

Comparative Pathology. — *The heredity of the size and the form of the seeds of Phaseolus vulgaris. The segregation of the F₂-generation.* By G. P. FRETZ. (Communicated by Prof. J. BOEKE).

(Communicated at the meeting of June 27, 1936).

In a first communication ¹⁾ I have been able to state that the bean yields of the F₃-generation in my experiments represent various types, that some of them clearly resemble the I-line of the starting-material and others the II-line. This could be demonstrated by means of the characterogram.

The characterogram ²⁾ is the graphic representation in one curve of the examined characteristics with regard to each other for each individual or for the average of the total yield of a plant (or of the group or number chosen).

As an amplification of my first paper I will now point out that on application of this method it also appears that among the individual variations of the F₂-generation some correspond to the I-line and others to the II-line.

If of the various examined characteristics separate curves are made, this statement does not hold good. These curves merely show that the F₂-generation is more or less intermediate ³⁾.

In order to make a characterogram, a standard characterogram is needed. For the characteristics of this standard characterogram I take the average of the characteristics of the I- and II-line; for this standard material I prefer to take beans of the same year as those of which I want to make the characterograms.

Since this communication refers to material of the F₂-generation of 1934, the standard characterogram already published in my first communication may be used for the composition of these characterograms.

The characterograms for the I-line and for the II-line are very constant in form.

For the F₂-generation I made the characterograms of 67 beans from plant No. 63 and of 129 beans from plant No. 99. Plant No. 63 originates from a I × II crossing, plant No. 99 from a II × I crossing.

The F₂-generation after I × II crossings does not differ from that after II × I crossings ⁴⁾.

¹⁾ Proc. Royal Acad. Amsterdam, Vol. 39, p. 432 (1936).

²⁾ Proceedings l.c. p. 432.

³⁾ Genetica 17, 1935, p. 62.

⁴⁾ Genetica l.c. p. 54.

The characterograms are made in descending order according to the length. In fig. 2 some have been reproduced.

For plant 63, 16 characterograms have the form of that of the I-line; they are particularly met with among the long beans. Nine characterograms have the form of that of the II-line; these are found among the short beans. In the characterograms of the I-line⁵⁾ length, breadth and thickness form a descending line, the weight lying high, the indices low. In characterograms of the II-line the line connecting length, breadth and thickness has a rising course, the weight lying low, the indices high (fig. 1).

