

THELEPHORACEAE OF THE MUSSOORIE HILLS—I

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(With Plates I & II and 2 Text-figures)

Eight species of Thelephoraceae collected from the Mussoorie Hills have been described. Of these, four are new records from India while *Craterellus odoratus* Schw. ex Fr. var. *solidostipite* is a new variety.

INTRODUCTION

An excursion is made every year from the Botany Department of the Panjab University to the Mussoorie Hills in the North-Western Himalayas (2,000-7,000 ft.) to study the cryptogamic flora. The Thelephoraceae form a part of the collection by the authors. This contribution describes seven known species and one new variety.* Of six dozens species of Thelephoraceae reported from India, about three dozens were described by Banerjee (1935) and Bagechee and Bakshi (1954). The rest are only isolated reports by different workers at different times (Butler & Bisby, 1931; Mundkur, 1938).

DESCRIPTIONS OF SPECIES

1. *Craterellus odoratus* Schw. ex Fr. var. *solidostipite* var. nov.

(Plate I, fig. 1; text-fig. 1, a-c)

Usque 16 cm. alta: pileus multiramosa: stipite solido: hymenio plano: ad terram.

Mossy Falls Estate, Mussoorie, India: September 14, 1954; Herb no. 181.

Fructifications annual: fleshy, brittle; stipitate; usually gregarious, sometimes solitary, or in caespitose clusters of 2-3 fruit-bodies; 6-16 cm. high. *Pileus* more or less infundibuliform, profusely and deeply lobed, lobes small to large, irregular and oriented variously and overlapping each other: orange yellow: 5-10 cm. in diameter. *Context* light orange yellow. *Margin* entire, concolorous, recurved. *Hymenial surface* lighter coloured than the upper surface of the pileus, yellow-orange; mostly smooth, sometimes irregularly rugulose or clearly lamelliform, or daedaloid at places, lamellae mostly towards the periphery but absent near the margin, very thin, radial and mostly wavy. *Hymenium* decurrent. *Stipe* central; yellow-orange; solid; uniformly cylindrical but sometimes grooved, inflated above towards the pileus, mostly straight, sometimes slightly

* The materials have been kept in the Herbarium of the Panjab University. Duplicate materials in alcohol-formalin have been deposited in the Herbarium, Royal Botanic Gardens, Kew, England.

bent; 2-9 cm. long and 0.5-1.5 cm. broad. *Hyphae* thin-walled, branched, septate, septa mostly at short intervals, clamp-connexions present almost at every septum, sub-hyaline, stainable, 3-8 μ wide, hyphal cells 20-100 μ long. *Basidia* clavate or elongated, hyaline, 8-12.5 \times 4-6 μ ; sterigmata 4, mostly incurved, 4-6 μ long. *Basidiospores* hyaline to sub-hyaline, oblong to ellipsoid or obovoid, papillate, papilla minute, smooth, thin-walled, mostly uniguttulate, 4-8 \times 4-6 μ .

Growing on soil near Mossy Falls under Oak (*Quercus incana* Roxb.) forest; Mussoorie; September 14, 1954; Herb. no. 181.

This fungus was found growing luxuriantly on soil in the Mossy Falls Estate. It is easily recognized by its mushroom like habit, large size, much branched and lobed, orange-yellow pileus, firm and solid stipe, and broadly ellipsoid, smooth basidiospores (4-8 \times 4-6 μ). It belongs to *Craterellus odoratus* Schw. ex Fr. except in that its stem is solid and firm. In the latter respect it resembles *C. cantharellus* Schw. ex Fr. but differs from the latter in its branched pileus and mostly even hymenium. Thus, this fungus is clearly intermediate between *C. odoratus* and *C. cantharellus* and is considered here as a new variety of *C. odoratus*. The varietal name *solidostipite* is proposed here to designate its stem.

