My sincere thanks are due to Professor J. J. Shah for his guidance and useful suggestions.  

J. D. PATEL  
Anand 388 001, August 4, 1975.


THE MINIMAL TIME REQUIRED FOR NEMATODE EXTRACTION BY OOSTENBRINK’S ELUTRIATOR  
A series of extraction trials was carried out for the root-knot nematode, Meloidogyne incognita (Kofoid and White, 1919), Chitwood, 1949, from tea soils using the standard Oostenbrink’s Elutriator, except that in the last stage of sieving the cotton wool filter was replaced by a nylon sieve with a pore size of 35 μm. In each of the 11 replicated extraction experiments, 100 g of soil was processed. The nematodes recovered through the nylon sieves were counted on the first, second, third and sixth hour, and thereafter on 18th, 21st and 24th hour in different sets. Only in one experiment a few nematodes were noticed at the end of 24th hour. Nematodes other than M. incognita were also found, but this note concerns only with the larvae of M. incognita.

Results presented in Fig. 1 show that in all cases within the first three hours about 86% of the total extractable population came out. Thereafter the extractable populations were very small. A statistical analysis of the data by Ratio test, indicated only a 4% variability in the overall extraction efficiency in the first three hours.

Fig. 1. Average Numbers of Meloidogyne incognita Chitwood extracted at different hours by Floatation technique. (The vertical lines are the standard errors of the mean).

To confirm these findings known populations of the second instar larvae of M. incognita in water suspension were also processed through the nylon sieves. Results presented in Table I are in agreement with what was noted earlier. In this case the extraction was in fact better than processing of soil samples, as in all cases, the extractable population came out within two hours.

<table>
<thead>
<tr>
<th>Replications</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours</td>
<td>1</td>
<td>640</td>
<td>1160</td>
<td>1280</td>
<td>1100</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>60</td>
<td>40</td>
<td>100</td>
<td>80</td>
</tr>
<tr>
<td>Total</td>
<td>700</td>
<td>1200</td>
<td>1380</td>
<td>1180</td>
<td>1140</td>
</tr>
</tbody>
</table>

No nematode extraction at 3, 4, 18, 21 and 23 hr intervals.

We thank the Director, Tocklai Experimental Station, for his interest and Tea Research Association, for permission to publish this report.

Tocklai Experimental Station, B. Banerjee.
Jorhat 8, Assam, S. D. Basu.


OCCURRENCE OF THERMOPHILIC FUNGI IN COAL-MINE SOILS OF MADHYA PRADESH  
Thermophilic and thermotolerant molds occur in a variety of habitats1 3 4 11 12. Presence of these organisms under Indian conditions has, however, not been explored inspite of their economic potential as producers of amylases and cellulases4 8 9 12. During the course of an extensive study of coalmine soils of Madhya Pradesh several new additions to Indian fungal flora were noted and these along with the other notable features of this investigation are reported herein.

Soils collected from the colliery area of District Chhindwara, in M.P. were plated on a variety of media using the plate method13. In order to facilitate the appearance of thermophilic fungi, soils were amended with glucose, cellulose, pepragaine, ammonium nitrate, or ammonium
Phosphate and incubated at 45° C prior to plating. Alternatively, unamended soil was incubated at 45° C and samples were plated on ten enrichment media. The cultures were maintained on peptone-dextrose and Emerson’s YPSS agar media. The temperature relationships were studied by incubating the fungal culture in the range 25–60° C. The identity was confirmed by referring the cultures to CMJ, Kew; their depository numbers are cited in the parentheses in the text.

A total of fourteen fungi were isolated.

**PHYCOMYCETES**: Ahsida carymbijera (Cohn) Saccardo et Trotter (188054); Rhizopus microsporus van Tieghem (188056); Rhizopus rhizopodiformis (Cohn) Zopf (188055).

**ASCOMYCETES**: Achatomum macrorhizum, Wadham et Tiwari (188681); Emericella nidulans (E. dam) Wint (188077); Thermaecous aurantiacus Miehe (188061); Thielavia minor (Rayes and Borut) Malloch et Cain (188066).

**DEUTEROMYCETES**: Aspergillus fumigatus Fresen us (188073, 188078, 188079); Humicola grisea Traen (188076); Penicillium sp. 1; Penicillium sp. II; Sporotrichum sp. (188065); Thermomyces lanuginosus Tsukinisky (188060); Torula thermophila Cooney et Emerson (188067).

Amongst these, *A. fumigatus* and *E. nidulans* were found to be thermotolerants, i.e., they could grow at room temperature (22° C) and also at 45° C but with an optimum at 35–40° C. Other molds grew best at 45° C and could also stand a temperature of 55–60° C.

**Rhizopus rhizopodiformis**, Thermaecous aurantiacus and Torula thermophila are new additions to the Indian fungal flora. The species of *Sporotrichum* recovered from coal-mine soils is new. *Achatomum macrorhizum* is known only as a mesophilic fungus but we have isolated a strain which shows strong thermophily and further studies will be required to define its proper taxonomic grouping.