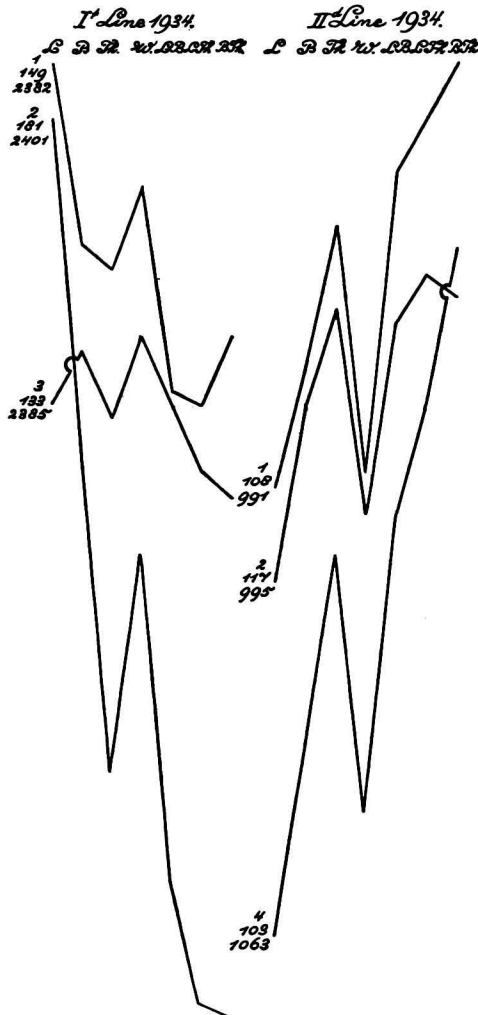
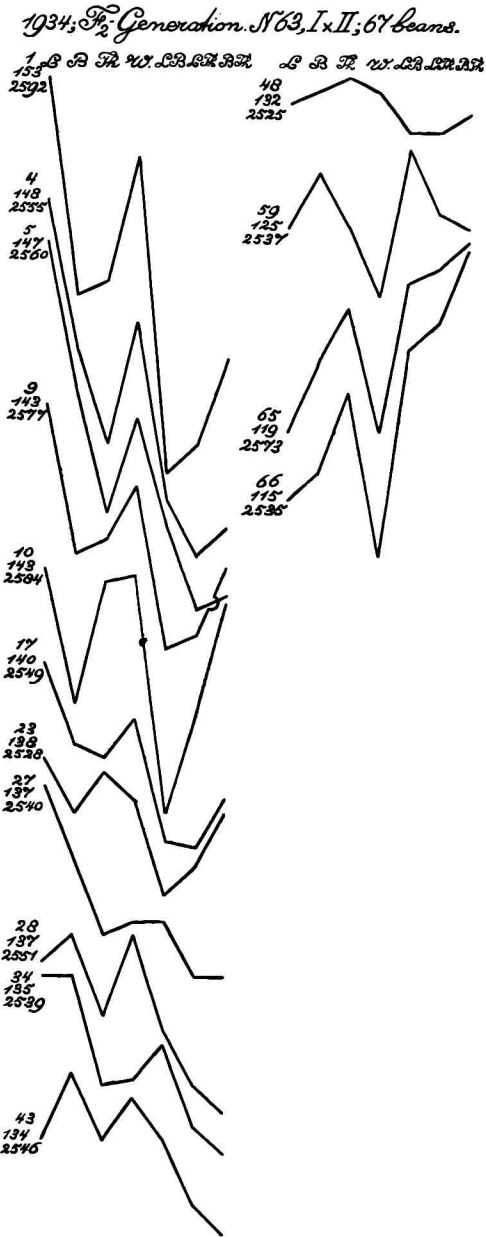


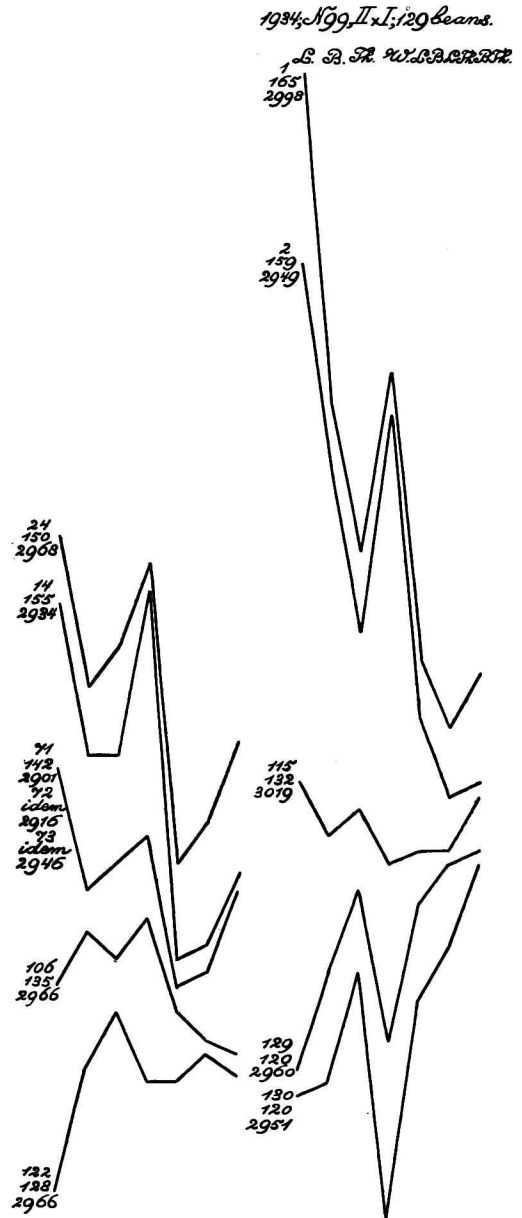
Fig. 1. Some characterograms of individual beans of the I-line and the II-line of generation 1934. On the left of each diagram its number, the length of the bean (in 0.1 mm) and the number of the bean are recorded.

