

ABSTRACT

The present paper deals with the mycofloristic and putative ectomycorrhizal aspects of agarics of South Kashmir. Agarics are the gilled mushrooms belonging to subphylum *Agaricomycotina* under phylum *Basidiomycota* Moore, of subclass *Agaricomycetidae* under Class *Agaricomycetes* Doweld, growing in varied habitat. The region of South-Kashmir is a part of hotspot mega centre of the Himalayan belt which has rich floristic diversity, represented by well demarcated vegetational zones, comprising of potential ectomycorrhizal hosts of agarics such as, *Abies pindrow* and *Picea smithiana* etc. The best seasons for the collection of the agarics being the spring, summer and autumn in the study area. In the present study the diversity of agarics along with their putative ectomycorrhizal associations with coniferous trees of the South Kashmir have been investigated. A number of fungal forays were undertaken to various localities, as a result of which a systematic account of various species viz, *Lepiota*, *Russula*, *Lactarius*, *Agaricus* etc. along with the putative ectomycorrhizal association with various conifers is presented presently.

INTRODUCTION

Agarics are gilled fungi belonging to Class *Agaricomycetes* of order *Agaricales*.

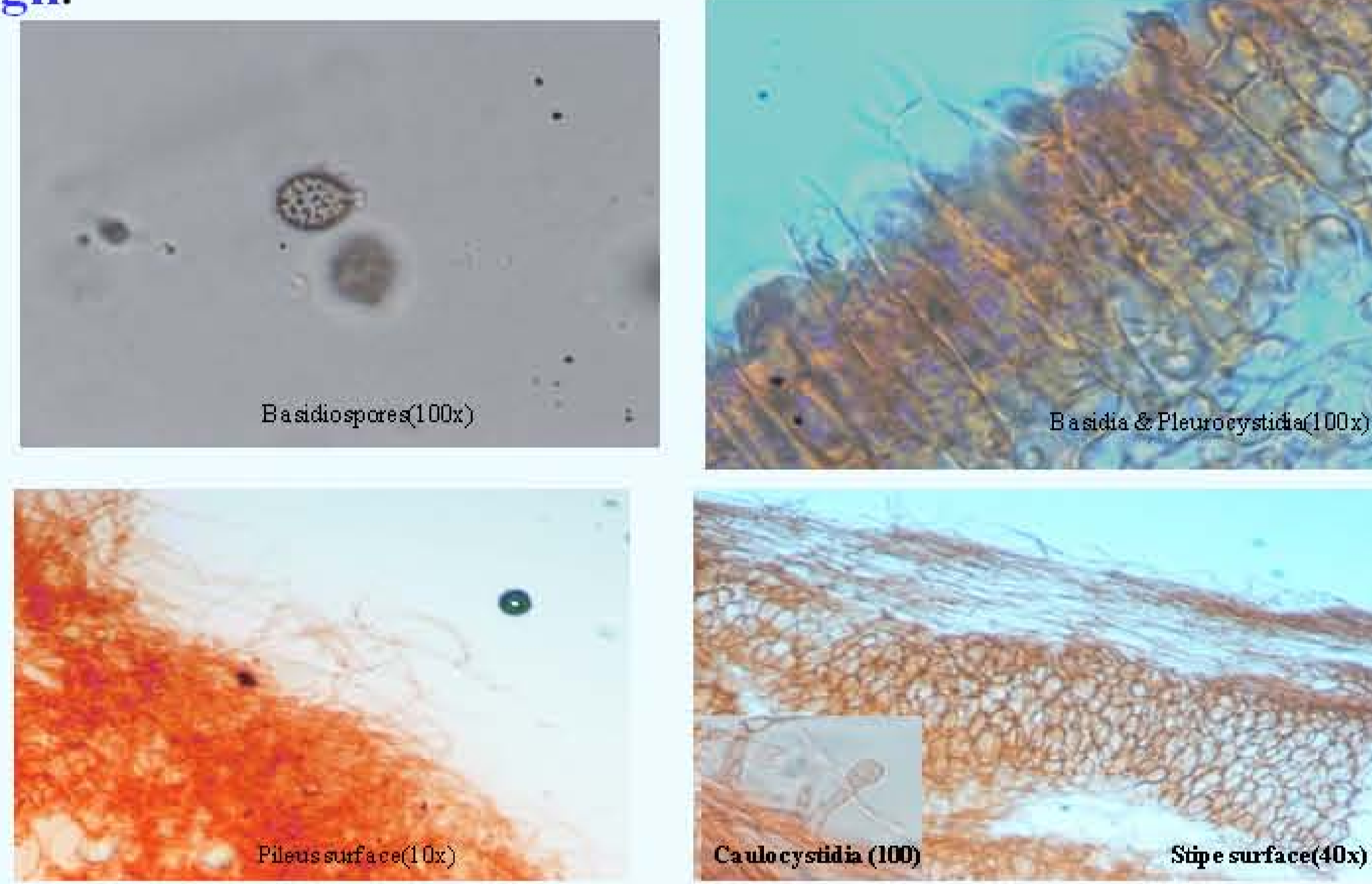
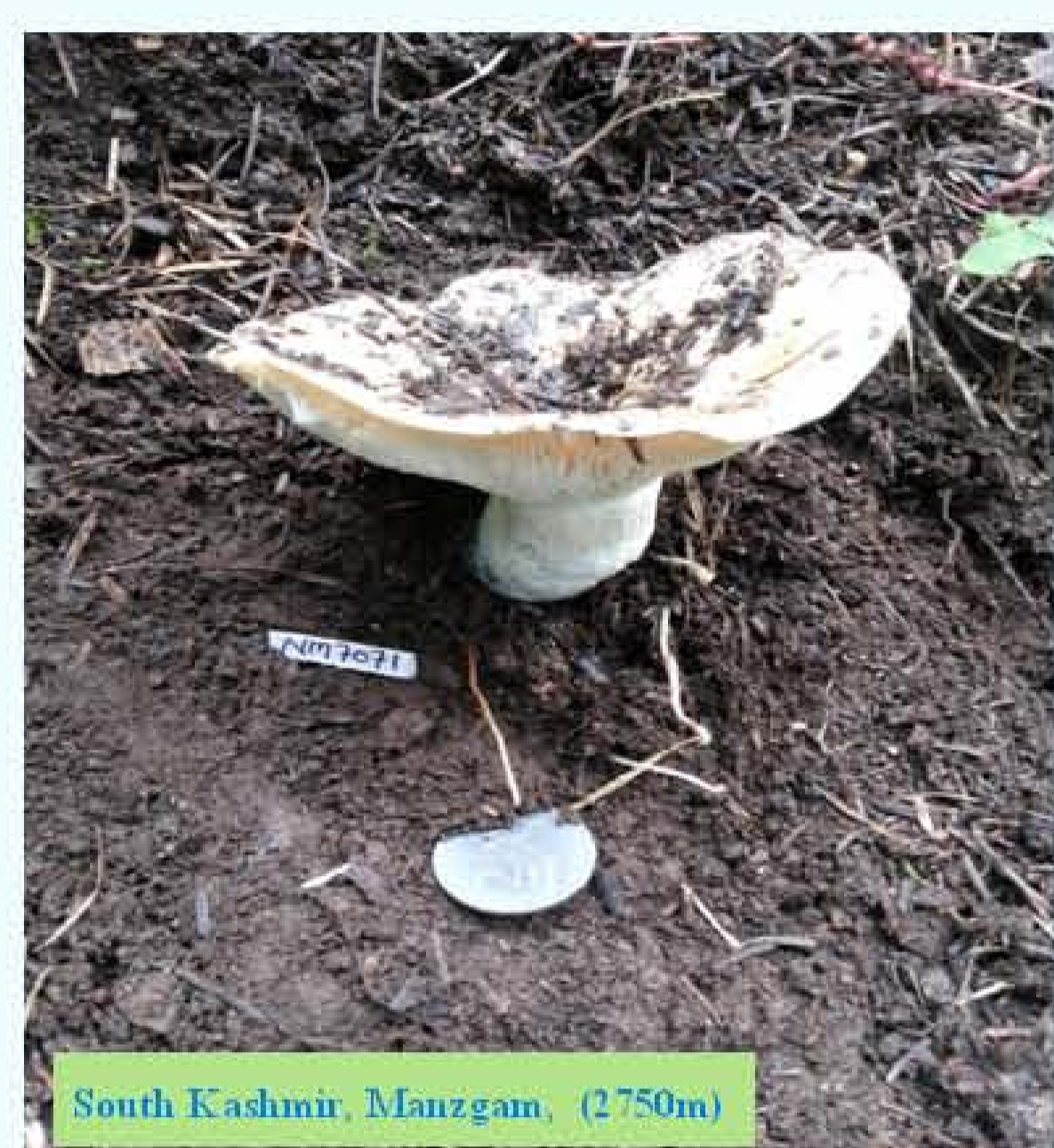
- They are cosmopolitan in diversity and are coprophilous, foliicolous, termitophilous, lignicolous and humicolous
- They form a natural system of organization with the roots of plants, called mycorrhizal association.
- Most of Ectomycorrhizal fungi belong to Basidiomycetes and most of plants are associated with these fungi including all species of family conifers

