

WHEAT RESEARCH INSTITUTE.

DIRECTOR'S REPORT.

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PLANT-BREEDING STATION, LINCOLN.

1. *Imported Varieties.*—A constant stream of imported varieties of wheats are on trial, and to date some 2,200 have been tested out under New Zealand conditions, but none of these have shown promise of surpassing local standard varieties in both yield and quality. Some of the foreign wheats have, however, possessed a distinctly high quality, but their yield has been low. Their high-quality factor, however, has made them useful for crossing purposes with low-quality high-yielding local varieties. During the year wheats from Sinai, Iraq, and India have been used for crossing purposes for the first time. It is worthy of notice that recent successful Australian new hybrid wheats have originated mostly from Indian parentage.

2. *Crossbreeding.*—(a) Cross 7 : Tuscan \times White Fife has reached its eighth generation, has been reduced to five lines, and has been subjected to field trials in six localities. On the average it has yielded as well as Tuscan, gives 2 per cent. more flour, and has produced a 10-per-cent. better loaf. A further and more extensive trial in twenty-five localities has been planned for the coming year, and if the results continue to show promise seed will be made available for general distribution through the Pure Seed Station of the Department of Agriculture at Lincoln. Here a stock of pure seed of Cross 7 has been produced, reselections have been made and tested again in order to maintain adequate supplies to fall back upon when seed from the original distribution becomes mixed.

(b) Cross 17 : Tuscan \times Marquis hybrid is now in its fifth generation, and has been reduced to 165 lines, which were tried in rod rows replicated ten times, with a standard used every fourth row. Of the 165 lines, some forty appeared to equal Tuscan in yield, but the Laboratory trials for quality do not give particularly favourable results. However, the baking-trials gave good results, and so this cross, now reduced to forty lines, will be given further trial.

(c) More recent crosses have given generally disappointing results, very few of the segregates approaching Tuscan in yield. Consequently, in order to improve the yield-factor, they have been crossed back to Tuscan.

In December, 1932, 6,700 crosses were made, and from these 6,200 fertile grains have been secured ; 2,900 of these were first crossed between Tuscan and various foreign wheats imported from Canada, Australia, Sinai, Iraq, and India. The remaining grains were secured from back crosses.

3. *Laboratory Tests.*—The absence of reliable tests for quality in wheat, when only the few ounces derived from the plant-breeder's activities are available, still holds up progress in producing varieties of wheat of high quality. Baking-tests require at least 6 lb. of grain, and reflect the acquired, as well as the hereditary, quality of the sample. The distensometer test, though it can be made only on a few ounces of grain, is slow, laborious, and applicable only to a fraction of the flour. It shows a high degree of efficacy in picking out the inheritable gluten quality.

During the year a new test, the Pelshenke, a modification of the Saunders test, has been utilized. This test is more rapid than either of the others, requires only a few ounces of wheat, and uses wholemeal instead of flour. Facilities are now available in the laboratory for testing forty meals, in triplicate, at the same time, in a fixed-temperature cabinet. Over one thousand meals were tested during the year, about one hundred of these samples being tested also by distensometer, and actual baking permitted comparison of the results of the three methods to be made. The conclusion drawn is that the Pelshenke test is eminently suitable for the determination of large differences in quality, but does not possess the reliability of the distensometer for finer work.

The haphazard introduction of new wheats by travellers has often caused considerable loss. The new introductions are usually grown under special conditions at first, and appear to be high yielders, so that they attain popularity and quickly spread over a considerable area. They then are often found to be unsuitable to general farm practice, either because of low yield or low quality, but this discovery is not made until after a costly experience. The Institute has, in its collection of over two thousand varieties, all wheats that are likely to be introduced in this way, and farmers and merchants now look to the Institute for guidance in this matter, instead of making expensive large-scale experiments for themselves.

The question of the quantity of wheat seed to sow per acre is one on which farm practice has reached no general conclusion, different growers using from 1 bushel to $2\frac{1}{2}$ bushels of seed per acre on exactly similar land. The Institute has shown that these variations are due to differences (1) the kind of pickle used, and (2) the evenness of the action of the drill ; and instructional work is being undertaken to improve these points in farm practice.

An investigation in soil-moisture was undertaken during the year to supplement the ordinary observations on rainfall and evaporation. When these observations have been continued over several seasons it is expected that they will lead to more accurate forecasts of yield and perhaps to modification of farm practice.