Using one such crystal flake of 1, 2, 5, 6-dibenzanthracene and allowing linearly polarised white light to be incident normally on the flake, its absorption spectra for the above two principal vibrations have been studied by us. Fig. 1 gives a microphotometric record of the absorption spectra in the visible region, the upper curve corresponding to vibrations along the *a* axis, and the lower to vibrations along the *b* axis. It is remarkable that whereas the absorption bands appear prominently when the vibrations are along the *a* axis, they are quite feeble for vibrations along the *b* axis. Thus, these absorptions are practically confined to vibrations in the plane of the benzene rings, the vibrations along the normal to the plane of the benzene rings being almost freely transmitted.

In Fig. 2 are reproduced the microphotometric records (on a different scale from that of Fig. 1) of these two principal absorptions for the *ultra-violet* region. The upper curve corresponds as before to vibrations along the *a* axis, and the lower curve to vibrations along the *b* axis. Here again, the polarisation of the absorption bands is evident.

The absorption by napthalene, 1, 4-napthoquinone and *p*-benzoquinone also show a similar striking dependence on the direction of the light vibration with reference to the molecular planes.

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Insect Transmission of Spike-Disease.

IN a recent issue of the *Indian Forester*[1] there have appeared some further communications on this highly controversial and vexed question. As the subject is one of much scientific as well as practical interest, it has been considered desirable to review the present position with special reference to its mere practical bearings.

In October 1933, Dover[2] announced that *Moonia albimaculata* had three positive transmissions of spike-disease. The resulting symptoms were 'inseparable' from those of typically spiked plants on morphological, biochemical and cytological grounds. The author admitted that the transmissibility of those symptoms by grafting had still to be established.

Sreenivasaya,[3] who carried out the grafting tests, failed, however, to obtain any transmission of symptoms to plants grafted with material derived from the *Moonia*-infected plants. He further states that "the three plants alleged to be diseased only represented a stunted condition which was brought on by an impoverished soil, want of a vigorous host and probably aggravated by insect-feeding"; they "after careful nursing with fresh soil and host, have since turned completely healthy."

In his reply to Sreenivasaya's note Dover[4] does not concur with the claims of his colleague that the *Moonia* plants became healthy and relates his experience of having seen healthier-looking plants recorded as "genuinely spiked" and of markedly reducing "spike-like faces of disease sandal plants" by pruning, nursing or growing in shade.

Literature on the spike-disease of sandal records several instances where such controversial differences of opinion have often been expressed. (See *Proc. Conference on Spike-Disease of Sandal*, 1917.) In fact, the "spike-like new flush bursting in response to certain types of injury to the sandal plant, like fire, has been mistaken for spike." "With regard to the appearance of spike-like growth on trees badly burnt as noted by Mr. Hole, both Mr. H. S. Narayana Rao and Rao Sahib Rama Rao considered that this should be worked upon as a temporary reaction and that later the growth would once more become normal" (*Ibid.*, p. 6). Hearsey referring to the idiosyncracies of sandal, invites attention (*Ibid.*, p. 31) to "the small leafed tree which is invariably found on dry soil in exposed localities, leading a novice to imagine that the tree was spiked". Chatterjee[5] in the course of his extensive

[1] *Indian Forester*, 1934, **60**, 492.
[2] *Ibid.*, 1933, **59**, 695.
[3] *Nature*, 1934, **133**, 382.
[4] *Indian Forester*, 1934, **60**, 505.
[5] *Investigations on Spike-Disease of Sandal*, **1932, 5, 12.**

experiments with "the suspected vectors", *M. variabilis* (*albimaculata*), *P. uniformis* and *Sarmia* sp. (?), observed "distinct shortening of internodes and leaves and also clustering of leaves" in his experiments with *P. uniformis*, but all these trees developed healthy flush later.

The few extracts given above illustrate that certain types of growth present "faces" which may sometimes be mistaken for spike, and emphasise the need for developing an "objective method" of diagnosing the disease, which would be helpful in deciding doubtful cases of growth. Its importance appears to have been fully realised by both the research organisations: (1) the Department of Agriculture, Mysore, and (2) the Indian Institute of Science. Narasimhan of the Mysore Group has provided a cytological technique by which one can diagnose spike while a grafting technique is offered by the Institute workers. The latter technique which is simpler has been applied successfully and extensively for deciding doubtful specimens.

Dover remarks that grafting experiments only yield "a type of evidence which is considered inconclusive when applied to the results of insect transmission studies"[6] and his contention is supported by the Editorial review which asserts that "the results of insect transmission experiments cannot now be proved or otherwise by grafting experiments."[7] It is rather difficult to appreciate the force of this argument, if one remembers that the grafting technique is one that has proved successful in diagnosing cases of spike naturally transmitted by vectors operating in forests. Since the main objective of the entomologist is to transmit spike through the agency of viruliferous vectors, the vector-fed plant, if it should be pronounced to be typically spiked, should answer the grafting test just as much as a spiked plant (grafted with material derived from a naturally diseased plant) does stand a similar test.

It may be argued that in the case of the *Moonia*-fed spiked plants, the dosage was insufficient, that the disease produced was not virulent, and that the vector in question transmitted only a single component of the virus complex which has possibly two or three. But it only serves to establish the fact that the insect transmission has not been the success, as it was announced to be some time ago.[8] It should be, however, admitted that the large number of negative experiments conducted by Chatterjee and Dover are very illuminating, but it is unfortunate that in spite of the independent efforts of the Mysore Agricultural Department and the Forest Research Institute, Dehra Dun, the natural transmission of spike should still remain obscure. We cordially endorse the opinion of the Editor of the *Indian Forester* that "the only profitable course in future is to repeat them extensively with such modifications of technique as are required by the possibly complex nature of the spike virus and the dependence of virulent infection or such factors as dosage or dual vectors."

[6] *Indian Forester*, 1934, **60**, 505.

[7] *Ibid.*, 1934, **60**, 492.

[8] Dover, *Nature*, 1933, **132**, 592.