

AGARICALES OF WEST BENGAL : VI

BY

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The present paper gives an account of Agaricales of Bankura district and its adjoining areas of West Bengal. Out of which *Lactarius rufus* (Scop. ex. Fr.) Fr., *Russula heterophylla* (Fr.) Fr., *Russula parazurea* J. Schaeff., *Russula albonigra* (Krombh.) Fr. are first reported from India and *Russula sanguinea* (Bull. ex. St. Amans) Fr., *Amanita hemibapha* (Berk & Br.) Sacc. (white form) are reported from West Bengal for the first time. *R. sanguinea* (Bull. ex. St. Amans) Fr., *R. albonigra* (Krombh.) Fr. and *Amanita hemibapha* (Berk. & Br.) Sacc. (white form) are edible species.

INTRODUCTION

During the last decade of this century the contributions on Agaricales are those of Trivedi (1972), Sing & Mehrotra (1974), Tewari & Sing (1973), Bakshi (1974), Singh & Mehrotra (1974), Kaul and Kachroo (1974), Purkayastha and Chandra (1974, 1975), Munjal *et al.* (1974), Natarajan (1975, 1977a, 1977b, 1977c), Sinha and Padhi (1976), Ray and Samajpati (1976, 1979), Sarma *et al.* (1977, 1978), and Sathe and Rahalkar (1975, 1976), and Sathe and Deshpande (1979).

The fungus flora of Bankura district has been reported by Ray and Samajpati (1976, 1979, 1980). Prior to these report there is no scientific information on this topic from Bankura district. It has been decided to publish all the available informations about the fungi growing in this region. This is the fourth report in the series.

MATERIALS AND METHODS

From the fresh pileus spore prints had been taken on both the black and

white papers. Next by using Melzer's reagent (KI-1.5 g., Iodine-0.5 g., Chloral hydrate-22.2 g, Distilled water—20 cc.) on the spore, their amyloid or non-amyloid nature was determined. Detail spore morphology was observed and by using micrometer the Q. value of the spore was calculated. By cutting thin hand and microtome sections (where ever necessary) of the fresh specimens anatomical peculiarities were noted and camera lucida drawings with magnification of the internal structures were made properly. Colour of the sporophore mentioned are according to the Mycological colour chart prepared by R. W. Rayner, C. M. I., Kew, Surrey & British Mycological Society.

Several chemical tests were also performed for obtaining necessary data which are to be used as criteria in the identification of fungi. The following chemicals were used : 10% FeSO_4 , 30% aq. NaOH, 20% aq. KOH, 40% aq. NH_4OH , Conc. HNO_3 , Conc. HCl, Conc. H_2SO_4 , 2% aq. phenol, 40% formalin, anilin oil pure, Melzer's reagent and acetocarmine.

All these species with index number and proper field data, are housed in the herbarium of Mushroom Research Centre, Mycology Laboratory, Botany Department, Calcutta University and duplicate collection in the Kew Herbarium, Royal Botanic Garden, Kew, Surrey, England.

ENUMERATION OF THE SPECIES

Russula albonigra (Krombh) Fr.

Kew Bull. 20 : 226 (1966-67)

(Test-fig. 1a, b, c, d, e)

Pileus—umbilicate, 30-40 mm in diam, whitish to buff at first, becomes blacken in age, not hygrophanous, brittle at fresh, moist, glabrous, *Margin*—regular, glabrous, veil absent, coriaceous, incurved or involute, not striate. *Lamellae*—free, crowded, distinctly formed, not easily separable, intermixed, pliable, tridymous, whitish at first, becomes blacken in age, without any latex. *Stipe*—centric, whitish at first, at maturity the whole sporophore inside and outside tending to blacken, solid, glabrous. both volva and annulus absent, 20-30 mm x 4-6 mm in diam. *Context*—whitish, tending to blacken in age, compact, hard, changing in colour on some external injury, latex nil, in-amyloid, without any clamp-connection, diam. of the hyphae 1.85-5.55 μ *Spore print*—white colour in mass. *Basidiospore*—globose, echinulate, apiculus, amyloseous, 3.70 μ -5.55 μ . Q.-1. *Basidium*—clavate, tetrasterigmatic, 20.35 μ -24.5 μ x 3.70 μ -5.55 μ . *Pileus trama*—heteromerous, without any clamp

connection. *Hymenophoral trama*—heteromerous, without any clamp. irregular to intermixed; diam. of the hyphae upto— 7.40μ . *Pleurocystidia*—lecythiform, thin walled, hyaline, arising from the sub-hymenial layer, 25.90μ - 27.75μ x 5.55μ - 7.40μ .

