knife struck a metal piece. The diameter of the metal piece was \( \frac{1}{2} \)". Attempts were made to identify the metal after microincineration. The metal was found to be lead in the form of yellow, rather opaque crystals, soluble in dilute nitric acid blackened by ammonium sulphide. There was definite lesion of the tusk right round the lead piece and the lesion ran about 3" below 1" above the metal piece. Histological sections were taken at 15 micron thickness at different parts of the lesion to study the distribution of the metallic substance. The sections were treated with chromic acid. Microscopically the particles were identified as lead. The concentration of the lead particles seemed to be higher just around the lead piece and was considerably less at the borders of the lesion. Figure 2 shows higher concentration immediately next to the lead piece and Fig. 3 shows single collection of lead particles far below the location of the lead piece. X-ray pictures revealed that the size of the lead piece was about 1" in depth embedded in an irregular manner.

In this specimen, the unusual penetration of the foreign body into the middle of the tusk without any external injury and therefore without any visual evidence of retained foreign body is a feature not seem to have been recorded before in the literature, and at the moment an explanation for this observation is baffling.

Central Food Technological Research Institute, Mysore-2, November 7, 1964.

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**BEHAVIOUR OF CATALASE IN CORN (ZEA MAYS) AND SOYBEAN LEAF TISSUES**

It is reported that catalase from different animal tissues and bacterial cells did not have the same activation energy and behaved differently. The activation energy of horse erythrocyte catalase, of beef liver catalase, and of bacterial catalase is not the same for all (Glick, 1954). In his studies on catalase-chlorophyll relationship in barley seedlings, Applemann (1952) found that catalase in etiolated seedlings had a lower activation energy than the catalase in green seedlings. In order to investigate how the catalase in monocotyledon and dicotyledon plants behaved an experiment was carried out.

**Experimental material.**—Corn (Zea mays) and soybean plants were raised in solution culture under controlled conditions of nutrient levels, duration and intensity of light and temperature in a plant growth chamber. Three weeks after planting, replicated leaf samples were collected from both the sets of plants. Careful consideration was given for proper sampling of leaf tissue since the catalase activity has been found to vary markedly from the base to the tip of the leaf (Euler, 1948). The sampling was done in a cool room by clean hands and at no stage was there any contamination from metal.

**Enzyme preparation.**—One gram of aliquot portion of leaf sample was transferred to a clean chilled porcelain mortar containing 3 ml tris buffer (0.2M tris in 0.3M sucrose solution,
pH adjusted to 7·0). A pinch of acid-washed fine sand was added and the leaf material was trichurated until a fine suspension of leaf homogenate was obtained. After allowing the sand to settle, the suspension was tilted on one side and transferred to a 50 ml. flask by means of a mechanical pipette. The mortar was rinsed several times with buffer solution and all washings transferred to the flask and finally made to volume. All the operations, including weighing, were done in the cold room and only glass-redistilled water was used.

Measurement of the enzyme activity.—Catalase activity was measured manometrically using a Warburg apparatus provided with a temperature control and shaking mechanism. Catalase in the leaf homogenate was allowed to react with hydrogen peroxide at a constant temperature and volume and the liberated oxygen was measured on the manometer.

One ml. of the leaf homogenate and 0·2 ml. of 0·1 N H$_2$O$_2$ were placed in the main vessel and sidearm respectively of the Warburg flask. After equilibrating for five minutes, H$_2$O$_2$ from the sidearm was tipped into the vessel containing the enzyme preparation. This was the zero time. Manometer readings were then recorded at an interval of two minutes each for a period of twenty minutes. The thermobarometer contained 1 ml. of buffer solution and 0·2 ml. of 0·01 N H$_2$O$_2$. The reaction was allowed to proceed at a constant temperature of 30° C. and a shaking rate of 120 °cy./min. Results of the experiment are given in Table I and are expressed as microlitres of oxygen liberated from 1 mg. dry weight during 20 minutes.

| Table I |
|---|---|---|
| Catalase activity* in corn and soybean leaf tissues |

<table>
<thead>
<tr>
<th>Replications</th>
<th>Corn</th>
<th>Soybean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% $O_2$ oxygen/mg. dry wt./20 minutes</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>8·05</td>
<td>9·17</td>
</tr>
<tr>
<td>2</td>
<td>8·84</td>
<td>7·78</td>
</tr>
<tr>
<td>3</td>
<td>9·57</td>
<td>11·44</td>
</tr>
<tr>
<td>4</td>
<td>8·93</td>
<td>8·69</td>
</tr>
<tr>
<td>5</td>
<td>8·14</td>
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</tr>
<tr>
<td>6</td>
<td>9·45</td>
<td>9·80</td>
</tr>
<tr>
<td>Mean</td>
<td>8·83</td>
<td>9·34</td>
</tr>
</tbody>
</table>

* Oxygen liberated in presence of enzyme preparation from hydrogen peroxide.

