LINKAGE-STUDIES IN PISUM. I

by

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I. INTRODUCTION

Recent genetic work in Pisum has met with difficulties in the interpretation of the results along the lines of the well known Drosophila principles.

The haploid number of chromosomes is seven. KAPPERT (4) however found eight independent factors or groups of factors and SVERDRUP (10) described nine such factors or groups [cp. also DE WINTON (16)]. KAPPERT (4, p. 26—27) surmised the possibility of linkage escaping observation by about 50 % crossing-over; this would explain the appa-
rent existance of more independent groups than chromosome-pairs. And indeed, Wellensiek (13, p. 48) found each of two apparently independent factors linked to a third one, which points to the existance of about 50% crossing-over between the first two factors. Wellensiek (13, p. 50) moreover assumes that in many cases linkage in Pisum may be rather weak, while Sverdrup (10, p. 240) supposes that the chromosomes in Pisum may possess a relatively loose structure.

Two factors showing linkage in one cross may be independently inherited in another cross. Hammerlund (2) found a very clear case of this and Wellensiek (13, p. 49—50) obtained results pointing in the same direction, although his results are far less striking than those of Hammerlund.

Variation in the percentage of crossing-over was supposed to exist by Wellensiek (13, p. 50) and by Sverdrup (10, p. 234—236). Rasmusson's results (8) show without any doubt that an enormous variation in the strength of the linkage can occur. Rasmusson is of opinion that the rate of crossing-over is determined by the genetic constitution of the parent plants. This is true for Hammerlund's above mentioned case, while Rasmusson himself obtained rather convincing results also.

Indications of the existence of more than 50% crossing-over were obtained by Wellensiek (14). This was mentioned preliminarily only, but more particulars are given in a paper, entitled „Pisum-Crosses III” which is now in the press. Rasmusson (8, p. 94, 99, 100) obtained results which can be explained by assuming the existence of more than 50% crossing-over, but evidently he did not think of this possibility.

Although several workers are studying linkages relations in Pisum and although important results have been obtained already, almost nothing is known compared with Drosophila. Much more experimental work has to be done, before we can build up a theory on the localization of genetic factors in Pisum. A hold-back in the advancement of our knowledge is that it is sometimes very hard to compare results of different investigators, partly because it is always hard to tell whether or not factors segregating in different material are identical, partly because there may be a variation in the crossing-over percentage up to about 50%.

The present study deals with the $F_2$ results of the three possible crosses between three lines of Pisum, involving the interrelations of ten factors. The main purpose of this study was to control whether the