

AN INHIBITOR FOR PETIOLATE  
CONDITION IN *NICOTIANA*  
*TABACUM* L.

In *Nicotiana tabacum*, sessile-leaved types are predominant while petiolate forms are few. Most of the commercial types such as flue-cured, wrapper, cigar, cheroot and chewing, etc., are sessile. The few cases of petiolate types, met with in India, are *Lanka*, an indigenous cheroot tobacco of Andhra, *Jati*, a fine chewing tobacco of Bengal, and some hookah types in Punjab. The known cases of petiolate condition were either under dominant monogenic control

or under complementary action of genes.<sup>1-5</sup> During our study to know the nature of petiolate condition in crosses between unrelated types in the collection maintained at the Central Tobacco Research Institute, Rajahmundry, a case was met with (N.P. 68 × Turkish sessile), where petiolate leaf base was apparently recessive to the sessile condition. The inheritance of this character is presented in this paper. Data are also reported in this study of another cross where a lanceolate petiolate type, *Lanka*, was crossed with a heart-shaped petiolate type, *Jati*, to study the inheritance of leaf shape between two petiolate types where the complications arising from sessile condition giving rise to different leaf shapes were not met with.

N.P. 68 is a petiolate type from the collection of Indian tobaccos maintained at the Indian Agricultural Research Institute, New Delhi. It resembles *Lanka* in many respects. Turkish sessile is a small, sessile-leaved Turkish type. The  $F_1$  between these two was definitely sessile. The crosses of Turkish sessile with other petiolate types known to carry dominant genes for petiolate leaf base, e.g., *Jati*, and *Lanka*, were suggestive that the Turkish type carried an inhibitor for petiolate condition. In the cross *Lanka* and *Jati*, the  $F_1$  was petiolate and lanceolate. The relevant data for both these crosses are presented in Tables I and II.

In the cross N.P. 68 × Turkish sessile, the  $F_2$  and backcross data indicated monogenic differ-

TABLE I  
Segregation of  $F_2$  and backcross of N.P. 68 × Turkish (sessile) for petiolate condition

Generation and Ratio	Observed		Expected		Total	X <sup>2</sup>	P
	Petiolate	Sessile	Petiolate	Sessile			
N.P. 68 ..	Petiolate	..	..	..	..	..	..
Turkish (sessile) ..	..	Sessile	..	..	..	..	..
$F_1$ N.P. 68 × Turkish (sessile) ..	..	do.	..	..	..	..	..
$F_2$ (1 : 3) ..	68	198	66.5	199.5	266	0.0451	0.80-0.90
$F_1$ × N.P. 68 (1 : 1) ..	125	101	113.0	113.0	226	2.5487	0.10-0.20
$F_1$ × Turkish (sessile) ..	0	155	0	155	155	..	..

TABLE II  
Segregation of leaf shape in  $F_2$  and backcrosses of *Lanka* × *Jati*

Generation and Ratio	Observed		Expected		Total	X <sup>2</sup>	P
	Lanceolate	Heart-shaped	Lanceolate	Heart-shaped			
<i>Lanka</i> × <i>Jati</i>							
$F_2$ (3 : 1) ..	83	31	85.5	28.5	114	0.2924	0.50-0.70
$F_1$ × <i>Lanka</i> (2 : 0) ..	301	0	301.0	0	301	..	..
$F_1$ × <i>Jati</i> (1 : 1) ..	27	25	26	26	52	0.0769	0.70-0.80

ence between the parents for this character. Since *Lanka* is known to carry the dominant gene  $P_1$ , for petiolate condition, the segregation indicated that the Turkish sessile type carried a dominant inhibitor in addition to the  $P_1$  gene.

In the cross between *Lanka* and *Jati*, there was no segregation for petiolate condition showing that both were isogenic for petiolate condition. As regards leaf shape, the lanceolate shape of *Lanka* was dominant over the heart shape of *Jati*. The  $F_2$  and backcross to *Jati* indicated a single gene difference for leaf shape in this cross in contrast to the complicated hypotheses postulated by other workers where the epistatic and other effects of genes controlling leaf base and auricle development made the phenotypic classification very difficult.<sup>3,5</sup> The gene is designated Lh-lh.

The wide prevalence of sessile types in *Nicotiana tabacum* is probably due to (a) presence of inhibitory factors for petiolate condition, (b) the necessity of the combination of three dominant genes responsible for petiolate condition in the case of complementary gene action, and (c) selection by man for greater surface of lamina. The data of Brieger and Forster<sup>6</sup> also fits with the inhibitory factor hypothesis suggested in our study. Among the postulated progenitors of *N. tabacum*, *N. sylvestris* is sessile-leaved. In the section *Tomentosæ*, which contains the other parent of *tabacum*, none has such distinct petiole without wing as in some forms in *N. tabacum*. Therefore, it is possible that the petiolate types in *N. tabacum* are due to the complementary action of the gene systems from the two parental species. In amphidiploid, the new gene combinations, not present in the original parents, tend to increase in their frequencies in the populations, if they have some bearing on the fitness of the new species. Petiolate condition in plants is intended to permit maximum exposure of the lamina to sunlight. However, the cultivation of *N. tabacum* is under wide spacing which permits ample supply of sunlight. Thus the petiolate types do not appear to have any specific advantage over the sessile types. However, it is likely that the natives of U.S.A. had selected lines for maximum leaf area which naturally eliminated petiolate types.

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