⁵⁾ Proceedings l.c. p. 434.

The remaining 42 characterograms of the beans from plant No. 63 have various forms. There are some where the line connecting length and breadth goes down, whereas the one connecting breadth and thickness rises; this happens in 27 cases. In 7 cases the line connecting length and breadth goes up and the one connecting breadth and thickness descends.



a, F₁ plant No. 63.



b, F₁ plant No. 99.

Fig. 2. Characterograms of individual beans of the F₂ seed generation.

Of the characterograms made of 131 beans from plant No. 95, 46 have the form of the I-line and 10 that of the II-line. Of 57 characterograms the line connecting length and breadth goes down and the line connecting breadth and thickness goes up, and on the other hand of 8 characterograms the line connecting length and breadth goes up and the one connecting breadth and thickness goes down.

Among the characterograms of plant No. 63 as well as of plant No. 99 there are some which cannot be classified with one of the 4 groups. In these few characterograms one (or two) of the lines connecting length and breadth and also breadth and thickness respectively have a horizontal course.

Consequently there is among the beans from the two examined plants a far greater number of characterograms with the form of the I-line than with the form of the II-line.

In fig. 3 have been reproduced some selected characterograms made of beans of the F_2 -generation of bean yields derived from other crossings.

From what has been communicated above the conclusion may be drawn that the F_2 -generation has a different composition from that of the I-line and the II-line.

It contains variations; there are long beans corresponding to the characterogram of the I-line and others, short beans, resembling the characterogram of the II-line.

By the side of this there is a number of characterograms where the line connecting length and breadth takes the same course as with the I-line and the one connecting breadth and thickness runs similarly as with the II-line, and another number where, reversely, the line connecting length and breadth goes up, as is the case with the II-line, and the one connecting breadth and thickness goes down, as in case of the I-line.

Whereas in many cases the F_2 -generation after crossings of individuals with characteristics which differ quantitatively is intermediate and it cannot be demonstrated that the various variations of the F_2 -generation differ from the variations of the starting-material, we have here for the characteristics examined in the characterogram found a means to distinguish the variations of the F_2 -

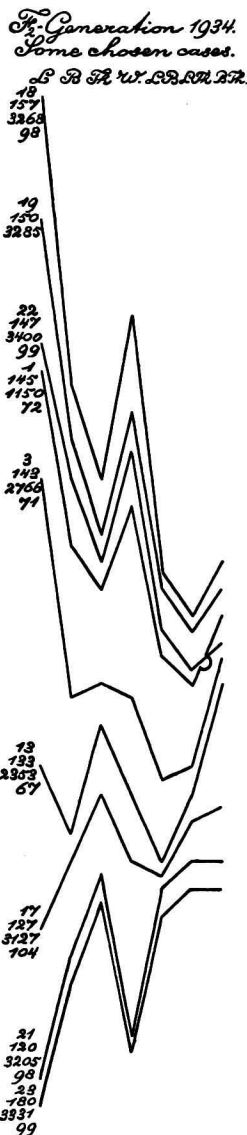


Fig. 3. Some selected characterograms of individual cases of beans of the F_2 seed generation.

generation and to connect them in a conclusive manner with the parental forms of the starting-material.

In this way we shall have indicated the hereditary variations of the F_2 -generation, which may be further corroborated by cultivation of the F_3 -generation.