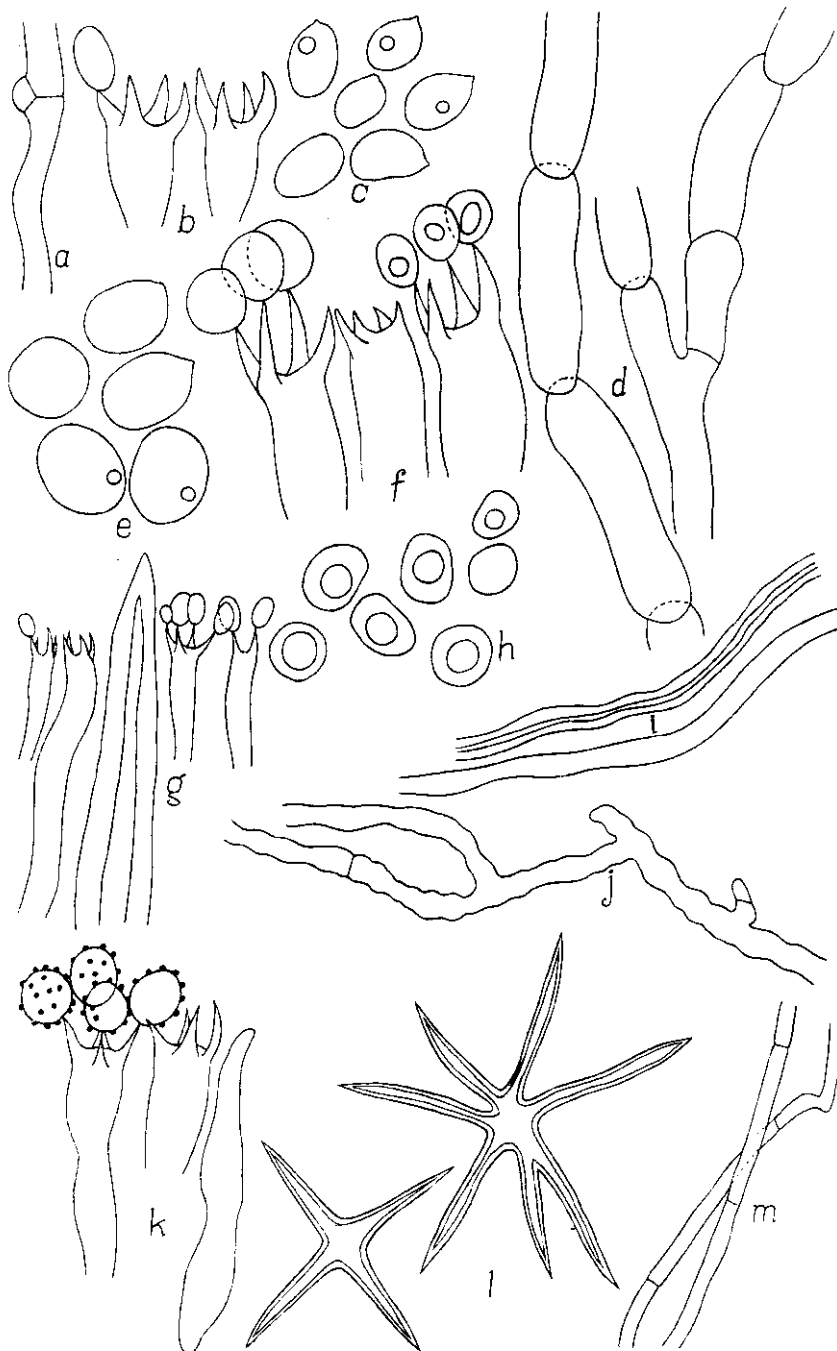
2. *Craterellus sinuosus* Fr., Epicr., 533. 1836-1838.

(Plate I, figs. 2 and 5; text-fig. 1, d, f, e)

