

Taxonomy of *Lenzites reichardtii* Schulz. and *Lenzites warnieri* Dur. et Mont. apud Mont.

S. DE*, A.B.DE** AND ANJALI ROY

* Department of Botany, Moulana Azad College, Kolkata, West Bengal, India **Department of Botany, Burdwan Raj College, Burdwan 713104, West Bengal, India and Department of Botany, Visva-Bharati University, Santiniketan 731235, West Bengal, India

Morphological and anatomical studies of *Lenzites reichardtii* Schulz. and *Lenzites warnieri* Dur. et Mont. apud Mont. show that these two species are quite different.

Key words: *Lenzites reichardtii*, *Lenzites warnieri*, taxonomy

INTRODUCTION

Lenzites reichardtii Schulz. and *Lenzites warnieri* Dur. et Mont. apud Mont. grow in Europe, Africa and Asia. They cause white rot on angiospermic wood. Morphological and anatomical characters of basidiocarps of *L.reichardtii* have been studied by Igmandy (1962), David (1967) and Tortic (1972) while Kreisel (1977) and Allard (1990) have studied *L.warnieri*. These two species are treated as synonymous by Jungblut and Reichling (1981) and Intini and Bernicchia (1984). The present paper reports the results of detailed studies on the morphological and anatomical characters of these two species and taxonomy of these taxa is discussed in the light of these findings to clarify the dispute around them. As these two species do not grow in India, their basidiocarps have been procured from the herbaria abroad but all attempts to procure cultures of these two fungi have failed. Conclusion on the taxonomy of these two species is, therefore, drawn on the basis of detailed critical studies of their morphological and anatomical characters.

MATERIALS AND METHODS

Sporophores of *L.reichardtii* and *L.warnieri* were procured from Herbarium Institute Zoologici et Botanici, Acad. Sc. RPSS Estonicae (TAA). Constructions of the basidiocarps were studied from

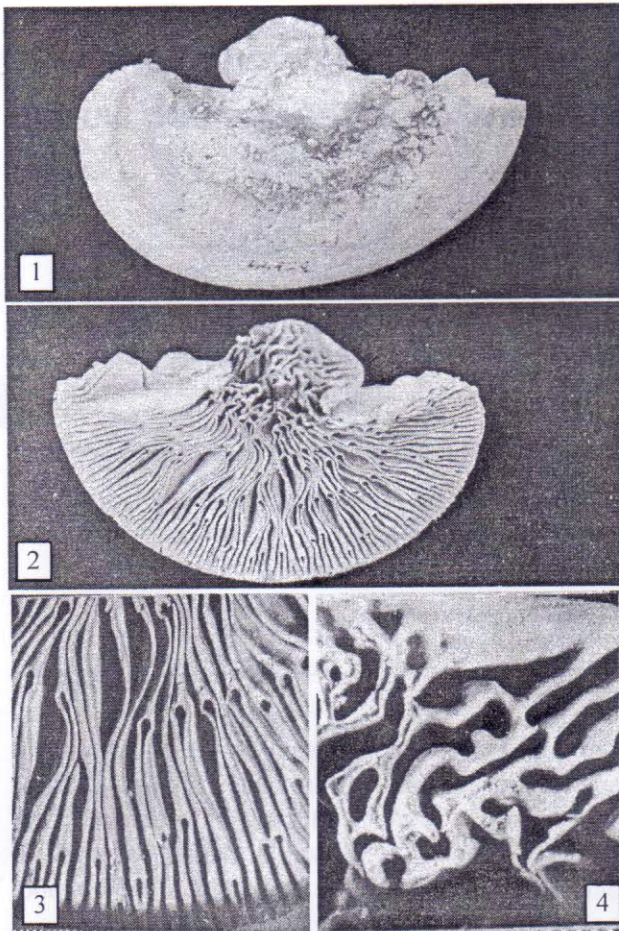
freehand thin sections of different parts of the specimens. Microstructures from different parts of basidiocarps were studied following the recommendations of Teixeira (1956), stained in cotton blue, teased apart, mounted in lactophenol and sealed by nailpolish for future use.

DESCRIPTION OF BASIDIOCARPS

Lenzites reichardtii Schulz. in Thum. Micol. Univ. No.1501 Flora, 1880.