MATERIALS AND METHODS

1. Collection and processing of Ectomycorrhizal (ECM) fungi.
2. Morphological characters.
3. Spore deposit
4. Preservation of fruit bodies and roots
5. Microscopical characters
6. Identification

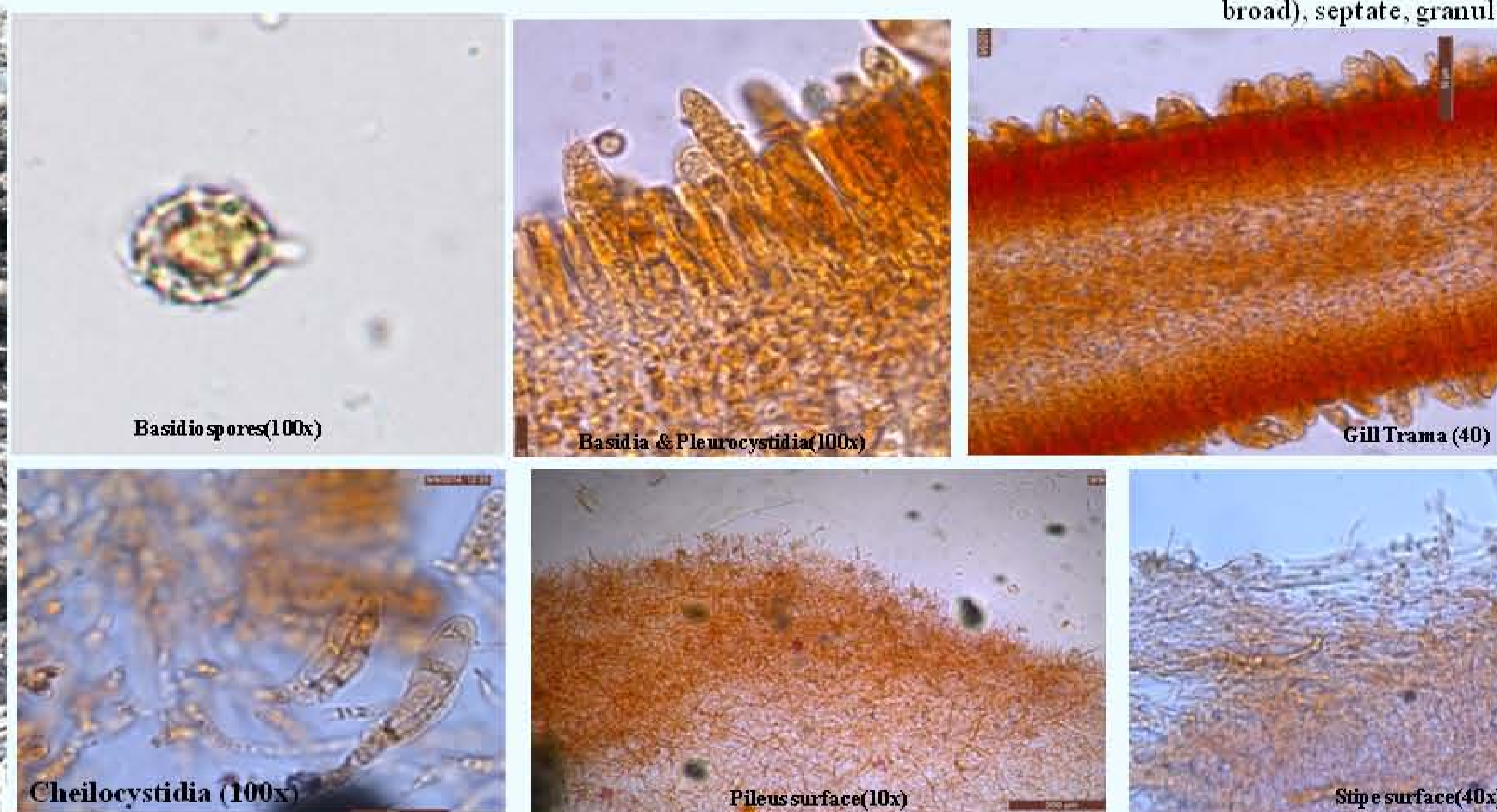
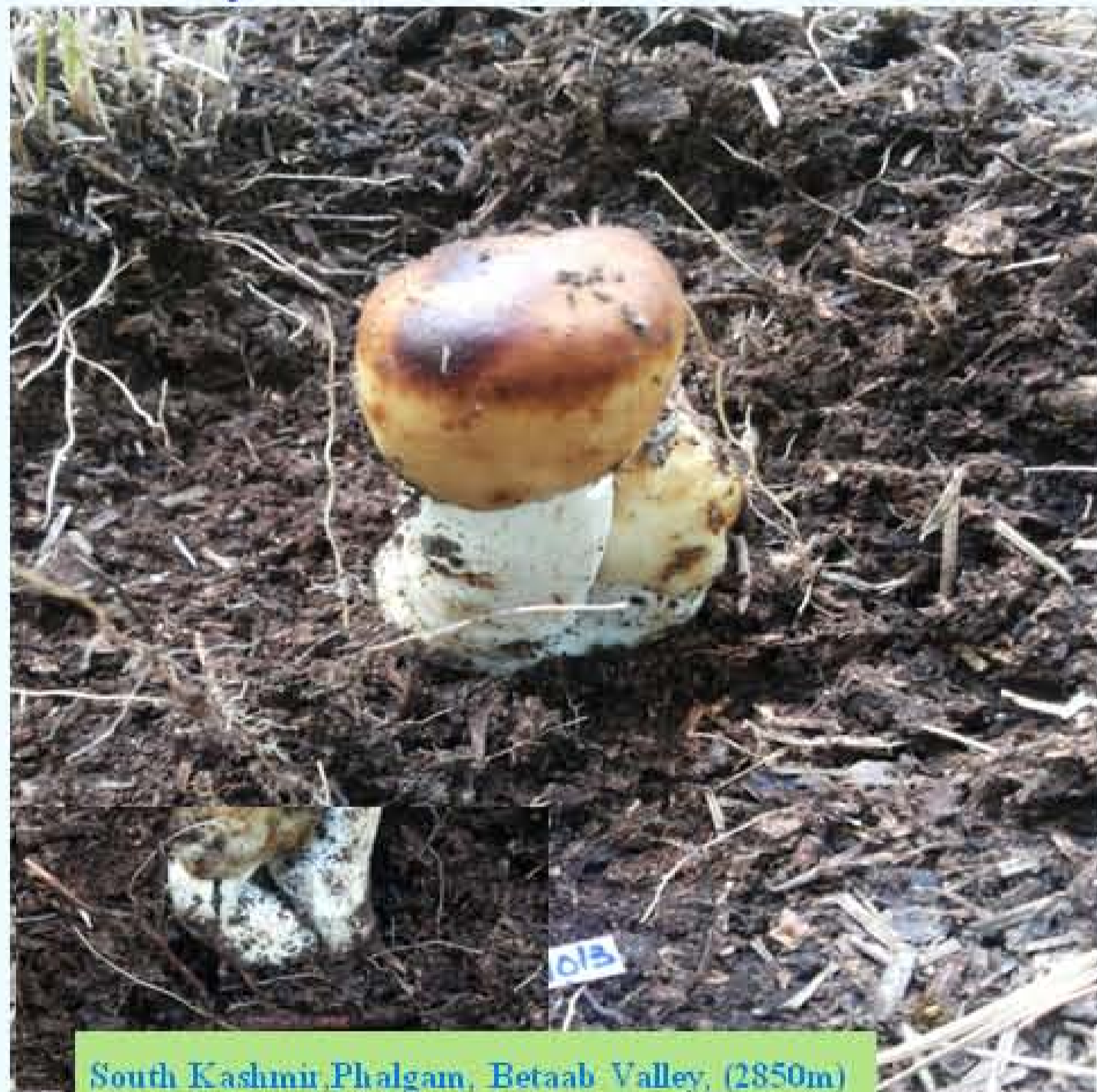
TAXONOMIC OBSERVATIONS, CHARACTERIZATION AND IDENTIFICATION OF ECTOMYCORRHIZAL FUNGI AND THEIR ROOTS:

Russula delica var. *puta* Romagn.



