

## Anti-jassid Resistance in the Cotton Plant.

By K B LAL, M SC, PH D (Edin), F R E S,  
Imperial Agricultural Research Institute, New Delhi

THE mechanism by which certain varieties of cotton resist jassid attack is still largely obscure. In addition to actual resistance there seems to be some, what may be called, jassid avoidance or jassid endurance in the plant brought about by a change in environment or cultural practices. It has been stated that the resistance of a variety to jassid attack is the result of (i) its better adaptability to unfavourable climatic conditions, specially drought (Hargreaves, 1934),<sup>1</sup> (ii) an abundance of rich fertilisers, specially potash, in the soil (Vuillet, 1925),<sup>2</sup> (iii) freedom of the soil from a water logged condition (Parnell),<sup>3</sup> etc. Some or all of such conditions may possibly at times be helpful to the crop and confer on any particular variety the semblance of jassid resistance.

Real resistance, however, may only result from a character or characters of the plant itself that will withstand jassid attack more or less independently of cultural factors. Of such the only one suggested, so far, is the hairiness of cotton leaves. Cotton varieties with hairy leaves usually resist jassid attack. This is no doubt true to a certain extent, but cases in which this rule breaks down point to the possibility of this association being merely of an incidental nature. The Punjab-American cotton 43F is one of the most hairy of varieties, yet its resistance against jassids, though higher than those of some very susceptible varieties such as 38F, 45F, and 289F is not as high as that of 4F for instance. Indeed at times it may be heavily attacked as was borne out by an observation, last August, of some plots under this variety in Sargodha District, Punjab. Similarly, Jublee cotton (a *desi* variety newly evolved at Lyallpur) is a very hairy variety even among *desi* cottons but its resistance to jassid attack, though better than those of the American varieties, is about the lowest among *desis*.

Although hairiness of cotton leaves has been prominently mentioned as a jassid resistant character, published records giving the comparative hairiness of different varieties of cotton, based on a satisfactory technique, are not many. Since hairs on cotton leaves are deciduous (Afzal, 1936),<sup>4</sup> hairiness will vary not only with variety, but also with

the age of the leaves, their position on the stem and the age of the plants. Hairiness of different varieties, therefore, is comparable only when due regard has been paid to these three factors in selecting leaves for examination. The table of hairiness of cotton varieties recently given by Luthra (1937)<sup>5</sup> suffers from this defect.

Hairiness of leaves usually refers to their hair density, though from the standpoint of the infesting insect, hair length cannot altogether be ignored, specially as adjoining hairs mat together and form a felt like covering on the leaf surface and their length coupled with their density determines the thickness of this covering. The writer measured the comparative hairiness on the lower surface of leaves, both in respect of density and length, of seven varieties of cotton in August 1936, at Lyallpur. Five leaves from each variety, all of the same age and plucked from identical positions on the main stems of plants also of the same age, were selected. Each leaf was examined at five places corresponding to its five lobes, for hairiness and for hair lengths, and the following table gives the hairiness and length of hair of the leaves of each variety as averages of all these figures for each variety —\*

Variety		No of hairs per sq cm of leaf area	Average length of hair in mm
1	38F	556	0.826
2	45F	372	0.834
3	43F	1306	0.901
4	47F	1215	0.625
5	289F	591	0.807
6	Labh Singh Selection	1152	0.665
7	Jublee cotton	1626	0.486

Here the resistant varieties have short hairs and high hair density, though the most hairy American variety which also has the longest hair length is not the most resistant. The table also indicates the need of testing the rôle of hairiness in resisting jassid attack.

\* Fuller details are being published elsewhere.



by evidence other than merely that of correlation

Parnell (*op cit*)<sup>3</sup> observed that jassid nymphs, when put on hairy and much less hairy cotton leaves, always showed their dislike of the former by kicking and knocking about, although apparently in great need of food, while those on the latter quietly settled down to feed

Similar experiments were carried out by the writer in which nymphs of *Empoasca devastans* Distant of II, III and IV instars were starved for periods varying from 4 to 6½ hours and put on fresh leaves of *Rosæ* 10, *Indicum* 50, *Mollisoni* 15, *Mollisoni* 39, Jublee cotton, 47F and 45F. In no case were the nymphs observed kicking and knocking about as observed by Parnell, although all the varieties except 45F are very hairy. The nymphs always took to the variety quietly and started feeding. These observations were continued constantly for 15 minutes after which they were allowed to remain on them for another 24 hours. Practically all of them easily survived this period and moulted in the normal manner. It is, therefore, difficult to confirm Parnell's findings in this respect. Incidentally the experiment also shows that the feeding ability of the nymphs has not much to do with producing immunity in varieties of cotton.

There is some indication that cotton varieties resist jassid attack because of the inability of the latter to oviposit on them †. If this be so, it shows that jassid resistant characters must be sought for in the leaf veins since it is in these that eggs are laid. A knowledge of the physical and chemical characters of the leaf veins, therefore, might furnish a clue to the very small numbers of eggs laid in the leaf veins of resistant varieties. It was in view of this fact that

in every examination of leaf areas for the determination of their hairiness (*vide* table given above) a part of one of the principal leaf veins was invariably included. Veins, however, do not seem to be appreciably more or less hairy than the general surface of the leaf which they serve. The determination of the relative toughness of the leaf veins in different cotton varieties appears to be a more promising line of investigation from the standpoint of their resistance to jassid attack.

It is, however, doubtful if any character or characters would safeguard cotton varieties against jassids under all circumstances and there seems some truth in the statement of Bebbington and Allen (1937)<sup>6</sup> that jassids may cause quite serious damage even to the most resistant strains if they are improperly grown. The South African cotton U4, though resistant to jassid attack in its native habitat, becomes susceptible when planted in the Punjab. In this case one of the two things might happen—either the U4 cotton imperceptibly sheds its jassid resistant character under Punjab conditions or the character or characters that protected it against *Empoasca fascialis* Jac, the South African species, do not afford it the same protection against *E. devastans* Distant, the Indian species. There appears to be sufficient justification for studying the question of jassid resistance primarily as local problems, in relation to the species of the insect and a limited number of cotton varieties concerned.

<sup>1</sup> Hargreaves, H., *Rept. Proc. II Conf. Cott. Grg. Prob.*, 1934

<sup>2</sup> Vuillet J., *Rev. App. Ent.* (A) 1925, pp. 74-75

<sup>3</sup> Parnell, F. R., *Rept. Proc. II Conf. Cott. Grg. Prob.* 1934

<sup>4</sup> Afzal M., *Ind. Jour. Agric. Sci.*, 1936 p. 824

<sup>5</sup> Luthra R. S. J. C. *Curr. Sci.*, 1937, p. 596

<sup>6</sup> Bebbington, A. G., and Allen, W., *Emp. Cott. Grg. Rev.*, 1937 p. 31

† Evidence on this point is being published elsewhere