Fructifications annual; fleshy; stipitate; gregarious to scattered, sometimes caespitose; 1.5-7 cm. high. *Pileus* infundibuliform, when young orbicular and depressed at the centre or tubiform; upper surface smooth to rough or floccose, light brown to dark brown or blackish brown; up to 4.5 cm. in diameter. *Margin* wavy to dentate, outcurved, concolorous to light coloured. *Hymenial surface* whitish grey or ash coloured; mostly smooth, later becoming irregularly wrinkled, sometimes slightly lamellate. *Hymenium* somewhat decurrent. *Stipe* simple; central: free, sometimes confluent: light brown to dark brown: cylindrical, sometimes flattened and grooved, expanded above into the pileus; solid, sometimes hollow; 1-5.5 cm. long and 2-8 mm. thick. *Hyphae* hyaline to sub-hyaline, thin-walled, branched, inflated, closely septate, without clamp-connexions, 4-10 μ wide; hyphal cells up to 40 μ long. *Basidia* clavate to elongate, sub-hyaline to light brown, 5-8 μ broad; sterigmata 4, incurved, mostly 4-7 (10) μ long. *Basidiospores* sub-hyaline, ovoid to broadly ellipsoid, minutely papillate, smooth, uniguttulate to vaguely guttulate, 8-10 \times 5-8 μ .

Growing on soil; The Park Toll Bar, Mussoorie; September 6, 1954; Herb. no. 182. The fungus is common in dark, shady, humid places along recently eroded hill slopes and growing out of holes or depressions; Chakrata Toll, Mussoorie; September 2, 1953; Herb. no. 183. On soil under Oak forest; Jabber Khet, Mussoorie; September 4, 1953; Herb. no. 184. On soil under Oak forest (*Quercus incana* Roxb.); Chakrata Toll, Mussoorie; September 15, 1954; Herb. no. 185: a new record from India.

The fungus is easily recognized by its infundibuliform pileus, whitish grey or ash coloured hymenium, and smooth, broadly ellipsoid basidiospores (8-10 \times 5-8 μ).



Text fig. 1. *a-c*, *C. odoratus* var. *solidostipite*: *a*, Hypha with clamp-connexion, $\times 750$; *b*, Basidia and *c*, Basidiospores, $\times 1150$. *d-f*, *C. sinosus*: *d*, Hyphae with inflated cells, $\times 750$; *e*, Basidiospores and *f*, Basidia, $\times 1150$. *g-j*, *H. semistupposa*: *g*, Basidia and setae, $\times 1150$; *h*, Basidiospores, $\times 1150$; *i*, Skeletal and *j*, Generative hyphae, $\times 750$ *k-m*, *A. cervicolor*: *k*, Basidia, Basidiospores and Gleocystidium, $\times 1150$; *l*, stellate Setae, $\times 480$; *m*, thin-walled Hyphae, $\times 750$.

3. *Hymenochaete semistupposa* Petch, Ann. R. bot. Gdns. Peradeniya 9, 278, 1925.

(Plate I. fig. 3: text-fig. 1, g-j)

Fructifications annual; coriaceous, becoming hard and brittle on drying; entirely resupinate and abundantly cracked, cracks anastomosing, extending up to 1 foot. *Hymenial surface* dark brown to almost black; smooth. *Margin* wavy, entire, thin, lighter coloured than the hymenium. *Subiculum* 600–750 μ thick, dark brown in colour. *Hyphae*: skeletal hyphae highly thick-walled, lumen completely obliterated in most cases, brown, unbranched, aseptate or with pseudosepta, clamp-connexions absent; 2.5–4 μ wide; generative hyphae thin-walled, light brown, branched, septate, without clamp-connexions, 2–4 μ wide. *Hyphal pegs* hyaline, mostly pyramidal, often surround the projected parts of setae, projecting about 10–20 μ beyond the hymenium. *Setae* very abundant, light brown to dark brown, subulate, mostly embedded in the subiculum, some projecting out and extending up to 40 μ beyond the hymenial layer, dimension 30–120 \times 6–10 μ . *Basidia* clavate or elongated; Sterigmata 4, sometimes 2, straight, 3–6 μ long. *Basidiospores* light brown, sub-globose or ellipsoid, smooth uniguttulate, thin-walled, 4–8 \times 3–5 μ .

Growing on stumps and exposed roots of *Quercus incana* Roxb.; Dhobi Ghat, Mussoorie: September 6, 1953; Herb. no. 186; a new record from India.

