The specimen studied by me in 1942 was collected not far from the fields where Dr. E. Åkerlund[7] cultivated a quantity of *Melandrium* some few years earlier. Whether the plant belonged to some foreign and natural line of his material, or whether it was produced by an accidental doubling of its chromosomes, is, and will remain, unknown.

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[1] Löve, D., *Hereditas*, **28**, 241 (1942).
[2] Löve, D., *Bot. Notiser*, 125 (1944).
[3] Fries, E., *Bot. Notiser*, 161 (1857).
[4] Baker, H. G., *J. Ecol.*, **35**, 271 (1947).
[5] Löve, D., *Sv. Bot. Tidskr.*, **36**, 262 (1942).
[6] Baker, H. G., and Jackson, W., *Nature*, **168**, 747 (1951).
[7] Åkerlund, E., *Hereditas*, **10**, 153 (1927); **18**, 16 (1933).

A Gene-controlled Flowering Inhibitor in *Pisum*

Von Denffer[1] has recently suggested that the stimulus to flowering is not brought about by the production of a new flowering hormone ('florigen') but results from the sudden drop in production of a flower inhibitor substance ('Blühhemmstoff'). We have been investigating the mode of action of the genes controlling the earliness or lateness of flowering in the garden pea, and have evidence that the late varieties are late because they produce an inhibitor which is absent from the earlies. We have used three varieties: Massey, which normally flowers about the ninth node; Richard Seddon, which flowers at about the fourteenth node; and Telephone, flowering at the seventeenth node. Pellew[2] has suggested that a series of three multiple alleles, L, l_1 and l_2, determine these differences in flowering behaviour, the dominant L gene determining late flowering (eighteenth node). It is probable that our three varieties are respectively l_2l_2, l_1l_1 and LL. However, the genetical tests are not yet complete.

Our technique is as follows. The peas are germinated in damp sand or *Sphagnum* in a heated greenhouse at a temperature of 15–20° C. At about four days old the plumules are approximately one to two centimetres long. At this stage, cleft grafts are easily made between the epicotyls of the stocks and scions of either the same or different varieties. Reciprocal grafts between Telephone and Massey and Telephone and Richard Seddon have been made. The peas are then grown on in pots in a heated greenhouse under natural illumination. The results of a typical experiment using Telephone and Massey are given in the table. The significance of the difference between the means of the various comparisons possible is also indicated (t or normal deviate test). The results show that a scion of a late variety grafted on to an early stock is made significantly earlier over the ungrafted controls, while an early scion grafted on to a late stock flowers later than when ungrafted. Further, grafting itself, in the case of Telephone, causes a significant decrease in node number. Grafting has apparently no effect on the flowering node of the early variety.

These results are best interpreted on the assumption that flowering behaviour in the pea is determined by the production of an inhibitor in late stocks, which is then transported to the plumule. Since grafting alone decreases node number in Telephone, we must also assume that the plumule can react to the inhibitor only over a relatively short time (probably at most two or three weeks) or that the stocks soon stop producing the inhibitor. The temporary interruption of the supply of inhibitor by the mere operation of grafting will thus produce an earlier scion. It is difficult to estimate the length of this interruption, but the scions recover their normal growth-rate three to four days after the operation.

These assumptions were further tested by removing the cotyledons from the seedlings. Under the conditions of our experiment, this operation is fatal if performed earlier than three days after the peas are soaked in water. After this date the excised embryo can survive and flower. The table shows that removal of the cotyledons has no significant effect on Massey, but produces a significant effect on Telephone, making it earlier. Thus the inhibitor is produced in the cotyledons of the late variety.

In these experiments, as the table shows, we have not succeeded in making the complete transformation of the pattern of flowering of any one variety into that of another variety. This may be due simply to the fact that at least a three-day germination period must elapse before the grafting or excision experiments can succeed. It may also mean that the action of these genes starts while the seed is growing in the pod. In either case the speed of action of the genes is remarkable.

With regard to the nature of the inhibitor, it is probably of a hormonal nature. Bonner and Thurlow[3], Thimann and Leopold[4] and von Denffer[1] have shown that physiological concentrations of auxin delay or even suppress flowering in a variety of plants. Experiments to test the effects of auxin on these varieties of peas are in progress. We have, also, some evidence that the rate of respiration during the early stages of growth may differ between late and early varieties, and there may also be a difference in the vitamin C and amino-acid contents of the germinating peas.

Experimental treatment	Treatment No.	Massey on Telephone					Telephone on Massey				
		No. of plants	Node of 1st flower	Comparison	Difference	P	No. of plants	Node of 1st flower	Comparison	Difference	P
Ungrafted control	1	45	9·27	1–2	−0·23	0·5–0·4	63	17·59	1–2	−0·51	0·02
Grafted control	2	24	9·04	1–3	1·83	<0·001	36	17·08	1–3	−2·61	<0·001
Experimental graft	3	31	11·10	1–4	0·44	0·2–0·1	63	14·98	1–4	−1·53	<0·001
Cotyledons removed	4	38	9·71	2–3	2·06	<0·001	51	16·06	2–3	−2·10	<0·001
				2–4	0·67	0·02–0·01			2–4	−1·02	<0·001
				3–4	−1·39	<0·001			3–4	1·08	<0·001

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[1] Denffer, D. v., *Naturwiss.*, **37**, 296 and 317 (1950).
[2] Pellew, C., *J. Genetics*, **39**, 363 (1940).
[3] Bonner, J., and Thurlow, J., *Bot. Gaz.*, **110**, 613 (1949).
[4] Thimann, K. V., and Leopold, A. C., *Amer. J. Bot.*, **36**, 342 (1949).