Leaf litter fungi found on Pinus longifolia Salisb.

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Very few studies (Webster, 1957; Pugh, 1958) have been made on leaf litter fungi in the world. In India so far no studies have been made on this material. Leaf-litter is the material from which the greater part of the organic horizon of the soil is derived, and certain of its properties play dominant roles in determining the nature of the organic horizon (Handley, 1954) and in the development of soil profile (Joffe, 1932). The leaf-litter of *Pinus longifolia* Salisb., is a very convenient material for study, as the forests of Pine are generally found in the Himalayan tracts in India. In the present study the place chosen was Ranikhet, District Almora, U. P. The leaf litter of *Pinus longifolia* Salisb., has strong humus forming tendencies and the protracted breakdown process leads to considerably accumulation of litter in progressive stages of decay which may be recognised as the litter, 'fermentation' and 'humification' as defined by Hesselman (1926).

Material and Methods.

Leaf litters of Pine needles which have accumulated on the soil were selected for the present study. The main needle falls in August with a secondary fall in May. These pine needles were collected in September and June in sterilized containers. The pine litters are of two types (i). The fallen needles which are dark grey in colour and quite fresh (fresh litter), (ii). The needles which become mixed with soil and old (old litter). These leaf litters were collected and different fungi were isolated by the following methods on different media (Hay extract agar, Potatodextrose agar and Czapek's agar).

1. Hyphal isolation method (Warcup, 1955 a).
2. Dilution method (Waksman, 1927).
3. Direct method (Waksman, 1916).

Mycelia growing in the interior of pine needles were selectively isolated by sterilizing the needles with 0.1% (W/V) aqueous mercuric chloride solution before plating.

Observations.

The fungi isolated by different methods were identified with the help of relevant literature.

Fungi	September 1963 Fresh litter	Old litter	June 1964 Fresh litter	Old litter
1. *Absidia spinosa* Lendner	+	—	+	—
2. *Gongronella butleri* (Lend.) Peyronel & Dal Vesco.	—	—	+	—
3. *Rhizopus stolonifer* (Ehrenberg) Fres.	+	+	+	+
4. *Circinella muscae* (Sorokine) Berl. & Detoni	+	+	—	—
5. *Mucor racemosus* Fresenius	+	+	+	+
6. *Mucor jansseni* Lendner	—	+	+	—
7. *Mucor luteus* Linnemann	—	+	+	+
8. *Mortierella ambiqua* Mehrotra	+	+	+	+
* 9. *Mortierella* spp.	+	+	+	+
10. *Helicostylum* spp.	+	+	—	—
11. *Achlya spp.*	+	+	+	+
12. *Aspergillus sydowi* (Bain & Sar.) Thom & Church	+	—	—	—
13. *Aspergillus fumigatus* Fres.	+	+	+	+
14. *Aspergillus awamori* Nakazava	+	+	+	+
15. *Penicillium funiculosum* Thom	+	+	+	+
16. *Penicillium stipitatum* Thom	+	—	+	+
* 17. *Penicillium duclauxi* Delacroix	+	—	—	—
18. *Neocosmospora vasinfecta* Smith (E. F.)	+	—	—	—
19. *Humicola grisea* Traaen	+	—	—	—
20. *Cladosporium herbarum* (Persoon) Link	+	+	+	+
21. *Trichoderma viride* Fres.	+	+	+	+
* 22. *Paecilomyces puntonii* (Vuill) Nannizzi	—	—	+	+
23. *Pullularia pullans* (de Bary) Berk.	+	+	+	+
* 24. *Stachybotrys* spp.	+	+	+	+

The fungus flora obtained from old leaves was found altered as the leaf material decomposed. This can be very well judged by the presence or absence of various fungi in the list. The number of species, and the number of isolations, were least in the oldest litter and greatest on the new surface leaves. Similar was the finding of Pugh (1958). Chesters has postulated that the so called „soil fungi" in fact grow upon particles of organic matter, so it may be appropriate to consider some opinions regarding the changes induced during colonization of such particles in the soil. Garrett (1951) was of the opinion that the changes which attributed in the flora to the progressive breakdown of the newly invaded substrate by a succession of heterotrophic micro-organisms, and Newman and Norman 1943) suggested that the nature of the available energy materials largely determined the fungus flora.

The most common fungi in the present studies were *Aspergillus awamori, Mortierella, ambigua, Mortierella* spp., *Penicillium funiculosum, Achlya* spp., *Pullularia pullans, Stachybotrys* spp., and *Trichoderma viride.* Out of these species isolated and identified from the fresh and old litter of *Pinus longifolia* Salisb., in September and June, viz., *P. duclauxi* Delacroix and *Paecilomyces puntonii* (Vuill.) Nan-

nizzi, were new records from India. Isolation techniques have shown that *Penicillium, Trichoderma* and *Mortierella* are widespread in old litter, *Mortierella* spp. often predominating.

The microflora recorded from inside the needles included are *Pullularia pullans, Stachybotrys* spp. and *Mortierella* spp. only.

Summary.

The most common fungi present in the leaf litters of Pine forests found on Himalayan tract in India were *Aspergillus awamori, Mortierella ambigua, Mortierella* spp., *Penicillium funiculosum, Achlya* spp. and *Trichoderma viride.* Out of the twentyfour species isolated and identified from the fresh and old litter of *Pinus longifolia* Salisb., viz., *Penicillium duclauxi* Delacroix, *Paecilomyces puntonii* (Vuill.) Nannizzi, *Stachybotrys* and *Mortierella* spp. were new records from India.

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* Originals not seen.