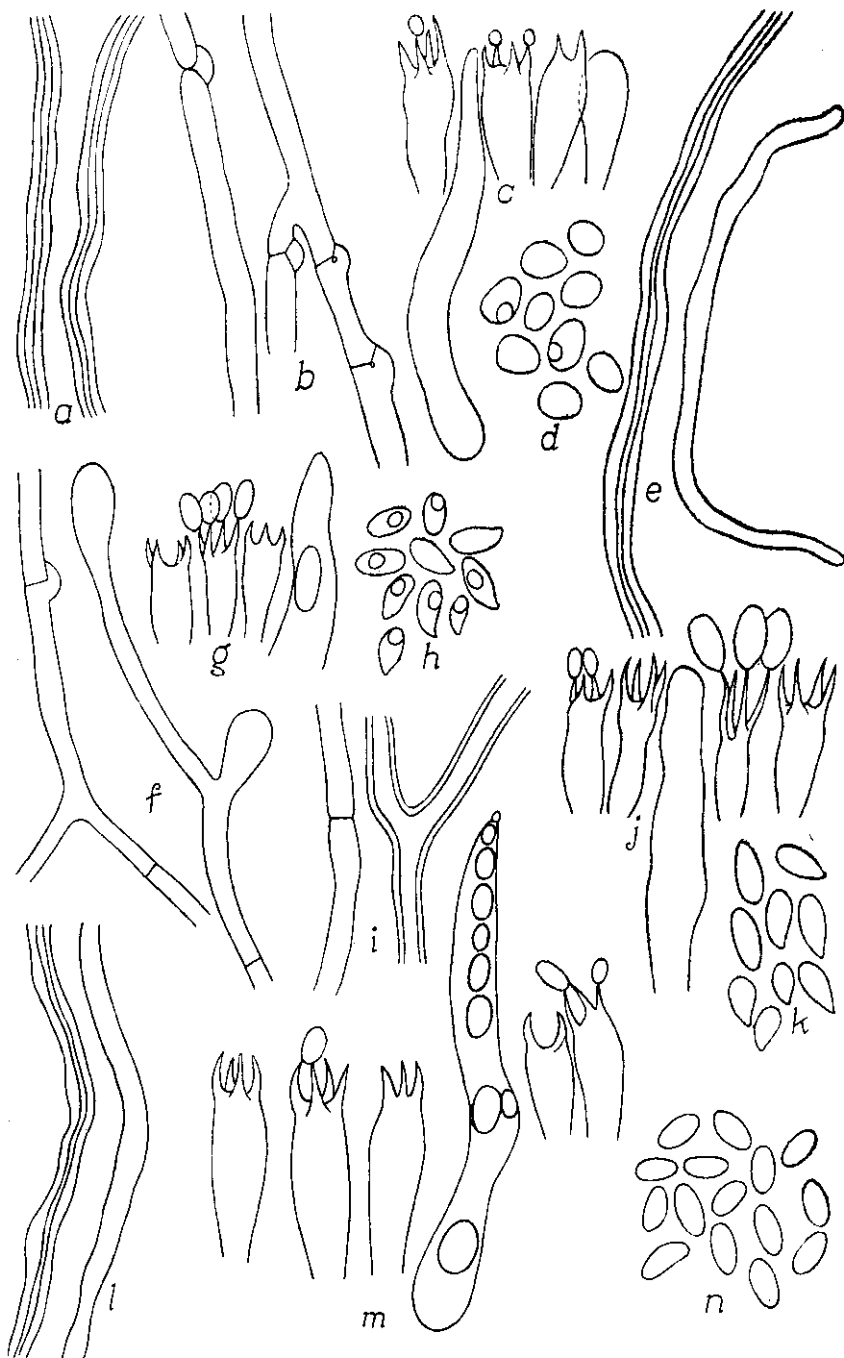
This species is characterized by the resupinate, dark brown to almost black fructifications which become abundantly cracked, mostly embedded setae, and light brown, smooth, sub-globose to broadly ellipsoid basidiospores (4–8 \times 3–5 μ).

4. *Asterostroma cervicolor* (Berk. and Curt.) Masee, J. Linn. Soc. Bot. 25, 155, 1889.

