

STRENGTH IN FLOURS.

It may be advisable at this point to state as exactly as possible what is meant by "strength." Biffen (1) defines it most satisfactorily as follows: "A strong wheat is one which yields flour capable of making large well-piled loaves." Wheat-flour has the property, in common only with rye-flour, of forming when mixed with water a dough which produces, on leavening and baking, a porous bread. This is due to the gluten it contains being able to imprison in small bubbles the gas generated by the fermentative action of yeast. Upon the quantity and quality of this gluten present in the flour its strength largely depends. A strong wheat-flour produces a loaf of larger volume than that produced by a weaker flour.

Flour, as a foodstuff, consists of about 70 per cent. of starch and 10 to 12 per cent. of proteins. These latter are highly complex compounds, for the most part non-crystalline in form. They are assimilated by the body, and furnish that constant supply of energy so necessary to life. Starches are heat-producing substances, while proteins are largely tissue-forming and contribute to the formation of muscle, &c.

One of the oldest methods of determining strength is the separation and weighing of gluten in flour. Gluten is a protein substance, and certain other proteins are associated with it in small amounts. Generally speaking, it may be said that with all grades of flour the higher the percentage of protein the greater the strength to a certain point (3); there is also a very close correlation between the protein in the flour, the quantity and quality of the gluten, and the loaf volume (4, 5). It is well known that there are exceptions to this relationship, but by examining a sufficient number of samples it should be possible to discover and isolate any exceptions to the general rule. Protein content, then, is an important factor in determining strength. Other factors which must be taken into consideration, however, are the volume of water absorbed, the amount of ash present, and the ratio of wet to dry gluten (8).

As regards the amount of gluten present, its quality and other physical properties, many of our locally grown wheats have been found to compare favourably with the strong and medium-strong wheats grown in Australia and North America. In this article, however, it is intended to deal only with the milling-qualities of New Zealand wheats.

CAUSES OF VARIATION IN STRENGTH.

The various influences determining the strength of wheats may be divided into three classes—climate, soil, and variety. It is well-nigh impossible to modify climate; as regards soil-fertility, it may be said that this is rarely a limiting factor in the growing of strong wheats (1, 6); there remains the varietal factor. One has but to turn to the monumental work of W. Farrer in Australia and R. H. Biffen in England to realize the importance of variety. Summed up, it may be said from their work that while the quality of some wheats may change considerably with climate and soil, there are other varieties in cultivation which retain their strength under all conditions. Thus in England the soft wheats grown at the beginning