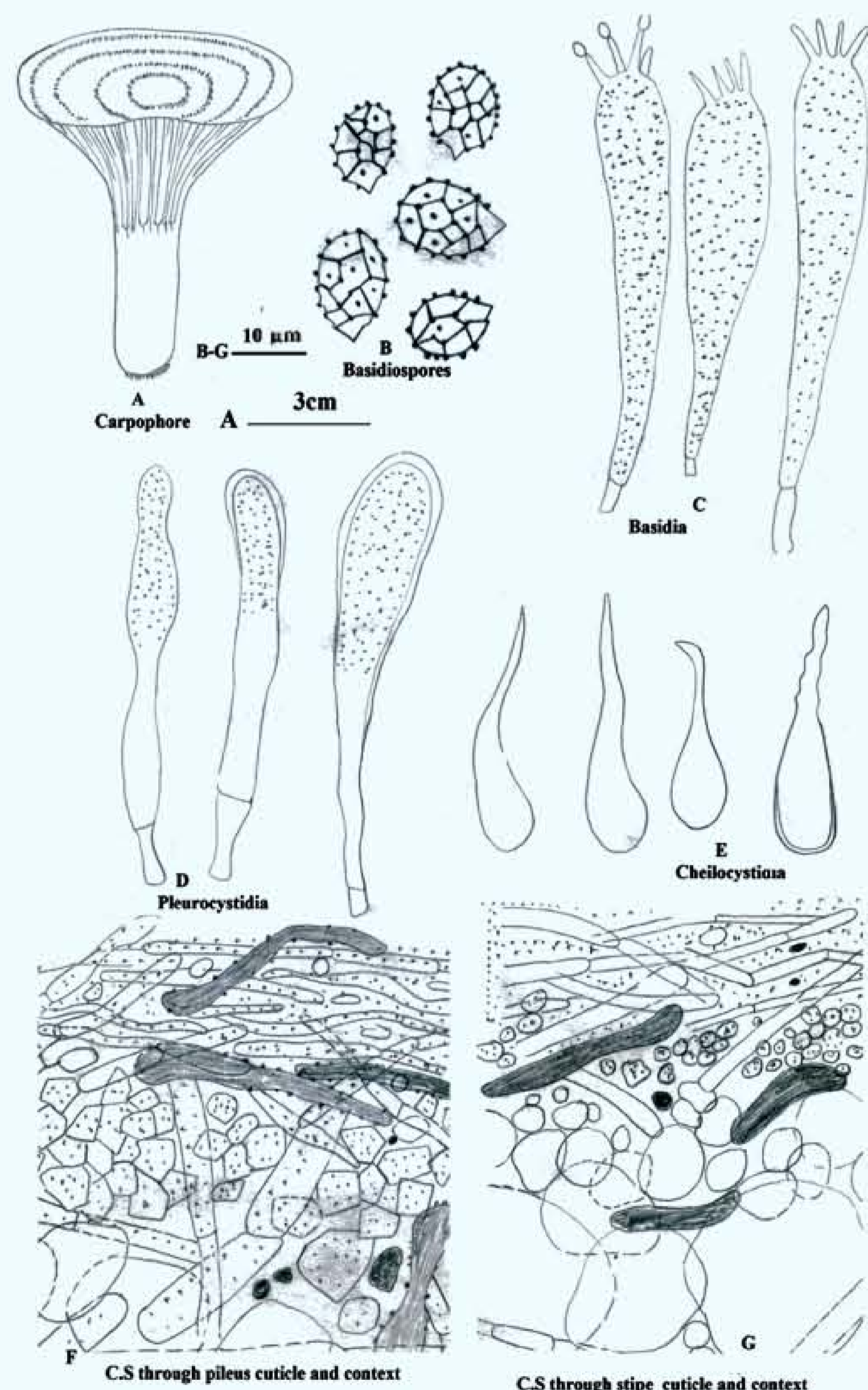
Carpophore upto 7 cm in height. **Pileus** 9cm broad, infundibuliform; surface orange white (6A₂), white(6A₁) at margin ; **moist**, glabrous; latex absent; margin, irregular, unstriated; cuticle half peeling; **flesh** 1cm broad, unchanging; **odour** fragrant; **taste** acid. **Basidiospores** 7.47- 9.96 x 6.64 – 8.3 μm (excluding ornamentation). **Lamellae** upto 0.2cm broad, descending to adnate, close, unequal, numerous, forked, offwhite (6A₁) to light orange (6A₂) with dull brown tinge; **lamellulae** unequal, not in series; **gill edge** smooth. **Spore** deposit white (2A₁). **Stipe** upto 5cm long, 3cm broad, equal in diameter, white with brown tinge; surface smooth; semisolid, fleshy; exannulate.