(Plate I. fig. 4: text-fig. 1, k-m)

Fructifications annual; entirely resupinate; brittle; resupinate patches extending up to 1.5 ft., encroaching upon mosses etc. that come in its way. *Margin* irregular, yellowish pink, fluffy, sterile. *Hymenial surface* smooth; ochraceous pink, becoming cream coloured or brownish on drying. *Subiculum* 60–80 μ thick. *Hyphae* thin-walled, branched, closely septate, sometimes swollen near the septa, hyaline, slightly stainable, without clamp-connexions, 1.5–3.5 μ wide; abundant crystals forming a regular compact layer in the subiculum present. *Stellate setae* abundant in the sub-hymenium as well as lower down in the subiculum but more abundant above the layer of crystals, dark brown, not stainable, with 3–6 radiating arms, thick-walled, dimension of the arms 20–50 \times 2.5–4 μ . *Gloeocystidia* abundant, mostly arising from the sub-hymenium, some extending up to the hymenial surface, broader below but narrowed above, hyaline to sub-hyaline, 20–52 \times 4–14 μ . *Basidia* clavate to elongate, hyaline, 10–14 \times 4–6 μ ; sterigmata 4, straight, sometimes curved. *Basidiospores* sub-hyaline to faintly brown, globose, with numerous tubercles, 3–4.5 μ in diameter.

Growing on stumps and decaying logs of wood; Hardwar Road, Dehra Dun; August 16, 1954; Herb. no. 187; a new record from India.



Text fig. 2. *a-d*, *S. elegans*: *a*, Skeletal and *b*, Generative hyphae, $\times 750$; *c*, Basidia, and *d*, Basidiospores, $\times 1150$; *e-h*, *S. purpureum*: *e*, Skeletal, and *f*, Generative hyphae, and also a hypha with differentiating Vesicular bodies, $\times 750$ *g*, Basidia, Gleocystidium and *h*, Basidiospores, $\times 1150$. *i-k*, *S. gausapatum*: *i*, Thin-walled or slightly thick-walled hypha, $\times 750$; *j*, Basidia and a Conducting organ, $\times 1150$; *k*, Basidiospores, $\times 1150$. *l-n*, *S. hirsutum*: *l*, Thick-walled to almost solid hyphae, $\times 750$; *m*, Basidia and a Conducting organ, $\times 1150$; *n*, Basidiospores, $\times 1150$.

This species is characterized by the large, resupinate, ochraceous pink fructifications with irregular, sterile margin, abundant stellate setae and gloeocystidia, and globose, prominently tubercled basidiospores (3-4.5 μ). In the Mussoorie collection gloeocystidia are all embedded and do not project out of the hymenial layer while they are reported to project up to 25 μ beyond the hymenial layer (Burt, 1924).

5. *Stereum elegans* (Meyer ex Fr.) Fr. sensu Petch. Ann. R. bot. Gdns., Peradeniya 9, 259-298, 1925.

(Plate II, fig. 6: text-fig. 2, a-d)

Fructifications annual; thin, tough, sub-cartilaginous, becoming slightly brittle on drying; erect; stipitate; in fasciculate clusters; up to 8 cm. high. *Pileus* flabelliform or infundibuliform; confluent with one another; deeply cleft on one side, or lobed, lobes large to small or irregular; upper surface irregularly and radially ridged, concentrically zoned, deep cream coloured, on drying, turning greyish brown with darker tips and shrivelling up; 1.5-5.5 cm. broad, 1.2-4 cm. high and up to 1 mm. thick. *Margin* slightly to deeply cleft, thin, lighter coloured. *Hymenial surface* cream coloured, lighter coloured than the upper surface, rough, ridged more or less radially, concentrically zoned. *Stipe* lateral or excentric, mostly confluent, solid, cylindrical to flattened, expanding above into the pileus, rough, dark brown, 1.4-3.5 cm. long and 2-3 mm. wide. *Hyphae*: skeletal hyphae thick-walled, mostly simple, rarely branched, flexuous, without clamp-connexions, hyaline, non-strainable, 3-5 μ wide, wall 1-1.5 μ thick; generative hyphae thin-walled, sparsely branched, distantly septate, with abundant large clamp-connexions, nodose-septate. *Gloeocystidia* abundant, arising from the sub-hymenium, broader below, but narrowed above, sub-hyaline, deeply stainable, 7-9 μ wide near the top and 60-95 μ long. *Basidia* clavate or elongated, hyaline, about 4-5 μ broad; sterigmata 4, sometimes 2, straight, 3.2-4 μ long. *Basidiospores* hyaline, broadly ellipsoid or obovate, sometimes sub-globose, smooth, thin-walled, uniguttulate, 3.5-5.5 \times 3-4 μ .

