

BLISTER-LIKE MALFORMATIONS ON TEA SEEDLINGS

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ABSTRACT

A condition resembling blister blight of tea on tea seedlings in quarantine was reported from New Guinea and although the causal fungus was not seen associated with the blisters it was felt that the malformation could have resulted from infection by the fungus which was prevented from sporulation by adverse climatic conditions. Similar malformations on tea seedlings have been observed in Ceylon and India and this article endeavours to show that they are in no way connected with the blister blight fungal disease of tea and to allay fears that the blister blight disease is seed-borne.

AN article on the above subject appeared in an issue of the *F.A.O. Plant Protection Bulletin* a few years ago (Shaw, 1965). It described, with illustrations, a malformed condition of tea seedlings (raised from seed imported from Ceylon) in which hyperplastic growth occurred on the leaves in the form of swellings or blisters, 1-15 mm. in length, often occupying the entire, but occasionally only a part of, the leaf. The malformations were either flat, concave, or slightly convex on the upper surface, convex on the lower surface, in colours ranging from pale green, pale yellow, to red. Although no fungal mycelium, basidium or basidiospore was observed in the sections of these swellings, the author has adduced indirect evidence to suggest that these swellings, or blisters, could be due to *Exobasidium vexans*, the causative fungus of the blister blight disease of tea which is present in Ceylon (and India, Indonesia and Malaysia), but hitherto unknown in Papua and New Guinea. As the chief aim of the article is to forewarn against the introduction of tea seeds from countries where blister blight is endemic, into others which are free from the disease, we are submitting this note to point out that the hyperplastic malformations described by the above-cited author have already been recorded on tea seedlings both in Ceylon (Gadd, 1949) and Southern India (Venkataramani, 1952), and that these are not

blisters produced by *E. vexans*. We will also endeavour to allay fears that the blister blight disease is seed-borne.

In his monograph *The Commoner Diseases of Tea*, Gadd (1949) mentioned the occasional occurrence on tea seedling leaves of what he termed "peculiar blister-like swellings". The description of the malformation in Shaw's paper is almost identical with that given on page 67 of Gadd's monograph. Surprisingly, this author has cited Gadd's publication, but made no mention of his record and description of the same malformation, nor has any reference been made to the record of this malformation by Venkataramani (1952) in Southern India. Both Gadd (1949) and Venkataramani (1952) studied these "blister-like swellings" on tea seedlings in detail, but neither was able to find any fungus, or other organism, within them. As the attempts of these two investigators to transmit the condition to other leaves failed, the origin of this disease was considered quite different from that of the infectious blister blight. Venkataramani (unpublished) also attempted in vain to transmit the condition to tea seedlings not exhibiting it by inarch-grafting, thus excluding the possibility of virus infection. Of course, in the paper under review (Shaw, 1965) the author has conceded that the malformed leaves were free from infective elements, but the suggestion that the malformation could have resulted from infection by *E. vexans*, which was prevented from sporulation by adverse climatic factors, is obvious.

In our observations, so far, most of the seed lots produce an occasional seedling which has blister-like swellings on the leaves, but the record of 8.6% of such seedlings made by Shaw (1965) is of considerable interest. There are no reports either from Ceylon or India of the occurrence of a high percentage of such malformed seedlings. Gadd (1949) has conjectured that the hyperplastic malformation is perhaps due to temporary excessive water supply, accompanied by abnormal rise in temperature. If this is substantiated it may explain the occurrence of an unusually large number of malformed seedlings reported by Shaw, as these were raised at relatively high temperatures. In our recent experiments, a summary of which has been published (Venkata Ram, 1965), potted tea plants were artificially infected with *E. vexans*, maintained in shade at 25° C. for 2-5 days after inoculation and subjected to heat treatment at temperatures ranging from 35° to 45° C. for various lengths of time. Exposure to temperature slightly above 35° prevented lesion formation; no blister-like swelling was seen on any of the inoculated plants subjected to thermotherapy, which should have appeared had the high temperature only prevented the fungus from sporulation, but

not the host reaction to the infection. It is, therefore, unlikely that adverse climatic conditions could prevent only the mycelial development, and subsequent sporulation, of *E. vexans* without impairing the mechanism of hyperplastic cell development resulting from the fungal invasion. Indeed, it appears to us too far-fetched to attribute a malformation which is devoid of any fungal element, to a disease of fungal origin merely from the resemblance of symptoms. In the case of the tea plant, galls and swellings have been occasionally recorded on leaves and roots as abnormalities and their occurrence, so far, has had little impact on commercial tea culture. However, the report of a high percentage of abnormal seedlings by Shaw (1965) should commit the subject to investigation, at least for the sake of academic interest, and as suggested in a country where blister blight is absent, if for no other reason at least to ensure that the experiments are not vitiated by blisters from chance infection through spores of *E. vexans*.

The evidence against *E. vexans* being seed-borne is overwhelming. Blister blight of tea is known to exist in North-East India for over 70 years and seed lots from there have been distributed to Ceylon, East Africa and Southern India. Most of the early planting in Southern India was done with seeds obtained from North East India, yet the occurrence of the disease in these areas is of relatively recent origin (1946-48); tea in East Africa is free from blister blight, although the climatic conditions there are extremely conducive to the disease. It may also be pointed out that if the hyperplastic malformations, under discussion, are produced by seed-borne infection of *E. vexans*, nursery plants raised from seeds collected in areas where the fungus is endemic should produce a high percentage of the malformed seedlings. This is not so. Even where there is the extreme likelihood of the blister spores being carried on the seedcoat, and into the germination beds, there has been no record of the malformed leaves beyond the odd instance. Further, if seed-borne infection were to be incriminated in the development of the "blister-like malformations", the malformations should have appeared on the hypocotyl, or on the tender stem, but none of the authors who has reported the abnormality found its occurrence on the stem. We have no evidence whatsoever to indicate that blister blight disease of tea is seed-borne.

REFERENCES

Gadd, C. H.

.. *The Commoner Diseases of Tea*, Monographs on Tea Production in Ceylon, 1949, 2, 1-94.

- Shaw, Dorothy, E. .. "Condition resembling blister blight of tea on tea seedlings in quarantine in New Guinea," *F.A.O. Plant Prot. Bull.*, 1965, 13, 56-64.
- Venkata Ram, C. S. "Report of the plant pathologist," *A.R. UPASI Sci. Dept. Tea Sect. for 1964-65, 1965*, 18-28.
- Venkataramani, K. S. .. "Report of the botanist," *A.R. UPASI Sci. Dept. Tea Sect. for 1951-52, 1952*, 26-29.