THE INHERITANCE OF GLUME-LENGTH AND GRAIN-LENGTH IN A WHEAT CROSS.

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(With 1 Text-figure.)

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I. THE EXPERIMENTAL MATERIAL AND THE NATURE OF THE BREEDING.

The inheritance results in wheat published by Biffen (1) in 1905, made it clear that certain simply "measurable" or "quantitative" characters behaved, in inheritance, in much the same general fashion as the "qualitative" ones. Manifestly most of the economic plant-breeding questions, e.g. "yield" inheritance, must depend upon "measurable" characters, and the investigations to be described were undertaken with the primary object of ascertaining the precise mode of inheritance of some simply measurable character. Biffen's observations on length
of glume had revealed the segregation of "long" and "short" glumes (apparently of the parental forms) in the $F_2$ and, in addition, of heterozygous forms of intermediate length. It seemed desirable to determine whether or not the numerical limits which characterised the parents of the cross, also characterised the apparently "parental" types found in the $F_2$.

Glume-length was chosen as the experimental character partly because of the general definiteness of Biffen's results, and further, on account of its botanical suitability to the requirements of a simply measurable character. It was such that numerous and accurate measurements were obtainable, and moreover, as a general experience proved, it was less liable to wide and sudden fluctuations than were most of the other length characters of the wheat-plant.

Grain-length it was clear, bore some definite relation to glume-length [vide (1), p. 38], and as it appeared to have an economic significance, it was included as an experimental character in the investigation.

The parents ($F_0$) of the cross were "Polish" (T. polonicum L.) and "Kubanka" (a variety of T. durum Desf.). They had been grown for some years by Professor Biffen, and were known to satisfy the requirements of a definition of "pure line" with regard to origin, behaviour, and mode of maintenance.

The sequence of the breeding was:

1911 Cross made, viz. $\varphi$ Polish × $\sigma$ Kubanka.

1912 $F_1$ plants grown and harvested.

1913 Every grain borne by the $F_1$ plants was sown and 530 $F_2$ plants thus raised. The main ear of every $F_2$ plant was harvested and labelled with a serial number (1–530). Of these plants only 487 set ripe grain.

1914 Every grain of every labelled ripe $F_2$ ear (one per plant) was sown, and 5145 $F_3$ plants were thus raised. The main ear of every plant was harvested. The ears from those plants which sprang from the seeds of any one $F_2$ plant were bunched together, and the bunch was labelled with a "family number" which was the number allotted in 1913 to the corresponding $F_2$ parent plant.