Chemical characters (on dry specimens)—colour of the context becomes greyish-pink with 10% FeSO_4 after 5-10 minutes at dry condition, reaction negative with 40% formalin, 2% phenol, and 50% anilin oil.

Geographical distribution and ecological data—India-W. Bengal; In the Sal (*Shorea robusta* Gaertn.) forest of Bankura, Joypur. On humus soil, solitary, under weak light illuminated condition. Soil pH—6.5; altitude—125' m. s. l. (approx.); S. Ray; 20th July, 1978; M.R.C. H. No.—A₁₀.

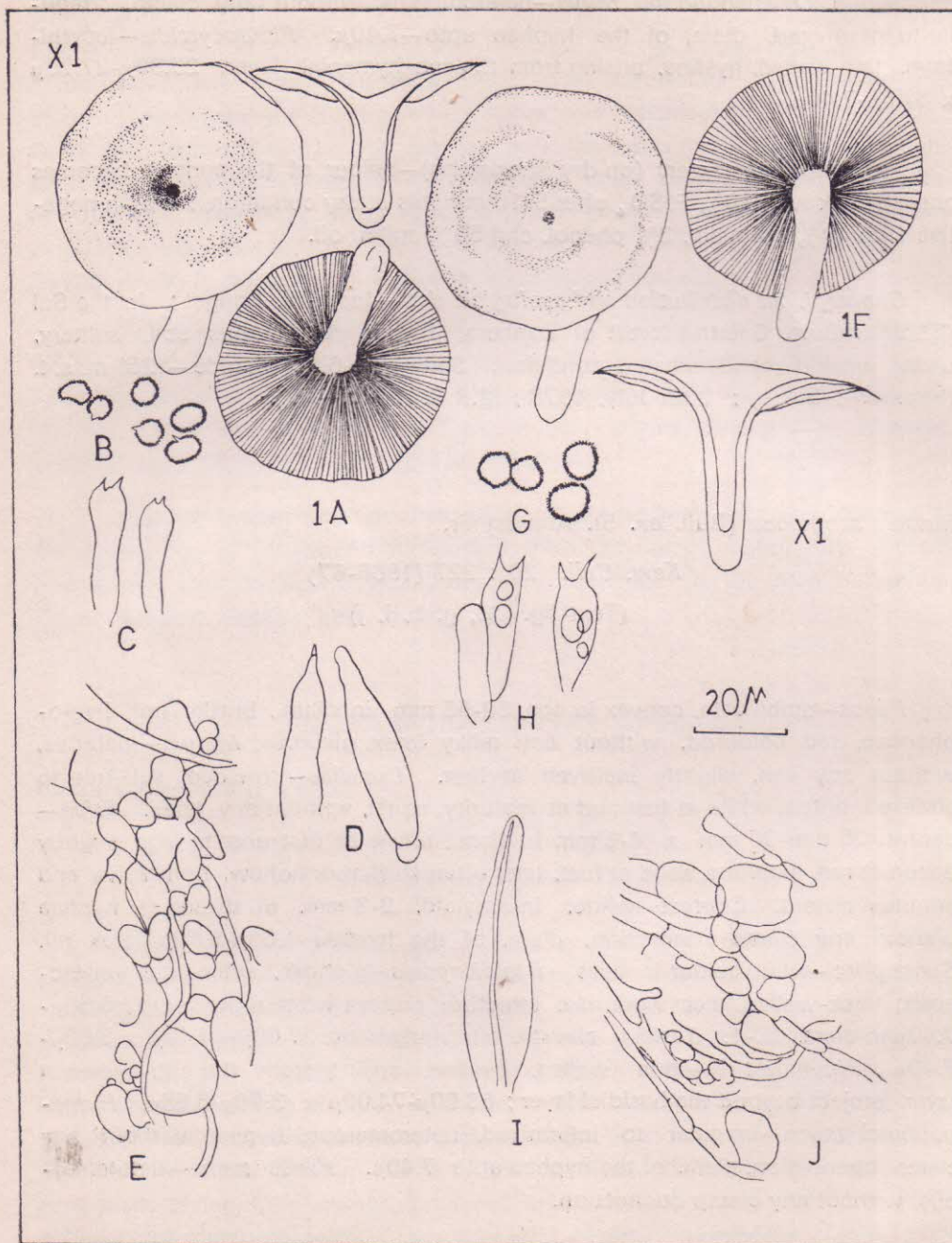
Russula sanguinea (Bull. ex. St. Amans) Fr.

