

Washington Agricultural Experiment Station have shown that a culture from a single sporidium can not infect wheat plants, but that cultures from two sporidia, properly selected, can cause normal infection which finally results in the production of new spores. This means that what corresponds to sex exists in these smut fungi and that proper mating is necessary for reproduction. This mating is similar in its results to pollination or the union of sex cells in such plants as wheat and corn. When different strains of such higher plants are cross-pollinated, progenies result which differ from either parent, but combine parental characteristics in different ways. Some of these new hybrids also may possess characteristics not apparent in either parent. The same thing happens with the stinking-smut fungi.

Hybridization is Possible

Careful experiments have demonstrated that hybridization is possible between the different strains of each of the two species of bunt and also between the two species themselves. As spores of both species are commonly found in the same wheat field, and, after threshing, even on the same wheat seed, it is probable that hybridization occurs in nature. This may account, at least in part, for the development of new strains of bunt and for the infection of varieties of wheat previously considered resistant. The appearance of new strains emphasizes both the difficulty of maintaining the resistance of a wheat variety to bunt and the desirability of thoroughly disinfecting new seed from outside sources to avoid introducing new smut strains.

H. H. FLOR, *Bureau of Plant Industry.*

WHEAT Growers in Central Great Plains Use Three Main Tillage Methods Three general methods are used in growing winter wheat in the central Great Plains—by continuous cropping, on fallow, and

in rotation with other crops. There is a close relation in this section between the quantity of moisture in the soil at seeding time and the yield, and consequently the methods of seed-bed preparation that are most efficient in storing moisture are likely to be the most successful.

When continuous cropping is to be practiced, it is very important to begin tillage work at the earliest possible date after the crop is removed. Timeliness of the first tillage operation is of more importance than the implement chosen for the work, provided it is a good one and is operated at a reasonable depth.

For the first operation in the preparation of wheat-stubble land for wheat, both the plow and the lister have given good results. The latter has given slightly the higher yields, and following its use the surface resists soil blowing a little better.

The 1-way disk and the Killifer chisel have not been used long enough in this section for their value to be fully determined. For three years at the Fort Hays branch station, Hays, Kans., these implements, when used at the same time and depth, have compared favorably with the plow and the lister.

Where such implements as the plow, 1-way disk, or chisel are used to a depth of 5 or 6 inches, the subsurface soil packer is a valuable aid in the preparation of a seed bed. It breaks up the larger clods, closes

or makes smaller the air pockets in the furrow slice, and retards the loss of water by evaporation. It also firms the soil over the straw and shattered wheat, keeping both damp for a longer period, thus accelerating decay of the straw and germination of the seed.

Where the lister is used, the furrows are left open until there is sufficient volunteer wheat or weed growth to justify tillage. The furrows are then leveled with a ridge "buster" or any implement that will do similar work. If there be another growth of vegetation before seeding time, a surface working with the disk or a shallow cutting with the 1-way disk generally makes a satisfactory seed bed. If there be not sufficient moisture after listing to start volunteer growth by the latter part of August, the furrows should be leveled at that time, as it is not best to leave them open too late in the fall or too near seeding time.

Methods of Handling Fallow

Where the time between the maturity of one crop and the seeding time for the following crop is too short for the storage of a considerable quantity of moisture, fallow generally produces better results than continuous cropping. There are numerous methods of handling fallow. It is not only more economical but gives as satisfactory results to leave the ground in stubble over winter, beginning work the following spring. The ground may then be plowed and thereafter surface worked as may be required to prevent vegetative growth; or it may be listed and later relisted, splitting the ridges, and then be leveled with the ridge "buster" and thereafter surface worked as required. If there is an early growth of spring vegetation, the ground may be disked or 1-way disked and the plowing or listing be delayed until in May. Plowing or listing just before the period of expected heavy rainfall prepares the ground to absorb the maximum amount of the rains.

When wheat is grown in rotations, if it follows a small-grain crop, the same method of preparation may be employed as is used in the preparation of wheat-stubbleland in continuous cropping. If the wheat follows corn that has been well cultivated, it may be drilled among the stalks, or if the corn be harvested the ground may be shallowly 1-way disked. If the ground be loose and free from weeds, equally good results may be secured by drilling-in the wheat without any tillage.

Regardless of the seed-bed preparation, there should be sufficient surface tillage to prevent vegetative growth. Implements that will leave the surface slightly rough and cloddy should be selected for this tillage, so far as possible. This prevents soil blowing and favors the absorption of water.

A. L. HALLSTED, *Bureau of Plant Industry.*

WHEAT in U. S. Attacked By Three Smuts, Two of Them Widely Distributed
 Wheat is attacked by three smuts: Stinking smut (bunt), loose smut, and flag smut. Stinking smut and loose smut are widely distributed in all wheat-growing areas in the United States, while flag smut is known to occur only in a limited territory.

Stinking Smut

Estimates made by the Department of Agriculture in cooperation with officials of various States indicate that owing to stinking smut or