Russula foetens Pers.



Carpophore 5-8 cm in height. **Pileus** 3-4cm broad, campanulate; surface pale orange (6A₃) violet brown(10D₂), white (6A₁) at margin; **moist**, glabrous; latex absent; margin, regular, unstriated; cuticle fully peeling; **flesh** upto 0.5cm broad, white, changing slowly to light pinkish; **odour** disagreeable; **taste** not observed. **Basidiospores** 6.64- 8.3 x 5.81 – 6.64 μm (excluding ornamentation). **Lamellae** upto 0.4cm broad, free, close, white to pale orange (6A₃), changing to pastel red (7A₅); **lamellulae** unequal, not in series; **gill edge** smooth. **Spore** deposit not found. **Stipe** upto 4-6.5cm long, 1cm at apex, 2cm in middle, 2.5 cm at base, distinctly bulbous, white(6A₁), changing to pastel red(7A₅); surface smooth; solid, fleshy; exannulate.

Lactarius rubrilacteus Hesler & Smith



Carpophore upto 5cm in height. **Pileus** upto 6cm broad, infundibuliform with involute margin; surface white (6A₁) to pale red(11A₃) with purplish grey (13D₂), changing to bluish green; Scaly, appressed fibrillose, cover the entire pileus in concentric rings, reddish brown (9D₁); **moist**, glabrous; latex present, quickly changes reddish black; margin, regular, involute; cuticle fully peeling; **flesh** upto 0.4cm broad, white, changing; **odour** disagreeable; **taste** not observed. **Basidiospores** 6.64- 9.13 x 4.98 – 7.47 μm (excluding ornamentation). **Lamellae** upto 0.2cm broad, decurrent, close, dull red(10D₆) to purplish grey (13D₂), changing to bluish green; **lamellulae** unequal, not in series, forked on the stipe; **gill edge** smooth. **Spore** deposit not found. **Stipe** upto 4cm long, 1cm in broad, excentric, brownish red (10D₆) to brown (6E₄); surface having depositions of mycelium; hollow, fleshy; exannulate.