Kew. Bull. 20 : 227 (1966-67)

(Text-fig. 1f, g, h, i, j)

Pileus—umbilicate, convex in age, 30-55 mm in diam., brittle, not hygrophanous, red coloured, without any milky latex, glabrous, *Margin*—glabrous, without any veil, slightly incurved at first. *Lamellae*—crowded, sub-free to adnexed, brittle, white at first and at maturity, equal, without any latex. *Stipe*—centric, 25 mm-30 mm x 4-5 mm in diam., white at first and in age slightly becomes red, glabrous, solid at first, later often stuffed or hollow, both volva and annulus absent. *Context*—white, in-amyloid, 2-3 mm. in thickness, hyphae without any clamp connection, diam. of the hyphae 1.85μ - 5.55μ , latex nil. *Spore print*—white colour in mass. *Basidiospores*—globose, echinulate, amylaceous, thick-walled, net work like structure present within the spore; 5.55μ - 7.40μ in diam., Q.-1. *Basidia*—clavate, tetrasterigmatic, 37.00μ - 44.40μ x 5.55μ - 7.40μ . *Pleurocystidia*—thin walled, hyaline, arising from the sub-hymenial layer, project beyond the basidial layer; 66.60μ - 74.00μ x 3.70μ - 5.55μ . *Hymenophoral trama*—irregular to intermixed, heteromerous, hyphae without any clamp connection, diam. of the hyphae upto 7.40μ . *Pileus trama*—heteromerous, without any clamp connection.

Chemical characters (on dry materials)—context (dry tissue) with 40% formalin and 2% phenol, 30% NaOH, 15% KOH after 5-10 minutes shows no significant change. Colour becomes slightly greyish-pink with 10% FeSO_4 .



Text Fig. 1A—*Russula albonigra*. 1A, habit and section. x 1.;
 B, Spores; C, Basidia; D, Pleurocystidia; E, Hyphae of gill trama.
 1F—*Russula sanguinea*. 1F, Habit and section x 1.:
 G, Spores; H, Basidia; I, Pleurocystidia; J, Hyphae of gill trama.

Geographical distribution and Ecological data : India-W. Bengal ; in the Sal forest (*Shorea robusta* Gaertn.) of Bankura, Jaypur. On humus soil, solitary, under weak light illuminated condition. Soil pH-6.5-7.0 ; altitude-125' m. s. l. (approx.) ; S. Ray, 2nd Aug. 1978 ; M. R. C. H. No.—A₁₉.

Russula heterophylla (Fr.) Fr.

Kew. Bull. 20 : 226 (1966-67)

(Text—fig. 2a, b, c, d, e)

Pileus—connate, convex at maturity, 45-55 mm. in diam., yellowish to ochraceous colour at young and old condition, pruinose all over, subtomentose, moist, *margin*—incurved at first, striate. *Lamellae*—free, brittle, crowded, distinctly formed, intermixed, buff at first and also with age. 2-3 gills per mm, lamellulae of three different length. 20-25 mm in length x 3-5 mm in width (at the middle). *Stipe*—centric, concolorous with the pileus, 20-30 x 4-4 mm in diam., glabrous, solid, both volva and annulus absent. *Context*—whitish colour at fresh, 3-4 mm. in thickness, hyphae without any clamp connection, diam. of the hyphae-1.85 μ -5.55 μ . *Taste*—mild ; *Spore print*—white colour in mass. *Basidiospores*—globose-sub-globose, echinulate, net-work like structure present within the spore, 5.55 μ -9.25 μ (7.9 μ) in diam., Q.—1. *Basidia*—clavate, tetrasterigmatic, 33.30 μ -37.00 μ (34.78 μ) x 5.55 μ -7.40 μ (6.87 μ). *Pleurocytidia*—ampulliform, thin walled, hyaline, arising from the sub-hymenial layer., 46.25 μ -51.80 μ (48.10 μ) x 5.55-7.40 μ (6.47 μ). *Hymenophoral trama*—heteromorous, hyphae without any clamp connection, diam. of the filamentous hyphae 1.85 μ -5.55 μ . *Pileus trama*—Heteromorous, hyphae without any clamp connection, Epicutis, hyphal.

