaves. This operation is not costly, but some leaves that would make a good article of tobacco are destroyed. In drooping kinds, the best leaves often touch the ground, causing sand holes in the tips and depreciating the value.

No scientific work has ever been done with dark tobacco and almost every detail needs to be studied. The yield could be greatly improved by closer planting, higher topping and fertilizing, but it is a serious question whether under these conditions, enough "body" would be secured to render the product fit for the destined markets.

## METHOD OF CURING.

German and Italian markets demand the heaviest, toughest leaf that can be produced. In a general way the methods of im-

provement suggested for the Burley apply to dark tobacco as well. The curing process is too little understood, yet it is one of the most important phases of tobacco raising. As a rule it is cured up in about five days after yellowing has been completed. The effect is a "drying up" rather than "curing up." This does not bring out the native elasticity and oiliness of the product. Curing should be a continuation of the ripening process, not a sudden termination of it. The best farmers are materially lengthening the curing period and are getting better results. The farmer should be encouraged to study the different grades of tobacco as they appear on the market. Lack of knowledge in this particular has often caused a grower to fail in realizing what he should for a crop. The question of colors is largely a matter of curing and should be mastered by close observation and study.

#### MATTER OF SEED GRADING.

Another phase of the work which applies to both districts, is the matter of seed grading. Farmers have been requested through the press and farmers' institutes to send their tobacco seed to the U. S. Department of Agriculture for grading. Responses were numerous. The seeds were separated in to heavy and light weights and both kinds returned to them, with the request that they be tried. Letters have been received showing the general satisfactory character of the work.

Most of the growers were well pleased with the beds that they secured from sowing the heavy-weight seed and in the way that the plants grew after transplanting. A few state that they observed a marked difference in the "stand" on the bed, that the heavy seed produced a thick, uniform, vigorous growth of plants, while the light seed produced a sparse growth, a rather indifferent plant, which, however, made a satisfactory growth when transplanted.

From our own experience, we have concluded that the most decided difference between light and heavy seed occurs in getting a satisfactory growth in the bed. The results after transplanting are not very different. In 1906, the yield for heavy-weight seed was somewhat greater. This line of work will be continued with the hope of coming in contact with the farmer and arousing his interest in the important matter of seed selection.

#### WORK FOR THE COMING YEA

Our plan for 1908 is to continue experiments on the Kentucky Experiment Station farm, two other plats in the White Burley district, and three plats in the dark-tobacco district of Kentucky and Tennessee.

In brief, the work for the coming year may be classified as follows:

Grading seed for farmers.

Variety tests.

Introduction of foreign varieties.

Improvement of native varieties.  
 Selection and inbreeding of individuals.  
 Creation of new varieties by hybridization.  
 Controlling house-burn while curing.  
 A study of fermentation processes.  
 A comparison of cultural methods.  
 Fertilizer experiments.

## REPORT OF THE COMMITTEE ON BREEDING CARNATIONS.

CHAS. W. WARD, *Queens, N. Y., Chairman,*  
 PETER FISHER, *Ellis, Mass.,* J. B. NORTON, *Ithaca, N. Y.,*  
 FRED DORNER, *Lafayette, Ind.,* FRED LEMON, *Richmond, Ind.*

OBJECTS: To investigate and report on methods and technique of improving carnations by breeding; and to encourage the production of new carnations.

(Report submitted by the Chairman.)

The carnation of today, the subject upon which we are working, is the product of several centuries of hybridization and culture. It is an open-pollinated species, and in order to be certain that no foreign pollen interferes with one's plans, it is best to protect the mother blooms after emasculation from such contamination. This may be accomplished by enclosing the blooms in paper bags or keeping the plant in a house where no other carnations are grown.

Mother plants may be chosen from amongst hybrids, inbreeding upon the same plant may be practiced, and fertilization between plants of the same variety has at times produced good varieties. In choosing both parents, care should be taken that each plant is in a vigorous, healthy, normal condition.

A variety once produced from seed is easily perpetuated for a certain period by propagation from cuttings which are easily rooted and may usually be secured in abundance. Improvements in varieties may be made by bud selection, and new varieties are sometimes secured by bud variation (sports) as well as from seed-variation and hybridization.

In raising varieties from hybridized seed, very few improvements are produced, the proportion being about one good variety for every thousand hybrids grown, and probably as little as one decided advance in each five or ten thousand hybrids grown; and unless some law is discovered whereby we can forecast more surely than we now can what certain specified hybrid seed will produce, it would seem as if even this low proportion of valuable new varieties would decrease rather than increase in view of the higher standard which is being demanded from year to year.