AREA SURVEYED

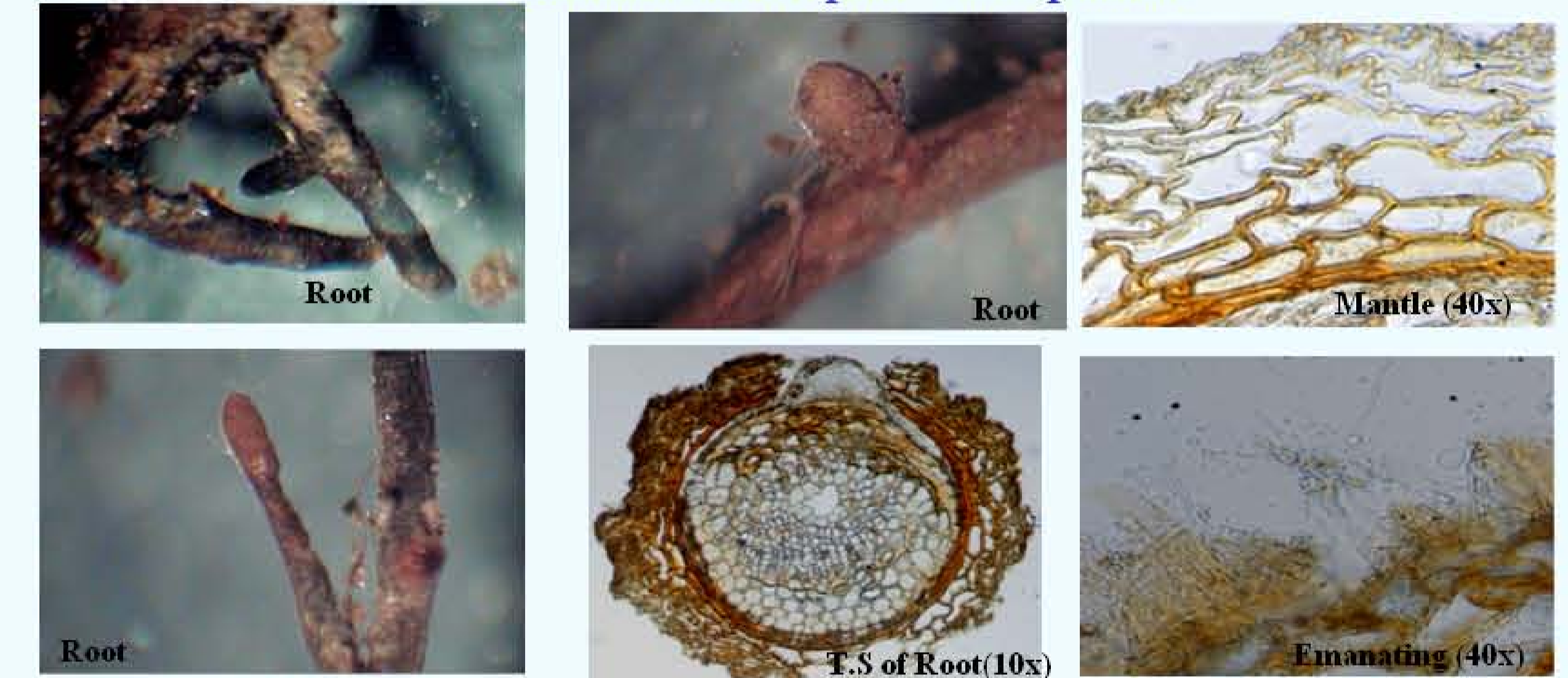


HABITAT



ECM ROOT

Russula delica var. *puta* + *Abies pindrow*

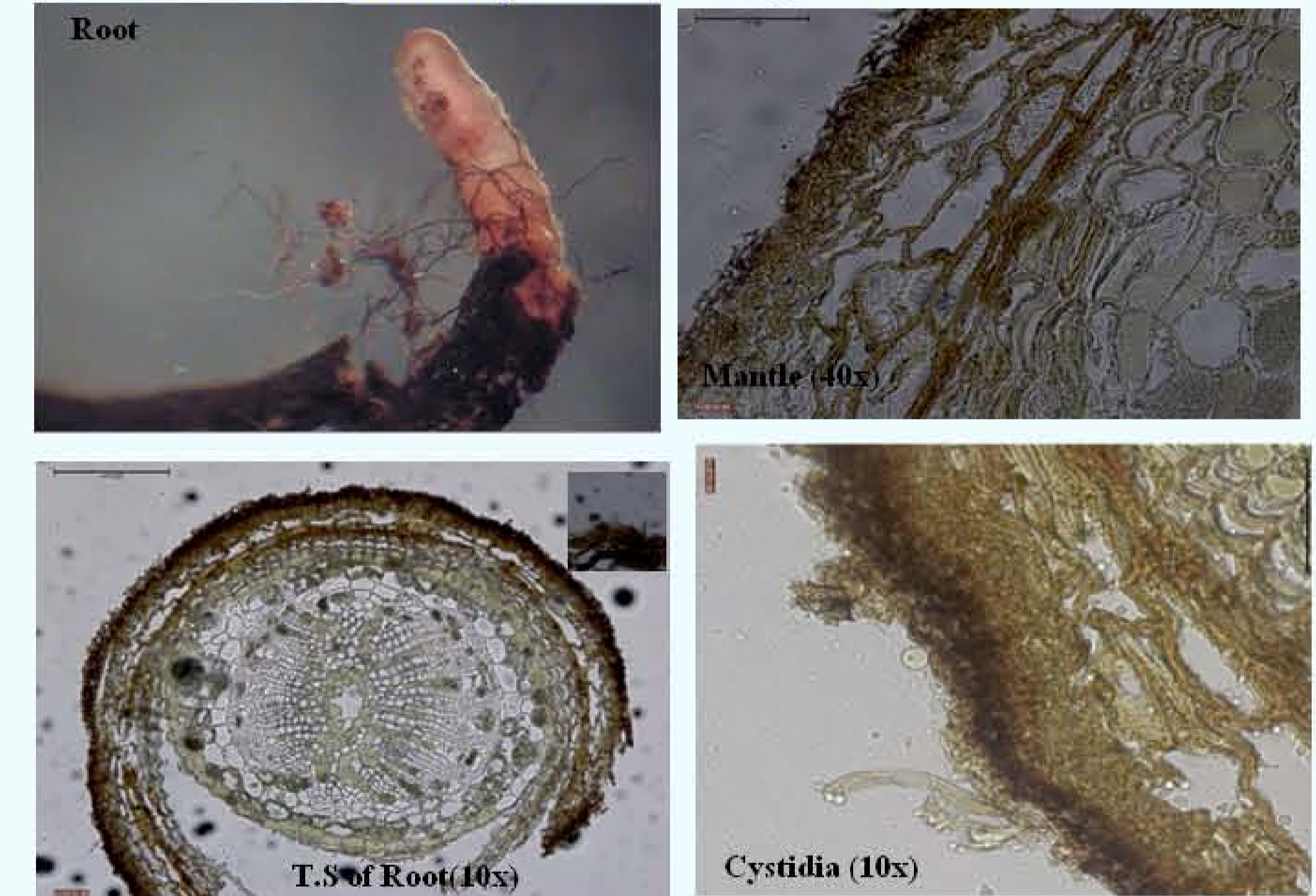


Morphology of ECM System: Colour creamy white to light brown in young while dark chocolate in mature. Ramification monopodial pinnate and unramified ends hydrophilic, smooth, covered with densely cottony emanating hyphae (1.66-3.32 μm broad) at an angle attachment less than 90°. Rhizomorphs absent.

Anatomical details of ectomycorrhizal roots: Mantle 61.35- 126.70 μm thick, differentiated into outer mantle and inner mantle. Outer mantle has gelatinized matrix between hyphae (Agerers, Type C), meandering to sinuous shaped. Inner mantle is non gelatinized, broad obtuse, even finger like branched hyphae in pseudoparenchymatous form. Emanating hyphae (1.66-3.32 μm broad), septate, granulated.

ECM

Russula foetens + *Abies pindrow*



Morphology of ECM System: Colour brown to light brown in young while dark in mature. Ramification monopodial pinnate and unramified ends hydrophilic, smooth, covered with cottony emanating hyphae (0.83-1.66 μm broad) at an angle attachment less than 90°.

Anatomical details of ectomycorrhizal roots: Mantle is thick, differentiated into outer mantle and inner mantle. Outer mantle (16.6- 41.5 μm) has gelatinized matrix between hyphae (Agerers, Type C), meandering to sinuous shaped. Inner mantle (8.3-16.6 μm) is non gelatinized, broad obtuse, blunt like branched hyphae having pseudoparenchymatous form. Emanating hyphae (1.66-3.32 μm broad), septate, granulated. Cystidia 29.88-33.2 x 3.32-4.15 μm, fusoid to cylindrical arise from outer mantle.