Chemical characters (on dry materials)—no change in colour with formalin (40%) after ten minutes, on context, gills & stipe. Reaction negative with 15% KOH and 30% NaOH after ten minutes. Context with 10% FeSO₄ becomes greyish after 5-10 minutes.

Geographical distribution and Ecological data : India-W. Bengal ; Bankura, Sonamukhi-Sal forest. Grows on soil, solitary, under weak light illuminated condition ; soil pH-7.0 ; altitude-200' m. s. l. (approx.) ; S. Ray—24th Aug. 1978 ; M. R. C. H. No.—A₂₅.

Russula parazurea J. Schaeff.

Kew. Bull. 20 : 227 (1966-67)

(Text Fig. 2f, g, h, i, j)

Pileus—umbilicate, 25-30 mm. in diam., smoke grey to pale mouse grey at young and old condition, fleshy, pruinose to some extent, moist, thin, not easily separable. *margin*—obtuse, glabrous, concolorous with the pileus, not striate. *Gills*—decurrent, intermixed, distinctly formed, lamellulae of three different lengths, pliable, whitish colour at first, later becomes smoky grey. *Stipe*—eccentric 20-25 mm. x 4-5 mm. in diam., coriaceous, glabrous, hollow, volva and annulus absent. *Taste*—mild. *Context*—whitish, latex nil, without any clamp connection, diam. of the hyphae— 1.85μ - 5.55μ . *Basidiospores*—globose to sub-globose, echinulate, net work like structure present within the spore, amylaceous. 5.55μ - 7.40μ in diam. *Q*—1. *Basidium*—clavate, tetrasterigmatic, 37.00μ - 44.40μ x 5.55 - 7.40μ . *Pleurocystidia*—thin-walled, hyaline, 37.00μ - 40.70μ x 3.70μ - 7.40μ . *Hymenophoral trama*—heteromerous, without any clamp connection, diam. of the hyphae— 1.85μ - 5.55μ . *Pileus trama*—heteromerous, without any clamp connection, Epicutis-hyphal.

Chemical characters (on dry tissues) :—15% KOH and 30% aq. NaOH on all parts show no significant change; context, gills with 10% FeSO_4 become greyish after 10 minutes. No change in colour with formalin-40% and 2% aq. phenol.