The catalase activity in soybean leaf tissue was slightly more than in corn leaf tissue. In the same period of time while soybean leaf tissue liberated 9·94 microlitres oxygen per mg. dry wt., corn leaf tissue under similar conditions liberated 8·83 microlitres oxygen per mg. dry wt. Here a comparison is made between the volumes of oxygen liberated within a period of twenty minutes in both the cases. Catalytic reaction of the catalase enzyme with H$_2$O$_2$ is of the first order (Glick, 1954). It would be, therefore, pertinent to compare the magnitude of the volume of oxygen liberated at the end of the period when the first reading was recorded. In the actual procedure the first measurement after the zero time was made at the end of two minutes. In Fig. 1 are plotted microlitres oxygen liberated against time, of the catalase reaction from corn and soybean leaf homogenates.

![Fig. 1. Catalase activity in corn and soybean leaf enzyme preparations.](image)

Although the total amount of oxygen accumulated at the end of the experiment was almost the same in both the samples, in soybean, at the end of first two minutes, oxygen liberated was twice as much as in corn. In the second interval it suddenly dropped showing a typical first-order reaction; and it reached zero level at the end of the fifth interval (10 minutes). However, in corn, oxygen was continued to be liberated even after the fifth interval.

The above observations lead to the conclusion that the catalase in soybean leaf followed the first-order reaction more rigidly than the one in corn, thus indicating difference in the
behaviour of catalase in monocotyledon and
dicotyledon leaf tissues.
Agronomy Department, Utah State University,
Logan, Utah, U.S.A.,
August 20, 1964.

N. G. PERUR.
R. L. SMITH.
HERMAN H. WIEBE.

Letters to the Editor


TEAK OIL FROM TECTONA GRANDIS LINN.

Teak (Tectona grandis Linn.; Family, Verbenaceae) is one of the important commercial timbers of India and other tropical countries. It is valued for its durability as it is immune to insect and fungus attacks and resists wood rot. This inherent quality of teak wood is largely attributed to the presence of oil. The exact nature of the oil is not known so far and the literature on this aspect is very scanty and confusing. A reference to the works on Indian Forestry reveals that teak wood contains an oil which is easily perceptible to the touch and is preservative in character. This oil is used medicinally, as a substitute for linseed oil and as a varnish, apparently indicating the nature of the oil to be as that of fixed oil. Although the woods yield essential oil on distillation, no trace of essential oil was detected on distillation of teak wood. Studies on the chemistry of teak heartwood by Romanis and Kafuku and Sebe have revealed the presence of tectoquinone (2-methyl anthraquinone) in the steam distillate of resinous material obtained by extractiing the saw dust with organic solvents. No work has, however, been reported so far on the oil. An investigation has been undertaken to study the chemistry of teak wood and also to ascertain the exact physico-chemical nature of the oil. The interim results are presented in this paper.

Teak wood on steam distillation yields 0·15% of an oil along with a solid compound (m.p. 178–790), identical with tectoquinone of Kafuku and Sebe.

Fresh shavings (10 kg., moisture, 10·15%) from a log of a brightly coloured teak wood were distilled with steam at a pressure of 2·81 kg/cm² (40 lb/in²) for 4 hours. The distillate was collected in a florentine flask and employing the ‘F.R.I. Oil Trap’ for the recovery of last traces of the oil in the overflowing water. On working up with ether, a thick yellowish-brown oil was obtained which on keeping deposited an orange coloured solid. By repeated congealing and filtration under suction, the solid was separated from the oil. The oil was obtained in 0·15% yield (zero moisture basis) and had the following physico-chemical characteristics:

Colour: Yellowish-brown; Sp. gr. at 28°C 0·9405; Ref. index at 28°C: 1·5023; Opt. rot. at 28°C: –2·20°; Acid value: 3·45; Sap. value: 17·88; Sap. value after acetylation: 96·42; Sol. in 95% alcohol: 1:20.

The solid was purified by chromatography over Brockmann’s alumina and on crystallization from alcohol separated as light yellow fibrous needles melting at 178–79°C. It agrees in all tests with 2-methyl anthraquinone (tectoquinone) of Kafuku and Sebe. With 2:4 dinitrophenylhydrazine, it formed a 2:4 dinitrophenylhydrazone, crystallized from alcohol and ethyl acetate, melting at 254–55°C. On boiling with acetic anhydride, pyridine and zinc, it gave the dicacetate of β-methyl anthrahydroquinone melting at 221–22°C (m.p. reported in literature 216–217°C).

Grateful thanks are due to Shri O. P. Sharma for his technical assistance.

Forest Research Institute, P.O. New Forest, Dehra Dun, M. G. KARNIK.
September 10, 1964.


A PROBABLE PLANT INDICATOR FOR ZINC MINERALISATION IN THE ZAWAR Pb-Zn BELT, UDAIPUR DISTRICT, RAJASTHAN

In the Zawar Pb-Zn belt the ore, consisting mainly of an assemblage of sphalerite, galena and pyrite, occurs as replacement along shear zones, fractures, lithological contacts and fold hinges exclusively in dolomite. The dolomites are intercalated with orthoquartzite, feldspathic quartzite, phyllite, slate, graywacke and epiclastic conglomerate. These Aravalli sediments have undergone regional metamorphism in green schist facies conditions.

Surface expressions of mineralisation like diagnostic gossan zones are absent or very poor.