

## LINKAGE OF THE GENES PR AND PRE DETERMINING SHORTENING OF THE INFLORESCENCES IN *PISUM*

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### Abstract

In studies with the linkage of genes pr and pre the gene pr was found to be located in chromosome 3 and pre in chromosome 4. Both the genes are responsible for the shortening of inflorescences length.

### Introduction

The aim of the present investigation was to study the linkage relations of the genes pr and pre which are not yet known. The said genes are responsible for the shortening of the length of the inflorescences. Lamprecht (1949) proposed these polymeric genes for the mutation type praecidere in which inflorescences had reduced length.

### Material and Method

For determination of linkage relations of the genes pr and pre a cross, 4516, between L851 and L936, made by Dr. Blixt at the Weibullsholm Plant Breeding Institute, Landskrona, Sweden, was used. A preliminary survey of the data indicated that the character inflorescence length segregated 224 long to 171 short, with  $\chi^2$  for 9:7 being 0.03. Thus both the genes pr and pre segregated in the cross (Lamprecht, 1967). The survey further indicated strong linkage of short inflorescences with the gene M in chromosome 3 and Le in chromosome 4. All segregations in genes from these chromosomes were therefore studied in detail.

The genetical constitution of the two parental lines with respect to the genes studied was as follows:

L851 b, gty, st, m, Fr, pr, fru, td, pro, le, np, pre.

L936 B, Gty, St, M, fr, Pr, Fru, Td, Pro, Le, Np, Pre.

A short description of the manifestation of these genes were:

- |         |   |
|---------|---|
| B - b   | Purple flowers - pink flowers of anthocyanin along upper suture of pod.             |
| Fr - fr | Lesser number of basal branches - increased no of basal branches; polymeric to fru. |

Fru - fru	Lesser number of basal branches - increased no of basal branches; polymeric to fr.
Gty - gty	Seed surface gritty due to dense regularly shaped evenly distributed prominences of minute size - without gritty prominences.
Le - le	Long internodes - short internodes.
M - m	Brownish marbling of testa - testa without brownish marbling.
Np - np	Whitish pustules all over the pods - no such pustules.
Pr - pr	Long - short inflorescences; polymeric to pre.
Pre - pre	Long - short inflorescences; polymeric to pr.
Pro - pro	Basal branches not growing at about 45 degree angle - growing at about 45 degrees angle.
St - st	Stipules normal - reduced.
Td - td	Leaflets with dentation - without dentation.

Statistical analyses of the results were performed on the Wang computer installation of the Cytogenetical Laboratory at the Weibullsholm Plant Breeding Institute.

#### Results and Discussion

The data of interest for the linkage of pr and pre are presented in Table 1. The significant linkages found with respect to chromosome 3 are presented in Fig. 1 and those of chromosome 4 in Fig. 2. The results are reconcilable with earlier results (Blixt, 1972). However, two of the investigated characters, inflorescence length and number of basal branches, are determined by each one pair of polymeric genes, both of which segregate in the cross. The CrO-values involving these genes are therefore less exact. The genes pr, pre and le work on length of plant parts, increasing the risk for missclassification. Besides, as judged from the fertility of the cross, a translocation is involved and the translocation point is linked with both pr/pre, le and ser. The cross does not, however, segregate in suitable neighbouring genes enabling a closer analysis.

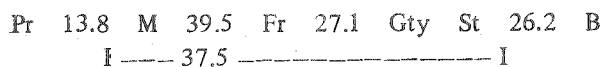


Fig. 1. Significant linkages in chromosome 3.



Fig. 2. Significant linkages in chromosome 4.

Table 1. Statistics of segregations in chromosome 3 and 4.

Gene pair	DD	Dr	rD	rr	Sum	Corrected Chisqr	Phase	CrO- value	Stand. error	Segregation
Chromosome 3										
B - St	240	48	35	47	370	55.566	K	26.2	2.73	(3:1) (3:1)
B - Fr	166	122	41	41	207	1.590	R	57.1	5.23	(3:1) (9:7)
B - Pr	164	102	50	31	214	0.000	K	50.1	6.15	(3:1) (9:7)
B - Gty	209	78	58	20	365	0.082	K	51.1	3.97	(3:1) (3:1)
B - M	226	59	61	21	367	0.826	K	46.1	3.74	(3:1) (3:1)
St - Fr	170	149	63	49	431	0.194	R	47.0	5.84	(3:1) (9:7)
St - Pr	176	119	48	52	395	4.442	K	39.4	4.77	(3:1) (9:7)
St - Gty	242	74	78	31	425	1.060	K	46.3	3.48	(3:1) (3:1)
St - M	262	52	74	37	425	14.509	K	37.5	3.10	(3:1) (3:1)
Fr - Pr	130	91	94	80	395	1.046	R	57.8	7.61	(9:7) (9:7)
Fr - Gty	159	71	161	34	425	9.988	R	27.1	9.69	(9:7) (3:1)
Fr - M	166	66	170	23	591	16.591	R	39.5	6.89	(9:7) (3:1)
Pr - Gty	152	68	132	37	389	4.295	R	37.1	7.62	(9:7) (3:1)
Pr - M	207	17	94	71	301	69.623	K	13.8	2.77	(9:7) (3:1)
Gty - M	251	63	80	25	419	0.690	K	46.9	3.53	(3:1) (3:1)
Chromosome 4										
Td - Fru	201	125	32	73	431	31.703	K	24.9	3.49	(3:1) (9:7)
Td - Pro	252	55	41	11	293	0.145	K	47.1	3.82	(3:1) (3:1)
Td - Pre	184	122	40	49	395	5.896	K	36.6	4.54	(3:1) (9:7)
Td - Le	273	47	62	42	335	30.611	K	32.0	2.84	(3:1) (3:1)
Td - Np	193	98	44	36	371	3.380	K	43.4	3.59	(3:1) (3:1)
Fru - Pro	211	17	82	49	359	50.123	K	16.0	3.08	(9:7) (3:1)
Fru - Pre	130	91	94	80	395	1.046	K	42.2	7.61	(9:7) (9:7)
Fru - Le	210	22	125	67	424	41.882	K	20.3	3.18	(9:7) (3:1)
Fru - Np	145	69	92	65	371	3.061	K	44.5	3.64	(9:7) (3:1)
Pro - Pre	167	112	36	27	342	0.080	K	47.3	5.89	(3:1) (9:7)
Pro - Le	261	28	54	11	354	3.123	K	41.2	3.57	(3:1) (3:1)
Pro - Np	183	86	36	23	328	0.831	K	45.7	3.93	(3:1) (3:1)
Pre - Le	213	9	116	50	329	51.139	K	12.8	2.68	(9:7) (3:1)
Pre - Np	154	69	83	64	370	5.928	K	30.5	6.50	(9:7) (3:1)
Le - Np	225	99	8	33	365	38.395	K	22.9	2.56	(3:1) (3:1)

Analysis of the cross 4516, line 851 x line 936, indicates that the genes *pr* and *pre*, determining shortening of inflorescences in *Pisum* are located in chromosome 3 and chromosome 4, respectively. As location was not previously known, the gene *pr* is designed to be located in chromosome 3 and *pre* in chromosome 4.

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