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Taxonomy of *Hexagonia scutellata Comb. nov.*

ANJALI ROY AND A. B. DE
Department of Botany, Visva-Bharati University, Santiniketan 731 235 and Department of Botany, Burdwan Raj College, Burdwan 713104, West Bengal

Detailed observations on morphological and cultural characters of *Fomes scutellatus* (Schw) Cke. are given and in the light of these observations the taxonomy of the fungus is discussed. The new combination *Hexagonia scutellata* (Schw.) Roy & De is proposed.

Key words : Toxonomy, *Hexagonia scutellata*

INTRODUCTION

In India *Fomes scutellatus* (Schw.) Cke. grows on dead wood of *Cedrus deodara* Loudon where it causes a white rot. The fungus is also distributed in Mexico, New Zealand, Agrentina and North America. The present paper reports the results of detailed studies on the morphological and cultural characters of *F. scutellatus* (Schw). Cke. The taxonomy of the species is also discussed in the light of these findings.

MATERIALS AND METHODS

Observations were based on fresh specimens collected by the authors from Uttar Pradesh and temperate Himalayas (India). Microscopic characters of the basidiocarps were studied from free-hand sections mounted in 10% KOH and stained with 1% Cotton blue. Cultures were established from context tissues of these basidiocarps and studied following the methods of Nobles (1948) and Nobles *et al.* (1957). Oxidase reactions were tested by the Bavendamm method as described by Davidson *et al.* (1938). Voucher specimens and cultures are maintained in the Mycological Herbarium of the Visva-Bharati University (VBMH).

DESCRIPTION OF BASIDIOCARP

Hexagonia scutellata (Schw.) Roy & De, comb, nov. = *Polyporus scutellatus* Schw., Trans, Amer, Phil. Soc. II 4 : 157, 1832 (Basionym).
= *Fomes scutellatus* (Schw.) Cke., Grevillea 14:19, 1885.

Basidiocarp annual or reviving next year, sessile, effused-reflexed to pileate, pileus broadly to narrowly attached, usually small, may be up to 3.5 cm long, 3.0 cm broad and 0.5 cm thick, corky to woody, scutellate or ungulate, whitish or brownish and tomentose when young, becoming glabrous later, forming black crust, concentrically zonate and radially wrinkled; margin round, entire or lobed; context light brown,

corky, about 2.5 mm wide; hymenophore white to grey to wood coloured, plane or concave, pores regular, circular, 4-6 per mm, tubes indistinctly stratified, up to 2 mm long in each layer.

Hyphal system trimitic. Generative hyphae usually hyaline, clamped, thin-walled, 2.2-4.2 µm wide (Fig. 1) some subhyaline, slightly thick-walled, shortly branched and with projections, all firmly interlocked, found in the crusty part of the pileus (Fig. 2) Skeletal hyphae (Fig. 3) yellowish brown, thick-walled to solid, 3-4 µm wide. Binding hyphae (Fig. 4.) hyaline to subhyaline, much branched with short flexuous branches, thick-walled to solid, 2.5-3.5 µm wide. Basidia (Fig. 5) hyaline, thin-walled, clavate, 4-sterigmate 12-20 x 6-9 µm. Basidiospores (Fig. 6) hyaline, cylindrical, thin-walled, smooth, guttulate, 7.0-10.0 x 3.0-3.5 µm.

Specimen examined : VBMH 821071, 821072, 831173, 861074, 881075 and 931076 on dead wood of *Cedrus deodara* Loudon.

Rot : Associated with white rot.

Growth characteristics : Growth slow to moderately rapid, plates covered in 3-5 weeks. Advancing zone even, hyaline and appressed. Mat at first white and appressed on start, later becoming raised, floccose to cottony-wooly and lacunose, forming a tough, somewhat crusty, cream buff to cinnamon brown mat after 3-4 weeks with scattered loose-cottony to compact felty balls of mycelium, some developing granular fruiting areas after 5-6 weeks. Reverse unchanged.

Oxidase reactions positive on both gallic acid and tannic acid agar. No growth on gallic acid agar but only a trace on tannic acid agar.

