

NOTES ON DEFICIENCY SYMPTOMS IN FORESTRY NURSERIES

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AN investigation of extensive chlorosis and subsequent bud rot among Klinki (*Araucaria Klinkii*) and hoop pine (*A. cunninghamii*) seedlings at Bulolo revealed that unavailability of iron at the high soil and water pHs was responsible for the condition.

Severe chlorosis and stuntedness throughout teak (*Tectona grandis*) nurseries at Keravat on colluvial soils of low organic matter content, proved to be due to a deficiency of nitrogen.

Symptoms similar to those present at the seedling stage can be found in young trees in the field, indicating that the sensitivity of Klinki and hoop pine to alkaline conditions and of teak to low nitrogen soils are factors to be considered in the selection of nursery sites for these trees.

KLINKI AND HOOP PINE

Since 1953, the manufacture of quality plywood from Klinki and hoop pine has become a major industry in the Territory of Papua and New Guinea, and in 1958 was second only to copra in value. The natural resources of these timbers are limited and the long-term prosperity of the industry depends on the success of the reforestation programme being carried out by the Administration.

This report is concerned with one problem which confronted the Department of Forests—the debilitation and, to some extent, loss of seedlings at the nursery stage.

Symptoms in Klinki

The terminal leaves become a uniform yellow tending towards whiteness, while the lower leaves remain dark green. As a secondary effect, bud rot of the chlorotic terminals often follows.

Symptoms in Hoop

Hoop seedlings exhibit identical symptoms, but appear to be a little less susceptible to chlorosis than Klinki.

An investigation of the nursery soils revealed a close relationship between the pH and the severity of the chlorosis in Klinki seedlings.

TABLE I.
Soil pH and Chlorosis comparison.

SOIL pH (0-4 inches) *	SYMPTOMS.
6-7	Invariably absent.
7.0-7.5	Slight and rarely present.
7.5-8.0	Marked and generally present.
8.0-8.4	Invariably present and very severe.

(* soil/water ratio 1 : 5 for pH determination with glass electrode).

The high pH values of the soil and the pattern of the chlorosis strongly suggested that a deficiency of one or more of the trace elements, particularly iron, was responsible. Accordingly, spray trials were designed and carried out by officers of the Department of Forests, and soil applications of sulphur to reduce the pH were recommended.

A composite spray, including magnesium and all trace elements except iron, produced no response. A marked response was obtained to spraying with one per cent. iron citrate with a wetting agent, and to the application of sulphur to the soil at the rate of 1.6 tons per acre. Similar responses were obtained with hoop seedlings.

It was concluded that iron had been rendered unavailable at the high soil pHs, and was responsible for the chlorotic condition of the seedlings, the position being further aggravated by the nursery water supply, which had a pH value of 8.4. Spraying with an iron compound appeared to be a less effective control measure than modification of the soil pH. This was considered to be due to the small leaf area presented by the hoop seedlings for absorption and the waxy nature of the leaf surface of the Klinki, which restricted penetration.

A very similar pattern of chlorosis occurs in young Klinki trees, in a nursery where the top soil had a pH of 7.3 and the subsoil 8.0. It is evident that where there is a choice of soil for nurseries and reforestation those which are alkaline should be avoided.

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KERAVAT TEAK CHLOROSIS

At Keravat, in the New Britain District, experiments have been in progress for some time on the establishment of teak on a plantation site. Material for these experiments comes from nurseries located on river flats, which are composed largely of coarse pumice with silt and volcanic ash intermixed, and have a low humus and clay content.

At the request of the Forestry Department, an inspection was made in 1957 of the chlorotic and stunted condition of the teak, which was present throughout these nurseries.

Symptoms in Teak

In the early stages, the chlorosis takes the form of an interveinal yellowing in the older leaves. As the condition becomes more severe, chlorosis extends to the younger leaves, and older ones become completely yellow with necrotic margins.

A one per cent. urea spray also produced clear evidence of a response in three weeks, but appeared to be less effective than the soil treatment.

The soils of the river flats are made up of colluvial debris and are characteristically low in organic matter, generally containing less than 0.2 per cent. total nitrogen in the 0-3 inch layer. By way of contrast, on higher ground where soils have developed under mature forest on volcanic ash, the total nitrogen content at 0-3 inch ranges between 0.8 and 1.0 per cent. In the field, it is evident that teak performs better on the latter soil, whereas trees such as *kamerere* (*Eucalyptus deglupta*) appear to be well adapted to the former.

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