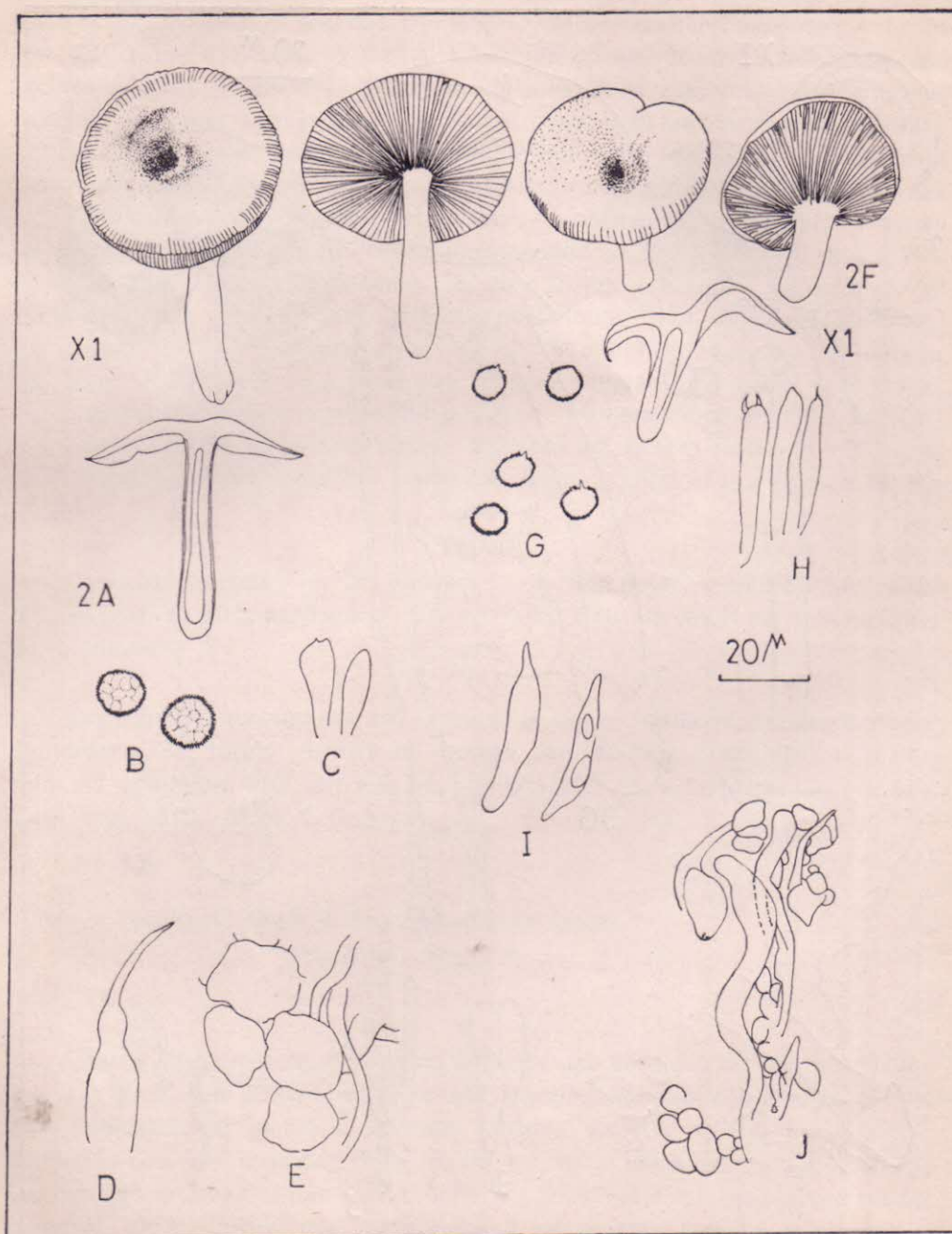
Geographical distribution and Ecoogical data :—India-W. Bengal-within the Sal forest of Bankura, Jaypur. Grows on humus soil, solitary, under weak light illuminated condition, soil pH-6.0, altitude-125' m. s. l. (approx.) ; S. Ray., 24th Aug., 1978; M. R. C. H. No.-A₂₆.

Lactarius rufus (Scop. ex Fr.) Fr.