**Rhizopus rhizopodiformis** (Fig. 1).—Grows very rapidly at 45° C on PDA filling a 9 cm Petri dish in nearly 24 hr. The wooly turf at first white, later turning greyish-black. Vegetative hyphae subhyaline, 3–7 μm diam. ; stolons somewhat reduced. Sporangiophores single, in twos or in groups from reduced nodal regions; rhizoid pale brown, 122–150 × 12–14 μ. Sporangia, black, spherical, smooth, 76–175 μ diam. Sporangiospores, pale brown, smooth, spherical, 3–6 μ diam.

**Thermaecous aurantiacus** (Fig. 2).—This fungus grows well on Sabouraud’s dextrose agar and PDA, filling a 9 cm Petri dish in 2–3 days at 45° C. The colony appears creamy-white; mycelium of septate hyphae, 2.5–3–5 μ diam.; cleistothecia, bright orange to brick red, scattered all over the surface. Asci bright orange, oval to irregular, 11–4–20.0 × 7.6–15.2 μ. Ascospores hyaline, ellipsoidal, 3.8–7.6 × 1.9–5.7 μ.

This organism has been reported from the upper layers of dry pasture soils and from self-heated wood chip piles. It is a new addition to the fungi of India.

**Thielavia minor** (Fig. 3).—Colony on Emerson’s YPSS agar broadly spreading, composed of white, cottony, aerial and submerged hyphae which are 2–5 μ diam. Cleistothecia globose to spherical, walls brown, without ostiole and appendages, 80–160 μ diam., brownish to almost black at maturity. Ascospores, broadly fusiform to elliptical, slightly apiculate at both the ends, dark olivaceous to brown, 10–12.5 × 13–15 μ.

**Figs. 1–4.** Fig. 1. *Rhizopus rhizopodiformis.* A, Rhizoidal system, mycelium, sporangiophore and sporangia; B, Sporangiospores. Fig. 2. *Thermaecous aurantiacus.* A, Branched, septate mycelium; B, Asci with ascospores; C, Ascospores. Fig. 3. *Thielavia minor.* A, Branched, septate mycelium; B, Cleistothecium; C, Ascospores. Fig. 4. *Torula thermophila.* A Mycelium with chains of chlamydospores; B, Thin and thick-walled chlamydospores occurring on the same chain.

Several species of the genus Thielavia: *T. septonum, T. thermophila*, etc., are thermophilic. Our isolate closely resembles the type described by Evans, but differs in that the size of the cleistothecia.
and ascospores are smaller. A fungus resembling T. minor was reported by Lodha\textsuperscript{1} and Padmavathy and Rao,\textsuperscript{2} as T. terricola var. minor but the coal-mine isolate shows strong thermophily and this justifies its placement as T. minor.

**Törula thermophila** (Fig. 4).—Grows well on yeast-malt extract agar, attaining 80 mm diam. 3-4 days at 45° C. Mycelium dark brown; hyphae 3-8-6-0 μ diam, septate, cells 3-8-10-0 μ in length. Chlamydospores smooth, dark brown, in long or short chains, usually intercalary, occasionally terminal, 15-2-16-0 × 11-4-13-2 μ. Thin-walled chlamydospores often associated with the chain of dark spores; the former are generally smaller in diam than the latter.

We thank Prof. S. B. Saksena, Head of the Botany Department, for laboratory facilities and Director, C.M.I., Kew, for identification of the cultures.

Department of Botany, University of Saugar, Sagar 470 003, M.P.,
September 8, 1975.


---

**VEIN ENATION: A NEW VIRUS DISEASE OF MAIZE IN INDIA**

Symptoms of vein swelling and vein enations or galls on the leaves of maize have been observed every year since 1972 in Darjeeling hills. Affected plants were stunted and showed leaf chlorosis. The root system of the diseased plants was much reduced and rotted. Affected plants developed partially sterile tassels which usually did not emerge due to curling or twisting habit of the leaves. The plants developed abnormal cob and the grain yield is reduced. Premature death of many of the affected seedlings was not uncommon. The incidence of the disease ranged from 1 to 15% in different fields. The disease was observed to be spreading in the fields, hence we suspected that the symptom-inducing factor was infectious in nature, possibly a virus, as no pathogenic fungus or bacteria was isolated from the affected plants. Since the disease appeared to cause considerable loss to the maize crop, investigations were undertaken to characterize the causal agent.

The disease was not transmissible by sap, seed or aphids (*Myzus persicae* and *Rhopalosiphum maidis*) but is transmitted by a jassid vector, *Cicadulina mbila* Naude. For transmission studies, insects were collected from the fields and were maintained for a week on diseased and subsequently for four days on healthy seedlings of maize var. Kalimpong local. In the first attempt 15 out of 20 plants inoculated with *C. mbila* were infected. Transmission of the disease was confirmed repeatedly in experiments using *C. mbila* as vector and glasshouse infected maize plants as virus source.

Symptoms of the disease in glasshouse infected maize plants appeared as white spots on leaf veins. The veins on the lower surface of leaf blade showed severe swelling and numerous white spindle shaped galls or enations usually developed within 3 to 5 days after infection (Fig. 1). Rest of the symptoms were similar to those observed in the field.

---

**FIG. 1.** Maize leaf showing symptoms of vein enation virus.

Various plant species were raised in the glasshouse and inoculated at 4 to 6 leaf stage for host range studies. For testing each species/variety 20 to 30 insects were employed. The insects were