CROSS FERTILIZATION IN PEAS UNDER DIFFERENT ECOLOGICAL CONDITIONS

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A simple method to determine the frequency of cross fertilizations occurring in cultivated peas recently was described (1). The work has been continued with WL 6040 which has green cotyledons (gene i) and is linearly fasciated. Table 1 shows ten and Table 2 eleven control groups of this line on two ecologically different fields (locations I and II). Location II has a richer insect fauna than location 1. The control groups were distributed among 20,000 plants with the dominant allele (gene I, yellow cotyledons) on location I and about 7,000 plants with this allele on location II.

Table 1. Percent cross fertilizations on location I.

Control group	Plants in each group	Plants with cross fertilization(s)		Seeds of each control group	Yellow seeds	
No.	No.	No.	%	No.	No.	%
1	19	5	26	606	11	1.8
2	20	3	15	728	3	0.4
3	18	6	33	941	13	1.4
4	19	1	5	679	1	0.2
5	20	6	30	771	8	1.0
6	20	8	40	907	11	1.2
7	19	6	32	1009	11	1.1
8	16	6	38	450	12	2.7
9	15	5	33	584	6	1.0
10	16	7	44	536	11	2.1
Totals/means	182	53	29.1	7211	87	1.21

The tables show that nearly one third of all plants bear one or more cross fertilizations. In comparison with the data from location 1 (= 100%), the number of seeds arising from cross pollinations was 59.13% higher on location II (non-rounded numbers as basis). Unexpectedly, the percentage of contaminated plants was only slightly higher on location II (+ 1.29%). I have not yet found a satisfactory explanation for this.

Table 2. Percent cross fertilizations on location II.

Control group	Plants in each group	Plants with cross fertilization(s)		Seeds of each control group	Yellow seeds	
No.	No.	No.	%	No.	No.	%
1	11	3	27	465	5	1.1
2	15	5	33	616	15	2.4
3	12	4	33	445	7	1.6
4	12	3	25	443	14	3.2
5	18	6	33	279	8	2.9
6	13	4	31	323	6	1.9
7	16	7	44	724	24	3.3
8	18	6	33	711	16	2.3
9	12	3	25	322	3	0.9
10	14	3	21	446	6	1.3
11	30	8	27	1372	14	1.0
Totals/means	171	52	30.4	6146	118	1.92

The percentage of cross fertilizations in the ten most severely contaminated plants is given in Table 3.

Table 3. Percent cross fertilizations of the 10 most severely contaminated plants.

Plant	Control group: Loc. I	Control group: Loc. II	Seeds of each control plant	Yellow seeds	Cross fertilizations
No.	No.	No.	No.	No.	%
1		6	13	3	23.1
2	10		9	2	22.2
3		2	42	9	21.4
4		4	36	6	16.7
5		7	87	10	11.5
6		5	57	6	10.5
7	8		59	6	10.2
8		8	30	3	10.0
9	1		56	4	7.1
10	7		44	3	6.8
Total/Means			433	52	12.0

To make sure whether the seeds of the stated cross fertilizations had really been correctly determined, 54 plants grown from such yellow seeds were investigated. Of these, 51 plants segregated for yellow and green cotyledons; the other three plants which did not show segregation produced 9, 10, and 37 yellow seeds respectively. For the first two a deficit of the recessives may be the explanation; for the last plant the problem is open. Nevertheless, all seeds had been correctly determined as yellow.

Special marker genes of the plants growing around the control groups (for example, for the structure and color of the seed coats of ecotype arvense and the fasciated type line WL 6) were identified in the F2 proving that cross-po1lination was the cause for the yellow seeds. Bombus agrorum Fabricius and Bombus terrestris L. were the most likely candidates for the pollen transfer (Figs. 1 and 2).

1. Loennig, W.-E. 1983. PNL 15:40.

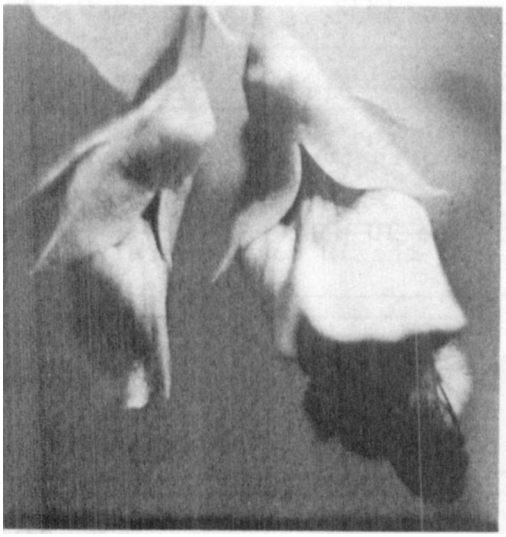

Fig. 1. Bombus agrorum in younger pea-blossom.

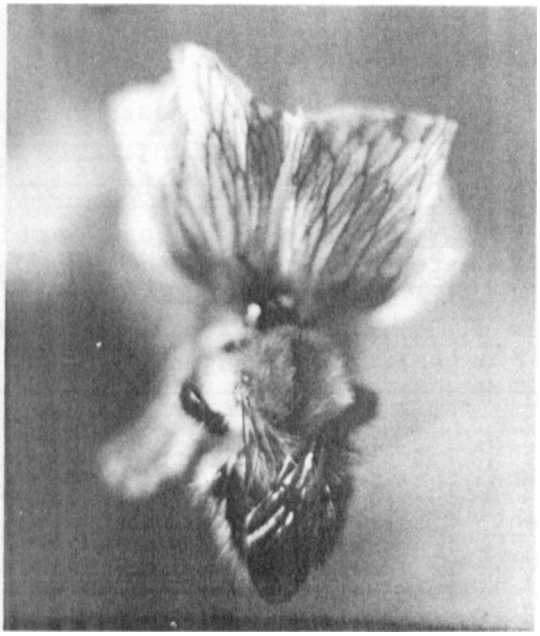

Fig. 2. B. agrorum on older blossom.

(Original colored photos converted to black and white.)