DISCUSSION

Fungal forays were undertaken during spring, summer and autumn season to various localities and sublocalities viz, Kulgam: Damhal Hanji Pora, Manzgam(2750m), Tsimar(2300m), Khull(2450m), Aharbal(2600m), Anantnag: Sinthontop(2980m), Pahlgam, Betaab Valley(2850m); Shopian, Sedev (2130m) etc. of South Kashmir Jammu and Kashmir. As a result, different agarics were collected which have ECM associations with conifers. Of these two taxa, *Russula delica* var. *puta* Romagn., *Lactarius rubrilacteus* Hesler & Smith were identified as first time reports from India and *Russula foetens* Pers rerecorded. In this present paper the taxonomic description supported by line drawing, field photographs and microphotographs are given.

REFERENCES

- Agerer R. 1987-1997. *Colour atlas of ectomycorrhizae*. Einhorn-Verlag, Germany, Schwäbisch Gmund, Germany.
- Shaffer J. 1934. *Russula* Monographie. *Annals Mycologici* 32(3/4): 141-243.
- Saini, SS. and Atri, NS. 1981. *Russula foetens* (Pers.) Fr. - A new record for India. *Curr. Sci.* 50: 460-461.
- Hesler LR, Smith AH. (1979). *North American Species of Lactarius*. Michigan: *The Uni of Michigan Press*. 255-256
- Romagnesi, H. 1967. *Les Russules d' Europe et de l' Afrique du Nord*. Bordas. Paris. p. 1-998.