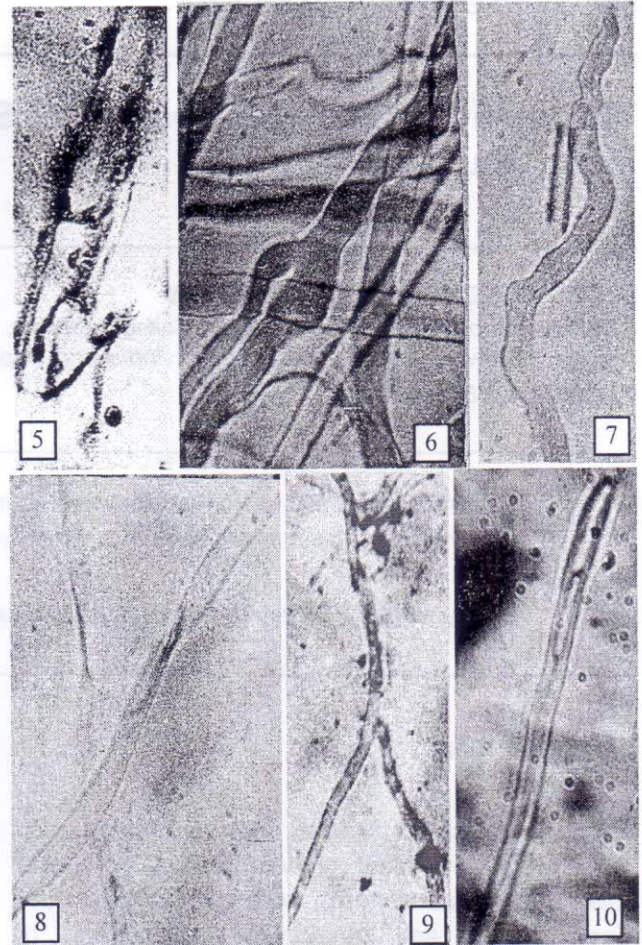
Macroscopic features: Basidiocarps sessile, dimidiate, semicircular, 5-20 X 3-8 X 1.5-2.0 cm, aplanate; upper surface of pileus finely tomentose when young, glabrous with age, subzonate, pale alutaceous to cream-brown to grayish-black, particularly towards the base where also appear small protuberances (Fig. 1); margin generally obtuse and sterile below; context suberose, cream-brown, up to 1 cm thick; hymenial surface (Fig. 2) creamy-ochraceous to cream-brown, lamellate, lamellae 3-4 times dichotomously branched in major portions (Fig. 3) and daedaloid towards the base (Fig. 4), lamellae up to 2 mm thick, up to 3 cm broad and 4-6 per cm at the margin.

Microscopic features: Hyphal system trimitic; generative hyphae hyaline, much branched with conspicuous clamp connections, of both thin- (Figs.



Figs. 1-4. *Lenzites reichardtii* : 1. upper surface of basidiocarp ($\times 1$); 2. hymenial surface of basidiocarp ($\times 1$); 3. lamellate type of hymenial configuration ($\times 3$); 4. daedaloid type of hymenial configuration ($\times 3$).

5 & 11) and thick-walled type, thickening more prominent at the septa (Fig.12), 1.2-2.6 μm wide, abundant in the pore field; skeletal hyphae abundant everywhere, hyaline but pale in mass, aseptate, some on the pileus surface showing brown pigmentation within the lumina (Fig.13), thick-walled to solid, usually unbranched (Fig.7), but occasionally some branched at the stem part (Figs. 6 & 14), apex rounded, 4.0-6.5 μm wide, tape-like skeletal hyphae (Figs. 8 & 15) of 4.0-5.2 μm wide also present; binding hyphae hyaline, much branched, branches mostly long (Figs. 9 & 16), some short, short branches characteristically wider than the main stem (Fig.17), sometimes arising almost at right angles from the main stem, thick-walled to subsolid to solid, 2.0-3.3(-5.5) μm wide, occur in the pore field and dissepiment but absent in the context proper, some of the short branches of binding hyphae penetrating into the pore mouth like candelabra (Fig.18), 2.0-2.6