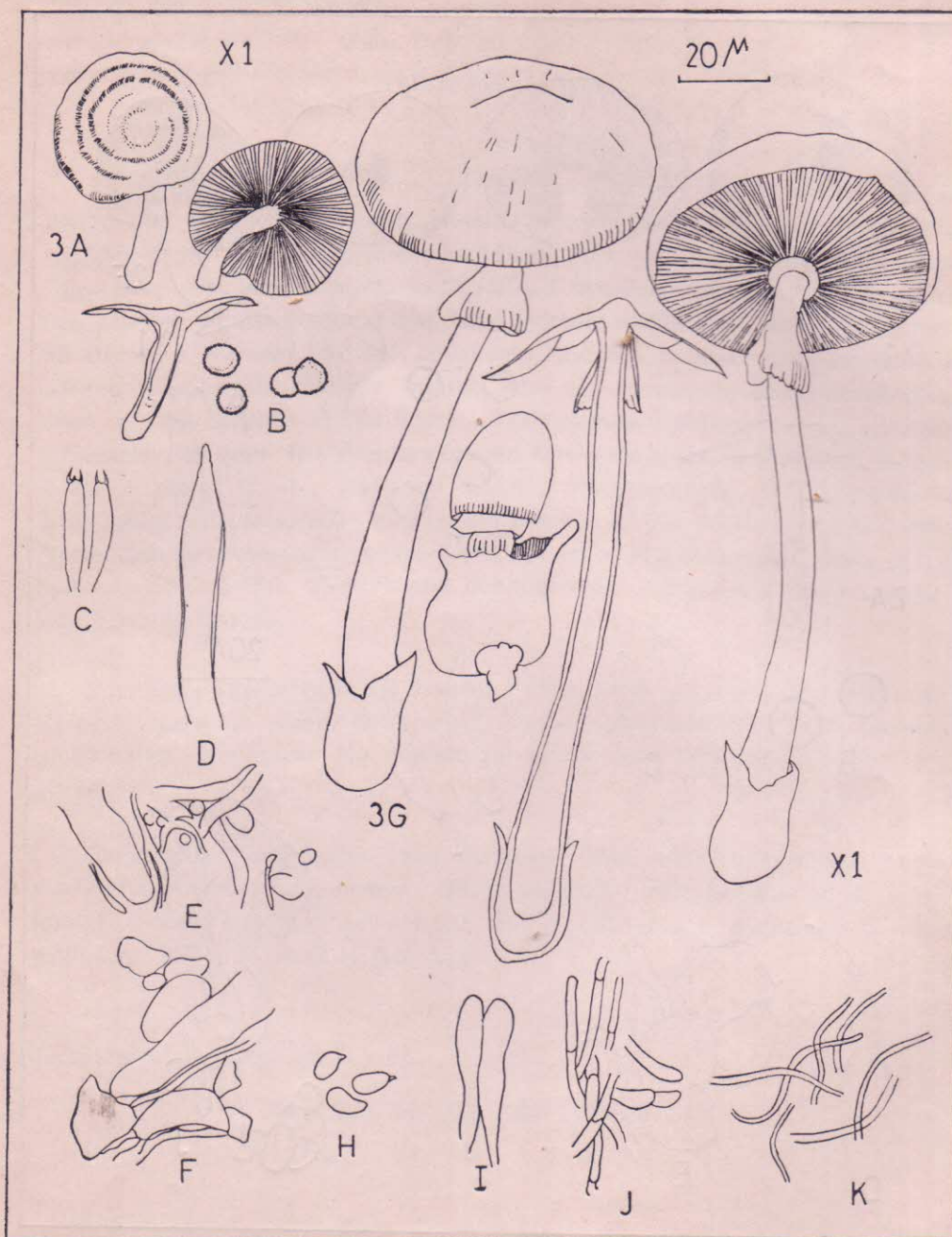
Kew Bull. Vol. 20 : 228 (1966-67)

(Text Fig. 3a, b, c, d, e, f)

Pileus—infundibuliform to umbilicate, fleshy, glabrous, azonate, 40-45 mm in diam., rufous buff to rust colour at fresh and also with age, not hygrophanous, faintly zonate. *margin*—regular, smooth, entire, incurved or involute, not striate,



Text-fig. 2A—*Russula heterophylla*. 2A, Habit and section $\times 1$.; B, Spores; C, Basidia; D, Pleurocystidia, E, Hyphae of gill trama.
 2F—*Russula parazurea*. 2F, Habit and section $\times 1$.; G, Spores; H, Basidia; I, Pleurocystidia; J, Hyphae of gill trama.



Text-fig. 3A—*Lactarius rufus*. 3A, Habit and section x 1.; B, Spores, C, Basidia, D, Pleurocystidia, E, Hyphae of gill trama. F. Hyphae of pileus trama.
 3G—*Amanita hemibapha*. 3G, Habit and section x 1., H, Spores
 I, Basidia. J, Hyphae of gill trama. K, Hyphae of pileus trama.

