LINKAGE RELATIONS OF TENDRILLED ACACIA (tac) AND APULV1NIC

Marx, G. A. NYS Agricultural Experiment Station, Geneva, NY USA

Two excellent seedling markers in peas have been isolated in recent years. Evidence presented here indicates that both reside in chromosome 3.

The first, tendrilled acacia (tac), was described by Sharma (3,4,5,6). The leaves of tac plants, like those of acacia (tl) plants, terminate with a fully developed, laminar leaflet. Unlike tl, however, tac plants have subterminal, tendril-like appendages (Fig. 1). The mutant behaves as a single recessive but it shows some variability of expression within the same plant and from plant-to-plant in segregating populations. Nevertheless, classification of tac in segregating populations presents little difficulty, especially if scoring is delayed until 6 or 7 nodes have developed on seedling plants.

In 1979, Harvey (2) described a mutant which he provisionally named apulvinic (Fig. 1). Appearing spontaneously in the cultivar 'Dark Skinned Perfection', the mutant plants bear leaves in which all foliar pulvini are replaced with rigid petiolules (2). It, too, is inherited as a single recessive and can be scored unambiguously in the early seedling stage. Its phenotype resembles a mutant designated by Blixt (personal communication) as petiolulatus but apparently the identity between the two has not been established. Until this matter is settled, I shall refer to the Harvey mutant as apulvinic, with apu as the provisional gene symbol.

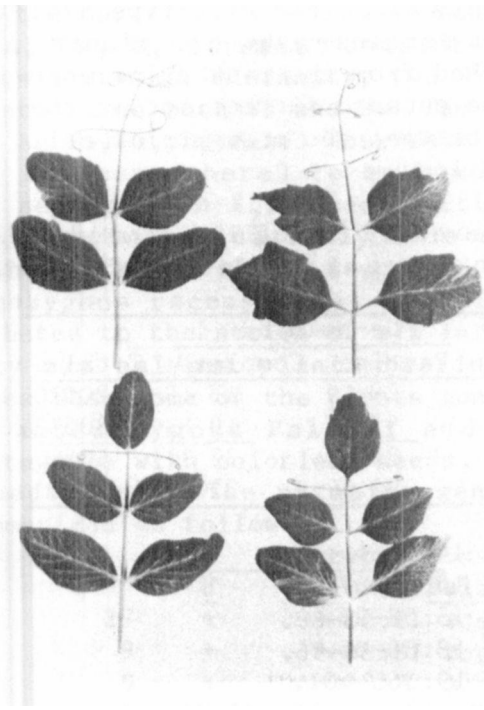

Fig. 1. Top: (left) Tac Apu
(right) Tac apu
Bottom: (left) tac Apu
(right) tac apu

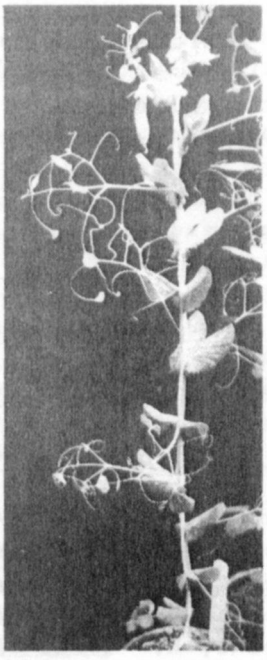

Fig. 2. af tac Note small laminar leaflets amid otherwise tendrilled leaflets.

Both tac and apu were crossed with marker lines in a preliminary effort to determine their chromosomal location. Table 1 gives single gene segregation data for tac and for apu in F2's of crosses in which no linkage was detected. Table 2 shows evidence that both mutants are situated in chromosome 3, with the following approximate relationship:

St----10-------Apu------23----Tac
----------------30----------------

It is not certain whether tac and apulvinic lie towards b or towards M on chromosome 3, but we are in the process of resolving this question.

Sharma and Kumar (7) also tested for linkage between st and tac but they concluded that their data did not reveal evidence of linkage.

Table 1. Single gene segregation for tac and apu in crosses in which linked markers were not involved.

Population identity	Tac	tac	Total	$X^2_{(3:1)}$
B283-130-150	217	92	309	3.76
	Apu	**apu**		
B283-217-231	170	58	228	0.02
B283-242-247	88	31	119	0.07
B283-257-278	254	105	359	3.45

Table 2. Joint segregation in F_2, chi-squares, and linkage estimates among **st, tac,** and **apu.**

Gene pair	Population identity	XY	Xy	xY	xy	Tot.	Chi-squares X	Chi-squares Y	Chi-squares Linkage	Recomb. fract.	S.E.
St-Apu	B283-232-241	101	59	52	0	212	0.02	0.91	28.21**	<13	
St-Tac	B283-296-302	92	39	28	4	163	2.51	0.16	3.63*	35.0	± 6.8
	B283-408-420	148	81	59	6	294	1.31	3.31	17.96**	27.6	± 5.3
Apu-Tac	B283-248-256	50	26	16	1	93	2.24	0.81	5.36*	22.9	± 9.7
	B283-279-284	50	36	22	2	110	0.59	5.35*	9.33**	23.4	± 8.9

L. G. Cruger has drawn attention (personal communication) to a most interesting interaction between tac and af. In combination with tac the af phenotype is modified such that small, irregularly formed leaflets are produced, apparently without any definite pattern (Fig. 2).

In the course of observing the behavior of tac in various gene combinations, I encountered one other interaction worth noting. As already mentioned (1), the normal expression of wlo is masked in combination with af. However, since af tac produce some small laminar leaf Lets, it might be expected that the upper surface of these leaflets would be waxless in the presence of wlo, i.e. in af tac wlo plants. But in fact they do not. Although typical wlo expression occurs in Af tac wlo plants, both surfaces of the leaflets on af tac wlo plants appear to be normal waxy (based on visual inspection). Indeed, many af tac plants display considerable laminar tissue, especially in the nodes bearing the first true leaf and two or three above. Still, the presence of wlo in such plants is not readily detectable. The nature of this interaction is unknown but no exceptions to the phenomenon have been observed among numerous populations homozygous for tac and wlo but segregating for Af-af.

1. Hampton, R. 0. and G. A. Marx. 1981. PNL 13:16-17.
2. Harvey, D. M. 1979. Seventieth Ann. Rpt. John Innes Inst. p. 34.
3. Sharma, H. 1972. PNL 4:50.
4. Sharma, B. 1972. PNL 4:51.
5. Sharma, H. 1972. PNL 4:52.
6. Sharma, B. 1981. Pulse Crops News 1. 1(1):56-57.
7. Sharma, B. and S. Kumar. 1981. Pulse Crops Newsl. 1(3):21-22.