Growing on dead roots and stumps of *Quercus incana* Roxb.; Saharanpur Road, Dehra Dun: July 31, 1953; Herb. no. 188.

This species is easily recognized by its densely fasciculate, deep cream coloured fructifications deeply cleft on one side and with a lighter coloured margin, abundant gloeocystidia, and hyaline, smooth, ovoid to sub-globose basidiospores (3.5-5.5 \times 3-4 μ). The Dehra Dun collection closely resembles *S. elegans* Fries reported from Bengal by Banerjee (1935) except that the Dehra Dun specimens are larger and possess abundant gloeocystidia and clamp-connexions in the generative hyphae.

6. *Stereum purpureum* Pers., Roemer Neues Mag. Bot 1, 10, 1794.

(Plate II, fig. 7: text-fig. 2, e-h)

Fructifications annual; cartilagenous; mostly effuso-reflexed; imbricate. *Pileus* light brown to dark brown with upper surface concentrically zoned and hairy or villose-tomentose, irregularly lobed, narrowed below into

a stem-like base, 2-4.8 cm. wide, up to 300μ thick; hairs in fascicles, sub-hyaline, thick-walled, lumen completely obliterated, unbranched. *Margin* closely incised, slightly incurved, thin, lighter coloured. *Hymenial surface* lighter coloured than the upper surface, light brown, smooth or slightly wrinkled radially. *Hyphae*: skeletal hyphae unbranched, aseptate, highly thick-walled, lumen completely obliterated in most cases, without clamp-connexions, stainable, $2-4\mu$ wide; generative hyphae thin-walled, branched, septate, with clamp-connexions, stainable, $2-4\mu$ wide; *Vesicular bodies* quite conspicuous, embedded in the sub-hymenium, globose to pyriform, thin-walled, deeply stainable, $10-20 \times 6-10\mu$. *Gloeocystida* sparsely present, arising from the sub-hymenial layer and extending up to the hymenial layer, sub-hyaline, deeply stainable, broader below and narrowed above, $13-30\mu$ long and $4-8\mu$ wide. *Basidia* clavate, sub-hyaline, $6-8 \times 2-3\mu$; sterigmata 4, sometimes 2, straight, $2-4\mu$ long. *Basidiospores* hyaline, narrowly ellipsoid, papillate, smooth, uniguttulate, $4-5 \times 2-3\mu$.

Growing on stumps of trees: The Park Road, Mussoorie: August 26, 1954; Herb. no. 189.

This species is characterized by its brown, tomentose and mostly effuso-reflexed fructifications, prominent vesicular bodies embedded in the sub-hymenium and narrowly ellipsoid, smooth basidiospores ($4-5 \times 2-3\mu$). *Gloeocystidia* have been noted *sparsely developed* in the Mussoorie collection.

7. *Stereum gausapatum* Fr., Hym. Eur., 638, 1874.

(Plate II, fig. 8; text-fig. 2, i-k)

Fructifications annual; tough, coriaceous; effuso-reflexed; imbricate; resupinate portion up to 37 cm. wide. *Pileus* with brown upper surface, paler at the periphery; concentrically zoned, zones faintly reddish brown in colour; hairy; lobed; up to 2 cm. high and 645μ in thickness; hairs shaggy, brown, thick-walled, rigid, erect, radially arranged. *Margin* dentate, thin, lighter coloured. *Hymenial surface* brown to dark brown, paler at the periphery, smooth or uneven due to irregular radial wrinkles. *Hyphae* thin-walled to slightly thick-walled, hyaline, branched, distantly septate, stainable, clamp-connexions absent, $1.5-4\mu$ wide. *Conducting organs* abundant, with reddish brown contents, broader below but narrowed above, $40-70 \times 6-12\mu$. *Basidia* clavate, hyaline, $8-12 \times 2.4-4\mu$; sterigmata 4, sometimes 2, straight or slightly incurved, $4-6\mu$ long. *Basidiospores* hyaline, narrowly ellipsoid, papillate, papilla minute, smooth, $4-7 \times 2-4\mu$.