concolorous with the pileus. *Lamellae*—adnate, crowded, not easily separable, intermixed, lamellae of two different length, pliable, concolorous. *Stipe*—eccentric, 25-35 mm x 4-5 mm in diam., rufus buff colour, at maturity slightly becomes whitish, coriaceous, glabrous, solid, without any volva and annulus. *Context*—2-3 mm in diam. pinkish colour at fresh, with laticiferous ducts, diam. 9.25μ - 12.95μ , white milky latex present both in pileus and stipe in very young and fresh condition; never changing by exposure to anything. *Spore print*—pinkish cream colour in mass. *Basidiospore*—globose, echinulate, net work like structure present within the spores, amylaceous; 3.70μ - 7.40μ in diam., Q.—1. *Basidia*—clavate, tetrasterigmatic, 27.75μ - 31.45μ (28.98μ) x 3.70μ - 7.40μ (5.85μ). *Pleuro cystidia*—ampulliform, base bulbous, thin walled, hyaline, arising from the sub-hymenial layer. 66.60μ - 81.40μ (75.54μ) x 5.55μ - 7.40μ (6.07μ). *Pileus trama*—heteromerous, hyphae without any clamp connection, diam. of the filamentous hyphae 3.70μ - 7.40μ . *Hymenophoral trama*—sub-regular, intermixed with laticiferous ducts. Sphaerocyst absent near the gill edge, filamentous hyphae without any clamp connection. Diam of the hyphae 3.70μ - 7.40μ .

Chemical characters (on dry tissues) : reaction negative with 40% formalin; 2% aq. phenol, 50% aniline oil, 15% aq. KOH, 30% aq. NaOH on context after 5-10 minutes.

Geographical distribution and Ecological data : India-W. Bengal-Bankura, Sonamukhi Sal forest. Grows on humus soil, solitary, under weak light illuminated condition, soil pH-6.5-7.0, altitude-200' m. s. l. (approx.) ; S. Ray, 24th Aug., 1978 ; M. R. C. H. No. A₁₄.

Amanita hemibapha (Berk. & Br.) Sacc. (white form.)

(Text Fig. 3g, h, i, j, k)

Pileus—at first conical, expanding with age and becomes more or less plano-convex, 80-90 mm in diam., white to buff in young and with age, fleshy, brittle, not hygrophanous, glabrous, *margin*—slightly sulcate, striate, concolorous. *Lamellae*—sub-free, crowded, distinctly formed, not interveined, brittle, 2-3 gills per mm, white colour at first and at maturity. *Stipe*—centric, concolorous, fleshy, glabrous, moist, brittle, not viscid, hollow, prominently volvate, membranous, persistent; distinctly annulate (superus), membranous, fugacious, concolorous, at maturity 70-100 mm x 10-12 mm (at the middle) diam., gradually attenuated towards the pileus. *Context*—white, composed of loosely interwoven hyphae,

diam.— 3.70μ – 5.55μ . without any latex, almost acyanophilous. *Taste*—mild. *Spore print*—white colour in mass. *Basidiospore*—ellipsoid to oblong, almost acyanophilous, apiculate in-amyloid, glabrous, 5.55μ – 7.40μ x 1.85μ – 3.70μ in diam., Q.—2.1. *Basidium*—clavate, tetrasterigmatic, 29.60μ – 35.15μ x 3.70μ – 7.40μ in diam. *Pleurocystidia and cheilocystidia*—none. *Pileus trama*—homoio-merous, composed of filamentous type of cells. diam. of the hyphae upto 1.85μ . *Hymenophoral trama*—homoio-merous, regular at primordium, bi-lateral in adult lamellae. Diam. of the hyphae 3.70μ – 5.55μ .

Chemical characters (on dry materials)—10% FeSO_4 , 30% aq. NaOH, 15% aq. KOH, 40% formalin on lamellae, stipe & context show no visible change in colour after two to five minutes. Reaction negative with Melzer's reagent on context after two to five minutes. Conc. HCl on context becomes cinnamon.

Geographical distribution and ecological data :—India-U.P.-Dehradun, Sal plantation in New forest, Asarori (Bakshi-1974)-W. Bengal, Bankura-Jaypur Sal forest, on soil, solitary, favours weak light illuminated condition. Soil pH-6.0-7.0; altitude—125' m. s. l. (adprox.) S. Ray, 2nd Aug., 1978; M.R.C.H. No.-A₂₈.

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