Microscopic characteristics : Advancing mycelium hyphae hyaline, thin-walled, clamped, frequently branched at or between the septa, 1.5-6.0 mm wide (Fig. 7)

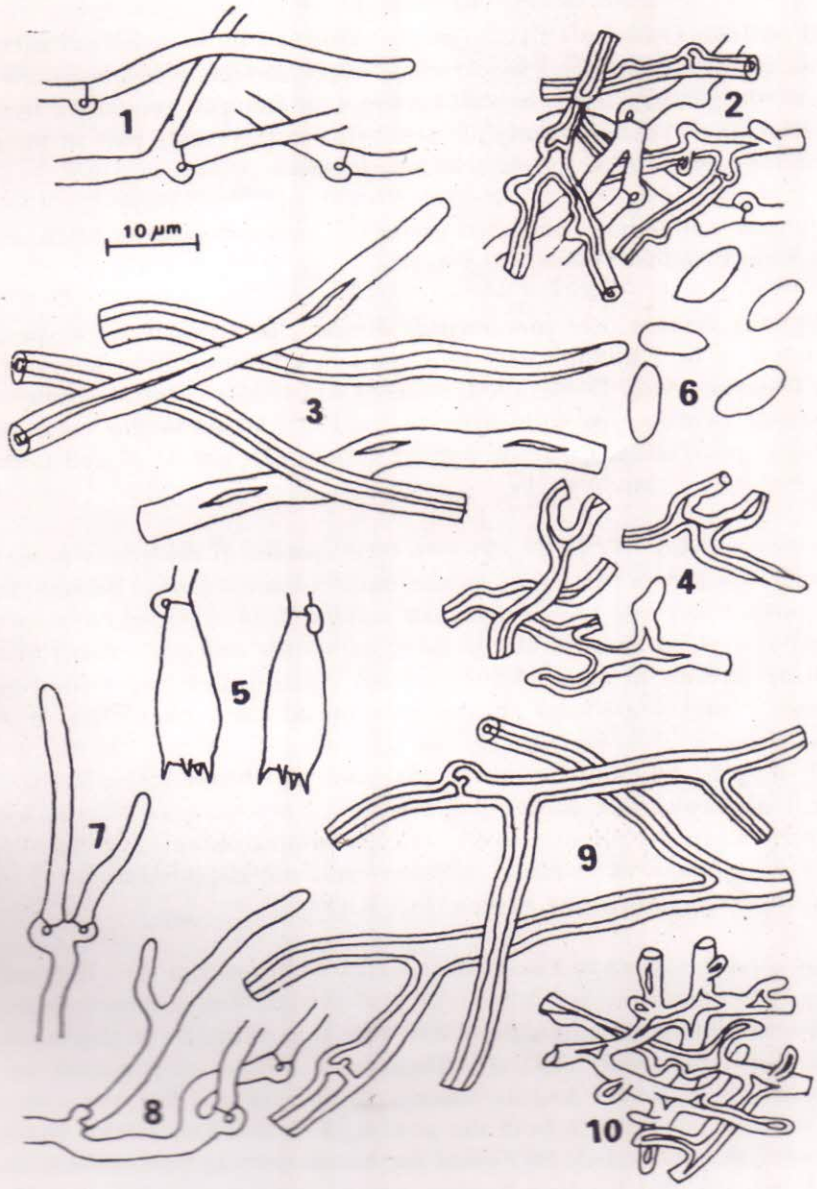
Aerial mycelium - a) hyphae as in the advancing zone (Fig. 8) (b) fibre hyphae abundant, hyaline, thick-walled to solid, some showing clamps, frequently branched (Fig. 9), often short branches arising at right angles and all firmly interwoven to form plectenchyma, found in tough or crusty part of the mat (Fig. 10). Fruitbody : hyphae as in the aerial mycelium. Basidia and basidiospores as in natural fruit body.

Sexuality : The result of pairing of 20 monosporous cultures obtained from a fresh basidiocarp (VBMH 92795) shows the species to be tetrapolar with the following distribution of mating types among the basidiospores.

$A_1 B_1$: 1, 7, 12, 18	$A_1 B_2$: 6, 9, 15, 17, 19
$A_2 B_2$: 5, 8, 11, 13, 16, 20	$A_2 B_1$: 3, 4, 10, 14

Species Code : 2, 3, 8, 11, 32, 37, 43, 44, 45, (48), 55, 68 [following the system of Nobles (1965)]

Cultures examined : VBMH 821071, 821072, 861074, 881075 and 931076.



Figs. 1-10 *Hexagonia scutellata.* 1-6. Microstructures from basidiocarp. 1. Thi-walled generative hyphae. 2. Thin-walled clamped interlocked hyphae in the crusty part of the pileus. 3. Thick-walled to solid skeletal hyphae. 4. Binding hyphae. 5. Basidia. 6. Basidiospores. 7-10 Microstructures from culture. 7. Hypha from advancing zone. 8. Thin-walled clamped aerial hypha. 9. Branched fibre hyphae. 10. Shortly branched fibre hyphae interwoven forming plectenchyma in the crustose mat.

