MORPHOLOGY AND TERMINOLOGY

Fructifications

The hydnaceous fruit bodies vary in their habit from typically resupinates to pileate ones with distinct stalks. In the genera Hydnum, Hydnellum, Phellodon, Sarcodon and Auriscalpium, the fructification is comprised of a well developed stipe with distinct pileus bearing spines on the under side. The attachment of stipe to the pileus is lateral (in a notch) in Auriscalpium and central to eccentric in the remaining genera. Donkiella pulcherrima and some species of Steucherinum have the pileate fruit bodies which may be sessile or attached to the substratum by narrow bases or vertices. Gloiodon strigosus is unique in having resupinate to pileate fruit bodies composed of dichotomously branching processes bearing spines on their undersides. In the genera Odontia, Grandinia, Sarcodontia, Kevinia, Caldesiella, and Eohinodontium, the fructifications are usually strictly resupinate or rarely resupinate to effused-reflexed, mostly adnate or sometimes loose and separable. The resupinate fructifications are composed of usually
a well developed subiculum on the substratum and bearing on it downwardly directed spines teeth or warts. In Hericium, the fructification is sessile or sub-stipitate, pendent, nodular and cushioned or repeatedly branched structure bearing downwardly directed spines.

Spines are typically subulate, terete and distinct in most of the species of pileate genera and in Sarcodonta and some species of Odontia from resupinates. These are represented by minute warts in most of the species of Grandinia, Caldesiella and many species of Odontia. In Stegcherinum, spines are sometimes irregular and flattened or irpiciform. In case of Radiulum, these are usually deformed, or replaced by small lamellar processes.

**Context**

In general, the term context means all tissue (except hymenium and subhymenium) of which the fructification is composed of. However, for the context present in the spines both in resupinates and stipitates the term 'trama' has been used here. Thus, term context implies to subicular tissue in resupinates and to the tissue of stipe and pileus in stipitates. In the stipitate genera, context may be homogeneous or it may be duplex, i.e., differentiated into two distinct parts on the basis of consistancy and colour; the hard parts are composed of parallel and compacted hyphae and the soft and spongy parts are of interwoven hyphae.
Hyphal system

In majority of the genera of Hydnaceae the hyphal system is monomitic but in Stegcherinum, Auriscalpium and Gloiodon, it is dimitic. Hyphae are usually subhyaline or light ochraceous but in Caldesiella, Sarcoodon, Phellodon, Auriscalpium, Hydnellum and Gloiodon, these are mostly dark-coloured. Hyphae are mostly non-inflating but inflated in the fleshy genera such as Hydnium, Sarcoodon and Hericium. The context hyphae in subiculum or stipe and pileus in stipitates and in the spines are similar except that these in the spines are slightly narrower in diameter. The description of hyphae given in the text pertains to all hyphae (in subiculum, stipe, pileus - which one is present, and spines), unless otherwise specified. In some species of Hydnellum, Sarcoodon and Phellodon, some hyphae in the context of pileus are encrusted with very fine granules which darken in Helzer's reagent and give the hyphae an 'apparent - amyloid' appearance.

Hymenium

Hymenium is located on the underside of the fructification on downwardly directed spines, teeth or warts and also in between them (except Kavinia alboviride where located only on spines). It is composed of basidia and paraphyses. In some cases, cystidia or gloeocystidia are also present in the hymenium. The subhymenium in
most of the species studied is insignificant or lacking but it is very distinct and stratified in *Echinodontium japonicum*.

**Basidia**

These are unicellular, usually clavate to subclavate or cylindrical but in some species of *Oidontia*, they are suburniform. The sterigmata are generally 4 or 2-4 per basidium but their number varies between 2-3-4-5 in *Hydnum repandum*.

**Paraphyses**

These are sterile structures present in the hymenium along with basidia. In most of the cases these are of no taxonomic value and hence have not been studied.