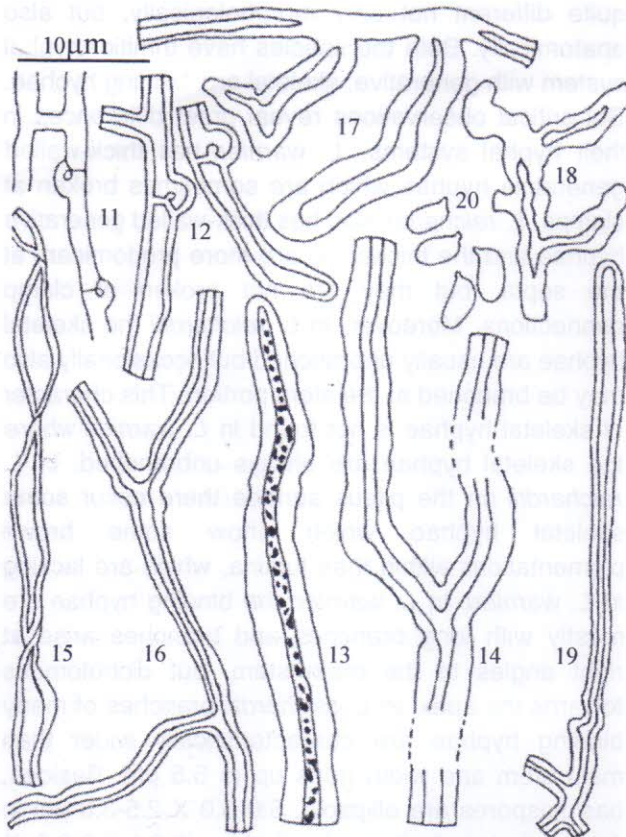
Figs. 5-10. *Lenzites reichardtii* : 5. thin-walled generative hypha ($\times 1000$); 6. skeletal hypha branched at stem part ($\times 1000$); 7. unbranched skeletal hypha ($\times 1000$); 8. tape-like, twisted skeletal hypha ($\times 1000$); 9. binding hypha ($\times 1000$); 10. cystidioid hypha ($\times 1000$).

μm wide; true cystidia lacking but frequently terminal part of binding hyphae found penetrating into the pore mouth from dissepiment behaving as cystidia (Figs. 10 & 19), 2.6-4.0 μm wide; basidiospores hyaline, thin-walled, ellipsoid-cylindric (Fig.20), (6.0-) 7.0-9.0 X 3.0-4.0 μm .

Specimens studied: N 44978, N 44979, N 44980 & N 44981, all from Tschatkal Mountains, Kirghizia, Kazakhstan. on logs of *Juglans regia*.

***Lenzites warnieri* Dur.et Mont. apud Mont., 1860: 182.**

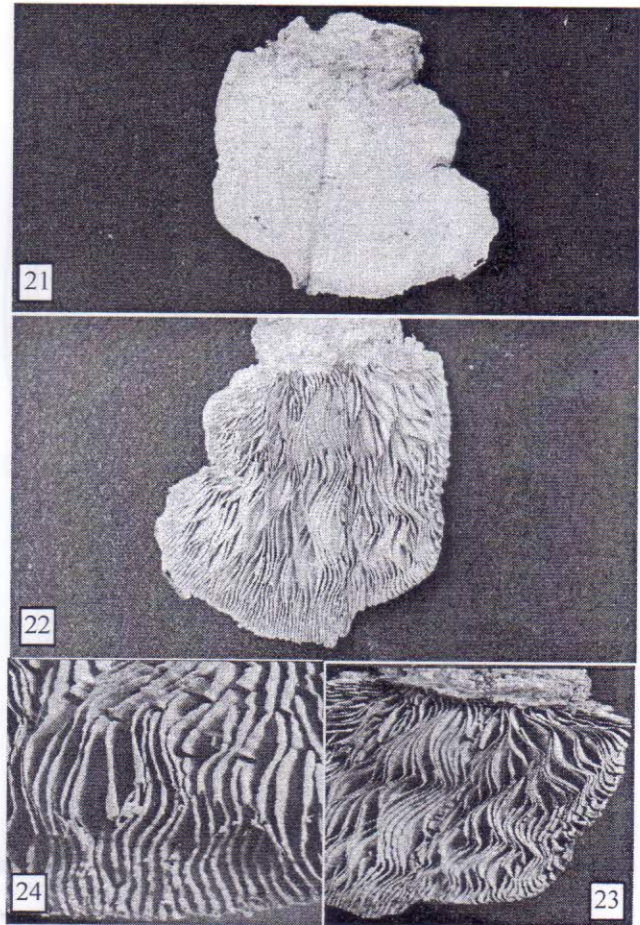
Macroscopic features: Basidiocarp sessile, dimidiate, 5-28 X 3-10 X 1.5-3.5 cm; upper surface of pileus (Fig. 21) pubescent when young, glabrous with age, subzonate, often tuberculate in the older part, colour cream-brown to grayish-brown; margin