DISCUSSION

Fomes scutellatus (Schw.) Cke. is easily identified by its small scutellate or ungulate basidiocarp with contrasting black crusty upper surface, wood-coloured lower surface with circular pores, trimitic hyphal system with clamped generative hyphae, presence of interlocking hyphae forming plectenchyma in the crusty part of the pileus surface and smooth thin-walled cylindrical basidiospores.

This fungus was initially included under the genus *Polyporus* Mich. ex Fr. but later it was transferred to *Fomes*. (Fr.) Kickx.

The hyphal system, i.e. monomitic, dimitic, or trimitic of a species has been considered to be taxonomically important in circumscribing genera (Bondartzeva, 1961; Teixeira, 1962; Donk, 1964; Fidalgo and Fidalgo, 1967). These authors would not include two species with different hyphal systems in the same genus. Thus *F. scutellatus* possessing a trimitic hyphal system can not be placed under the dimitic genus *Polyporus* Mich. ex Fr.

Fomes fomentarius (L. ex Fr.) Fr., the type species of the genus *Fomes* (Fr.) Kickx, is characterised by a perennial, sessile, dark-coloured, poroid basidiocarp with crusty upper surface and pale brown hymenial surface, trimitic hyphal system with clamped generative hyphae, absence of cystidia, metuloids and other structures, presence of cystidiole, ability to cause white rot and smooth, delicate-walled basidiospores. Although *Fomes scutellatus* passesses most of these characters of *Fomes* but it differes from *F. fomentarius* by the following features : (1) basidiocarp mostly annual, may be biennial but never perennial (ii) basidiocarps effused reflexed to pileate. (iii) pore surface darker in colour; (iv) it produces interlocked hyphae forming plectenchyma in the pileus surface; (v) cystidioles absent; (vi) basidiospores much smaller. Differences in so many characters rule out the possibility of inclusion of *F. scutellatus* under the genus *Fomes* (Fr.) Kickx.

A genus closely related to *Fomes* (Fr.) Kickx is *Hexagonia* Fr.. Both of these genera possess brown basidiocarps, trimitic hyphal system with coloured vegetative hyphae, produce similar oxidase reactions and rot. It is difficult to distinguish these two genera. Teixeira (1964) separated them on the basis of presence of crust on the pileus surface of *Fomes* and its absence in *Hexagonia*. But our studies reveal that pileus surface is crusty in both the genera (Roy and De, 1995). However, certain differences may be noted. In *Fomes* the basidiocarp is perennial, hymenial surface is pale brown and binding hyphae are of long type while in *Hexagonia* the basidiocarp is mostly annual, hymenial surface and skeletal hyphae are darker in colour and the binding hyphae are mostly of coralloid type. *F. scutellatus* bears all of these characters of *Hexagonia* and not of *Fomes*. Besides, plectenchyma has been reported in the pileus surface of different species of *Hexagonia* (Fidalgo, 1968; Wright, Deschamps and Rovetta, 1973). *F. scutellatus* also bears this character of *Hexagonia*.

As *Hexagonia crinigera* Fr., the type species of *Hexagonia* Fr., has not been studied in culture, its cultural characters could not be compared with those of *F. scutellatus*. But species of *Hexagonia* so far studied in culture viz. *Hexagonia tenuis* Hook. ex

Fr. (Van der Westhuizen, 1971). *Hexagonia hydnoides* (Swartz. ex Fr.) K. Fidalgo and *Hexagonia papyracoa* Berk. (Wright, Deschamps and Rovetta, 1973) produce white to brownish mat with pellicular crustose areas in culture accompanying modified hyphal structures and give positive reactions in oxidase tests. Like *F. scutellatus, H. tenuis* also is tetrapolar (Roy and De, 1979). Possessing all these characters *F. scutellatus* resembles species of *Hexagonia*. Evidently so great resemblances in morphological, cultural and biochemical characters between *F. scutellatus* and the species of *Hexagonia* are phylogenetically significant.

Consideration of all these facts leads to the conclusion that the right place of *F. scutellatus* is in the genus *Hexagonia*. Therefore, the following new combination is proposed :

Hexagonia scutellata (Schw.) Roy & De, comb. nov. Basionym : *Polyporus scutellatus* Schw., Trans. Amer. Phil. Soc. II, 4 : 157, 1832.

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