

RYE AND WHEAT BREEDING IN FINLAND

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THERE are two plant breeding stations in Finland, one private and one supported by the Government. The private one is owned by the co-operative concern Hankkija, and is situated in Malm, Tammisto, near Helsinki. Its breeding work was commenced in the year 1913. The chief and most eminent breeders at Tammisto have been Drs J. O. Sauli (1913-1934), Otto Valle (1934-1942), and E. Huttunen (1942). The State plant breeding work was commenced in the year 1909. It was continued in the years 1918-1923 at a private station, and in 1924 it was again taken up by the Government. Since 1928 it has been carried on in Jokioinen, about 70 miles north-west of Helsinki. The chief of this station has been, since 1918, Dr Vilho A. Pesola. A large part of the work at this station was done in the years 1935-1945, by Dr Onni Pohjakallio, at present professor in plant pathology at the University of Helsinki.

The main breeding work in Finland has been devoted to cereals and field peas. Many new varieties of these plants have been produced by the plant breeding stations and are now generally grown in Finland. Some features of the rye and wheat breeding work done by these stations will be presented here.

The main aim in the breeding of winter crops has been to produce a variety as winter-hardy as possible and in other respects suitable both for cultivation and sale.

Winter rye is the main bread crop in Finland, the total crop of this cereal being during the last years about 200 million kg. (60 to 70 per cent. of the total consumption). The local (native) rye varieties are very winter-hardy, but they have a long and weak straw, there is much hereditary sterility in the ears, and the grain is rather small and light. The Swedish, German, and other foreign rye varieties have not proved sufficiently winter-hardy in Finland, but they have a stiff straw and the ear and grain properties are favourable.

In order to improve the rye in Finland many crosses have been made between the Finnish and foreign varieties, aiming at a combination of the winter-hardiness of the Finnish varieties with the stiffness of straw and other favourable characteristics of the foreign varieties. Thus the new rye varieties, Toivo (Jokioinen), Oiva (Tammisto), Pekka (Jokioinen) and Onni (Jokioinen), have been produced and brought into the market. The parents of these varieties

are as follows : Toivo = Campiner (Belgium) × Finnish native rye ; Oiva = Petkus (Germany) × Finnish native rye ; Pekka = Steel (Sweden) × Härmä (Finland) ; Onni = Star (Sweden) × Finnish native rye. All these varieties represent a realization, to some extent, of the breeding programme mentioned above. They have a winter-hardiness fully or almost as good as that of the Finnish native varieties, while the straw and ear and grain properties are better. In these last respects they are not yet as good as the foreign varieties, so that the breeding work is continuing.

These Finnish bred rye varieties have been favourably accepted by the farmers, so that during the last years almost 50 per cent. of all rye grown in Finland has been seeded with them, the other 50 per cent. being native varieties, or lines taken from them (Ensi) or foreign varieties, especially Sangaste (from Estonia).

Of wheat harvested in Finland, at present totalling about 200 million kg., the major part, about 180 million kg., is spring wheat, the rest being winter wheat. The winter wheat can be grown only in the clay regions of the south-western part of Finland. The breeding of winter wheat aims mainly at the same ends as the breeding of rye, but in the case of wheat problems of a special nature have also to be taken into account, viz. the baking quality and resistance to disease, especially stripe rust (*Puccinia glumarum*) and brown rust (*P. triticina*).

Both the pedigree method and the crossing method have been used in breeding winter wheat. From the local (native) winter wheat populations the new varieties Sukkula (I and II, Tammisto), Pohjola (Jokioinen) and Olympia (Jokioinen), etc., have been produced. All these varieties are at present grown in Finland to some extent. All these varieties are very winter-hardy, especially Pohjola and Olympia, but they are weak in straw and susceptible to stripe rust (*Puccinia glumarum*). The baking quality of Olympia is excellent, that of Pohjola good, and of Sukkula medium. By the crossing method the varieties Sampo (Jokioinen), Varma (Tammisto), and Panu (Tammisto) have been produced. The parent varieties of these are as follows : Sampo = Thule II (Svalöf) × Finnish local variety ; Varma and Panu = Svea (Svalöf) × Finnish local variety. Varma is at present the variety most widely grown in Finland. These (cross) varieties are not quite as winter-hardy as Olympia and Pohjola, nor is their baking quality so good, but their straw is stronger and the rust resistance better. By way of comparison it may be mentioned that, if we use a scale 0-10 for winter-hardiness (10 = perfect ; 0 = none), we have in Jokioinen for the undermentioned varieties the following winter-hardiness numbers : Olympia 9.0, Pohjola 8.5, Varma 8.0, Sampo 7.5, Gluten (Svalöf) 7.0, Thule II (Svalöf) 6.0 and Yeoman (England) 0.5. At present the cross-breeding work is going on in order to obtain better combinations of winter-hardiness, strength of straw and other cultural and economic properties in one variety.

For a number of reasons the cultivation of spring wheat in Finland increased very rapidly in the years 1930-1940. At present the excellent Svalöf varieties Diamond (I and II) are the most widely grown spring wheat varieties in Finland. But being rather late they can be grown reliably only in the south of Finland (to ca. $61^{\circ} 30'$ N. lat.), whereas the range of spring wheat in Finland at present extends to the polar circle (ca. 66°). Thus the breeding of spring wheat in Finland has aimed at producing varieties earlier than Diamond, but as good as it or better in respect of yielding capacity, strength of straw, disease resistance, baking quality, etc. And it has been successful. The newest Finnish spring wheat varieties, Tammi (Tammisto), Söpu (Jokioinen), Hopea (Jokioinen) and Kimmo (Tammisto) are 7, 6, 4, and 3 days earlier, respectively, than Diamond, and otherwise as good as or better than Diamond, except that their yielding capacity is slightly inferior. It may be mentioned that the spring wheat having been sown in Jokioinen on 17th May, on an average of 15 years, Diamond has ripened on the average in 105 days, *i.e.* on 25th August. The Swedish varieties Atle and Progress, for instance, ripen a week or more later than Diamond in Jokioinen, and cannot therefore be recommended for Finland.

All the newest Finnish spring wheat varieties mentioned above are products from crossings. The parent varieties of Hopea and Söpu are the well-known Canadian variety, Marquis (too late in Finland), and the Finnish variety Ruskea (Brown ; Tammisto). The main aim of this cross was to combine the good rust resistance (against *Puccinia glumarum*) and fine baking quality of Marquis with the earliness and small soil and water requirements of Ruskea. The results, the Söpu and Hopea wheats, are interesting both practically and theoretically in many respects. They are clear positive transgressions with regard to yielding capacity and strength of straw. In rust resistance Hopea equals Marquis, Söpu having a position intermediate between its parents. In baking quality, Söpu and Hopea are intermediate, Hopea being yet nearer to Marquis. Söpu can be grown in the central parts of Finland (as far as the 63° N. lat.).

The breeding of improved spring wheat is being continued.