Figs. 11-20. Microscopic structures from basidiocarp of *Lenzites reichardtii* schulz.: 11. thin-walled generative hypha; 12. thick-walled generative hypha; 13. skeletal hypha with brown pigmentation; 14. skeletal hypha branched at the stem part; 15. tape-like, twisted skeletal hypha; 16. binding hypha with long branches; 17. binding hypha with short branches characteristically wider than the main stem; 18. candelabra-shaped binding hypha; 19. cystidioid hypha; 20. basidiospores.

thin, acute, fertile below; context corky, suberose, white-buff, up to 1.5 cm thick; hymenial surface (Fig. 22) creamy-ochraceous, lamellate (Fig. 23), lamellae 3-4 times dichotomously branched (Fig. 26), up to 1 mm thick and up to 1.5 cm wide, 8-12 per cm at the margin, lamellae sometimes daedaloid or sinuous at the base of the pileus.

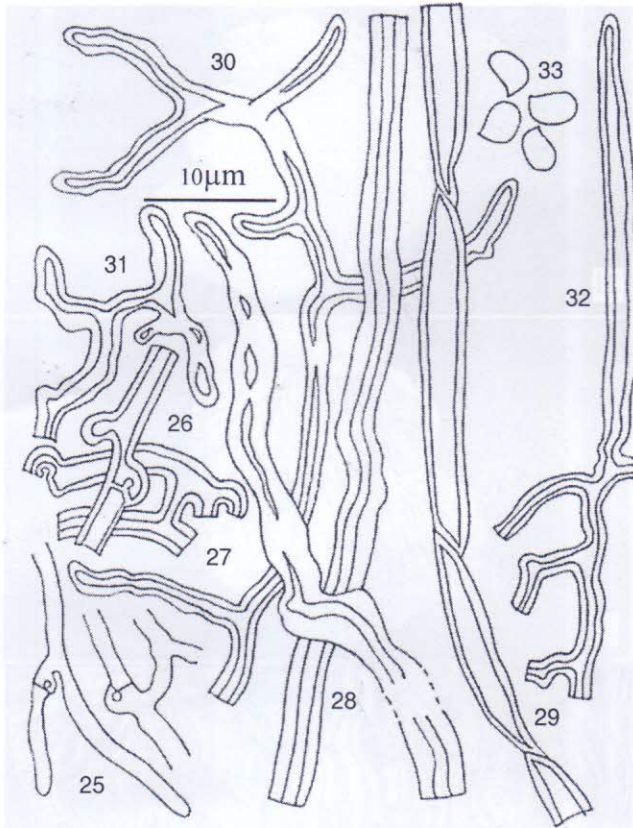
Microscopic features: Hyphal system trimitic; generative hyphae hyaline, much branched with clamp connections, mostly thin-walled (Fig. 25) but some also thick-walled (Fig. 26) and broken at clamps (Figs. 26 & 27), 1.8-3.0 µm wide; skeletal hyphae hyaline, unbranched, aseptate, tortuous, of two types: (i) thick-walled with narrow lumina, subsolid to solid, apex tapering or blunt, 5.2-6.5 µm wide, abundant everywhere (Fig. 28), (ii) slightly thick-walled, twisted and tape-like with wide lumina, 5.2-6.5 µm wide, much less abundant than the other



Figs. 21-24. *Lenzites warnieri*: 21. upper surface of basidiocarp (×1); 22. hymenial surface of basidiocarp (×1); 23. lamellate type of hymenial configuration (×2); 24. lamellate type of hymenial configuration showing 3-4 times dichotomous branching of lamellae (×4).

type ((Fig. 29); binding hyphae hyaline, tortuous, much branched, branches mostly long, thick-walled with narrow lumina or solid, often arising at right angles to the main stem and dichotomous towards the apex, 2.0-4.0 µm wide (Fig. 30), abundant in all the regions of basidiocarps, also occur at the edges of the pore mouth candelabra-shaped structures formed by the short, upright branches of binding hyphae, 2.0-2.6 µm wide, characteristic of the genus *Lenzites* (Fig. 31); true cystidia lacking, but frequently terminal part of long branches of binding hyphae found penetrating into the pore mouth from dissepiment like cystidia, 2.6-4.0 µm wide (Fig. 32); basidiospores hyaline, thin-walled, ellipsoid, 5.0-6.0 X 2.5-3.0 µm (Fig. 33).