**Cystidia**

The cystidia are very variable structures present in the context (both in subiculum and spines) or hymenium of fruit body, or in both. These are formed by the modification of the part of hypha or whole of the hypha in such a way that they become distinct from the adjoining tissue. Thus, these may be thin-walled or thick-walled, encrusted or naked, and of various shapes - cylindrical, clavate, fusoid or ventricose, vesiculose etc. Cystidia may be projecting out from hymenium or completely embedded in trama and context, often in fascicles and
embedded in trama of spines and projecting in bundles at their apices and sides. Normally, cystidia are non-septate but in *Odontia setigera*, *O. cristulata* and *O. hydnoides* septate cystidia are present. Lentz (1954) has given an excellent account of cystidia. He has discussed the true cystidia under two main types, their on the basis of origin and location, namely, i) Tramal cystidia originating deep in trama and ii) Hymenial cystidia present in the hymenium and originating in the same way as the basidia.

Cystidia are present in two genera, *Stecherinum* and *Odontia* and serve as a very good taxonomic character for distinguishing between the species. Because of the presence of the cystidia, *Odontia* stands distinct from the allied resupinate genera *Grandinia* and *Garrodontia*.

**Gloeocystidia**

These are thin-walled structures filled with oily contents and are usually immersed in or sometimes slightly projecting out of hymenium. The gloeocystidia are present in all species of *Hericium*, *Auriscalpium*, *Dentipellis* and *Gloiodon*. Since, the gloeocystidia usually do not show any significant morphological variation, these are not helpful in segregating the species. Normally, these are detectable, even without staining but when stained with 1% Phloxine in KOH, the gloeocystidia become deeper in colour than rest of the tissue. However, in some cases,
their presence or absence can be confirmed with sulfobenzeldehyde*.

**Basidiospores**

The basidiospores show great variation in their shape, size, colour and ornamentation of the wall. These may be globose or subglobose, ovoid to ellipsoidal or allantoid. Spores are smooth to minutely verrucose in majority of the genera, echinulate in Phellodon and tuberculate in Caldesiella, Sarcodon and Hydnellum. Usually the basidiospores are subhyaline or white but are brown in Hydnellum, Sarcodon, Caldesiella and Kavinia albiviride. It has been observed that these are amyloid in Hericium, Gloioodon, Auriscalpium, Dentipellis and Echinodontium.

**Texture**

The texture is an important character and in stipitate Hydnums it is often helpful in distinguishing the genera. Thus, in Sarcodon texture is fleshy and brittle but in Hydnellum it is leathery-pliable, the spores in the two genera being exactly similar. It is easier to know the texture of larger fruit bodies but it is very difficult to record the texture of resupinates, where the tissue is very thin. Thus, where the texture of larger fruit bodies is noted with the feeling of touch,

*Water 1.5 ml, pure sulphuric acid 5.0 ml, and Benzeldehyde 4.5 ml.*
it is done so with the help of a microscope in case of
many resupinates. Largely the terminology followed
here for denoting various types of texture in the
resupinates is after Talbot (1954). The following
5 main types of texture were similarly recorded:

1. Membranous: The hyphae are very compact and there
   is not a clearcut demarcation between the hymenium
   and context, e.g., Odontia fimbriata.

2. Pelliculose: The hyphae of context are loosely
   interwoven but the hymenium forms a compact palisade
   like layer and is sharply delimited from the context,
   e.g., Grandinia farinacea, Odontia sp.

3. Waxy or ceraceous: In arrangement of hyphae it
   resembles with membranous type but finally the hyphae
   lose their individuality due to agglutination or some
   chemical changes, e.g., Odontia hydnoides, Q. crustosa,
   Q. bicolor, species of Sarcoodontia.

4. Floccose: The hyphae are very loosely interwoven
   and the hymenium is discontinuous and often staged
   at different levels, e.g., Caldesiella viridis.

5. Arachnoid: It is like floccose except that
   hymenium is not staged at different levels, e.g.,
   Odontia arguta, Grandinia stimulispore.