Growing on logs and stumps of Oak (*Quercus incana* Roxb.): The Park, Mussoorie: August 23, 1954; Herb. no. 190; a new record from India.

S. gausapatum is recognized by its brown, effuso-reflexed fruit-body, imbricate growth, villose to shaggy hairs, darker hymenium which bleeds when cut or bruised, abundant conducting organs, and smooth, narrowly ellipsoid basidiospores ($4-7 \times 2-4\mu$).

8. *Stereum hirsutum* Willd. ex Fr., Epicr., 549, 1838.

(Plate II, fig. 9; text-fig. 2, l-n)

Fructifications perennial; leathery; effuso-reflexed, extending up to 20 cm.; imbricate; up to 5 cm. high. *Pileus* with upper surface yellowish brown, concentrically zoned, irregularly lobed, surface profusely hairy,

7 × 5 cm. wide and up to 540 μ thick (excluding the tomentose layer); hairs yellowish brown, becoming deeper coloured in old specimens, highly thick-walled so as to obliterate the lumen completely. *Margin* entire, wavy, lighter coloured, involuted when dry. *Hymenial surface* orange coloured, smooth. *Hyphae* thick-walled, unbranched, aseptate, sub-hyaline, slightly stainable, clamp-connexions absent, 1.4–6 μ wide, wall 1.4–2.4 μ thick. *Conducting organs* filled with orange contents, elongated, sinuous, usually broader below but narrowed above, tips rounded or prolonged into a knob-like portion, slightly stainable, 160–720 × 3.2–5.6 μ . *Basidia* elongated, sub-hyaline, 4–6 μ broad; sterigmata 4, sometimes 2, straight, 2.4–4.8 μ long. *Basidiospores* hyaline, narrowly ellipsoid, smooth, aguttulate; 4–6 × 1.8–2.5 μ .

Growing on stumps of trees; Burning Ghat, Mussoorie; August 23, 1954; Herb. no. 191.

This species is very common in the Mussoorie Hills and is easily recognized by its yellowish brown, strigose-hirsute, effuso-reflexed pileus, and narrowly ellipsoid basidiospores (4–6 × 1.8–2.5 μ). This Mussoorie collection shows abundant conducting organs filled with orange contents. No conducting organs were reported for the species by Burt (1920). However, conducting organs have been reported for the species by Banerjee (1935) and rarely observed by Bagchee and Bakshi (1954).

ACKNOWLEDGEMENT

The authors are deeply indebted to Dr. D. A. Reid, the Royal Botanic Gardens, Kew, for help in the identification of the species and to Prof. P. N. Mehra for conducting the excursion and for providing facilities and encouragement.

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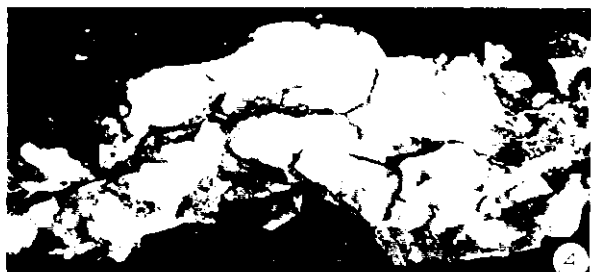
EXPLANATION OF PLATES

PLATE I

- Fig. 1. *Craterellus odoratus* Schw. ex Fr. var. *solidostipite* var. nov.
 Figs. 2 & 5. *Craterellus sinuosus* Fr.
 Fig. 3. *Asterostroma cervicolor* (Berk. and Curt.) Masec.
 Fig. 4. *Hymenochaete semistupposa* Peteh.

PLATE II

- Fig. 6. *Stereum elegans* (Meyer ex Fr.) Fr.
 Fig. 7. *S. purpureum* Pers.
 Fig. 8. *S. gausapatum* Fr.
 Fig. 9. *S. hirsutum* Willd. ex Fr.





Thelephoraceae - I

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