Specimens studied: TAA 93634, TAA 93635, TAA 93636 & TAA 93637, all from Lozo, Bitshevaja, former USSR, on logs of deciduous woods.



Figs. 25-33. Microscopic structures from basidiocarp of *Lenzites warnieri* Dur. et Mont.: 25. thin-walled generative hypha; 26. thick-walled generative hypha; 27. thick-walled generative hypha with broken clamp; 28. skeletal hyphae; 29. tape-like, twisted skeletal hypha; 30. binding hyphae; 31. candelabra-shaped binding hypha; 32. cystidioid hypha; 33. basidiospores

DISCUSSION

From the above observations it is clear that there are more dissimilarities between *L. reichardtii* and *L. warnieri* than similarities. The morphology of *L. reichardtii* shows its independence as a species from *L. warnieri*. The shape of the basidiocarp is semicircular in *L. reichardtii* which is not in *L. warnieri*. *L. reichardtii* with basidiocarp having obtuse margin which is sterile below differs largely from *L. warnieri* having basidiocarp with acute thin margin which is fertile to the end. These two species are similar in showing lamellate hymenial surface in their cream-brown to grayish basidiocarps; but in *L. reichardtii* the lamellae are thicker (up to 2 mm) than those of *L. warnieri* (up to 1 mm). In the former lamellae are 4-6 per cm in the margin while in the latter they are 8-12 per cm.

These two species, *L. reichardtii* and *L. warnieri*, are

quite different not only morphologically, but also anatomically. Both the species have trimitic hyphal system with generative, skeletal and binding hyphae. But critical observations reveal great differences in their hyphal systems. *L. warnieri* has thick-walled generative hyphae which are sometimes broken at clamps. *L. reichardtii* also has thick-walled generative hyphae and the thickening are more predominant at the septa, but they are not broken at clamp connections. Moreover, in *L. reichardtii* the skeletal hyphae are usually unbranched but occasionally also may be branched at the stem portion. This character of skeletal hyphae is not found in *L. warnieri* where the skeletal hyphae are always unbranched. In *L. reichardtii* on the pileus surface there occur some skeletal hyphae which show some brown pigmentations within their lumina, which are lacking in *L. warnieri*. In *L. warnieri* the binding hyphae are mostly with long branches and branches arise at right angles to the main stem, but dichotomous towards the apex. In *L. reichardtii* branches of many binding hyphae are characteristically wider than main stem and width goes up to 5.5 µm. Besides, basidiospores are ellipsoid, 5.0-6.0 X 2.5-3.0 µm in *L. warnieri* and ellipsoid-cylindric, (6.0-) 7.0-9.0 X 3.0-4.0 µm in *L. reichardtii*.

Great differences are also noticed in the distribution pattern of the hyphal systems in these two species. *L. warnieri* is trimitic with all the three kinds of hyphae viz., skeletal hyphae, binding hyphae and generative hyphae abundantly distributed in every region within the basidiocarp. But in *L. reichardtii*, its context is dimitic with generative and skeletal hyphae, while its pore field and dissepiment are trimitic where binding hyphae occur along with generative and skeletal hyphae. Such differences in distribution pattern of hyphal systems in the two species is of great importance because hyphal types as well as their distribution pattern in the different regions of basidiocarps is now recognized as having great taxonomic significance (Bondartzeva, 1963; Niemela, 1972).

Presence or absence of hyphal types as well as the different types of hyphae in a basidiocarp are regarded by modern taxonomists as characters of great taxonomic value (De, 1994; Roy, De & Pal, 1994; Permasto & Ryvarden, 1990; Ryvarden & Guzman, 1993; Melo, 1995). So, the great dissimilarities in the hyphal characters, hyphal types

and hyphal distribution within the basidiocarps of these two species are taxonomically noteworthy and clearly indicate that the two species namely *L. reichardtii* and *L. warnieri* are two different species, one differing widely from the other.

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