

Toxic and hallucinogenic mushrooms of Kerala

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As part of an ongoing study of the agaric flora of Western Ghats of Kerala, several agarics were collected and studied. This paper highlights a few of the known poisonous and hallucinogenic mushrooms from Kerala.

Key words : Agarics, poisonous, taxonomy

INTRODUCTION

Wild edible fungi are collected for food and to earn money in more than 80 countries. Throughout India, people gather and eat certain species of edible wild mushrooms with which they are familiar. Most people, who eat mushrooms, are familiar with only a few edible species. In many cases, such knowledge of edible fungi is a folklore phenomenon, based up on information handed down from generation to generation. Identification of the edible mushroom is important as there are poisonous and deadly poisonous ones in nature and mushroom poisoning is quite common now-a-days. Mistakes are being made by those who can not always differentiate between edible species and their poisonous 'look-alikes'. To know several of the poisonous ones also is important, in order to avoid them.

As part of an ongoing study of the agaric flora of Kerala, several toxic and hallucinogenic mushrooms have been collected and studied on several occasion, the details of some of which are presented here.

MATERIALS AND METHODS

Mushrooms were collected from different forest localities of Kerala during the monsoon months. The period from June-August (south-west monsoon) and October-November (north-east monsoon) was chosen to coincide with the season under maximum rainfall. Systematic study was conducted following standard taxonomic

methodology (Largent, 1977; Singer, 1986). All the specimen collected were deposited in the mycological herbarium of TBGRI (TBGT).

OBSERVATIONS

During the course of our study on wild fungi, several known poisonous and hallucinogenic species were collected and studied in detail. Most of them are either related to edible species or confused with them. The deadly *Amanitas* have typically persistent, prominent identifying characteristics: they are whitish mushrooms with an annulus near the apex of the stipe and an ample membranous volva about the base of the stipe. Most nondeadly *Amanita* species are quite variable in colour and form. The annulus and volva are fugacious in some species, leaving little traces of their former presence; and what fragment remain can be overlooked by the unobservant or unknowledgeable collector. As a result poisonous amanitas can be mistakenly gathered for a few edible species of *Amanita* or few edible species of *Lepiota*, *Agaricus*, *Termitomyces* or *Volvariella*. There are, of course, real danger in collecting and consuming poisonous fungi, but these should be seen against the wider background of millions of people collecting and eating wild fungi safely on a regular basis.

Agaricus endoxanthus Berk & Br., Journ. Linn. Soc. Bot. 11 : 548 (1871)

Psalliota endoxantha (Berk & Br.) Petch, Ann. Roy. Bot. Gard., Peradeniya 6 : 320 (1917)

Agaricus iodolens Heinem & Gooss., Bull. Jard. Bot. Brux. 26 : 22 (1956)

A. xanthodermus sensu Baker, CMI Mycol. Pap. 33:85 (1951) non Gebevier (1876).

A. arvensis sensu Berk., Hooker, Lond Journ. Bot. 6:488 bis (1947), non Schaeffer, Icon. Fung. Bav. Palat., Ratisb. 4:pl. 310 (1770).

This is a well known species with a widespread distribution reported from Sri Lanka (Pegler, 1986), Kenya (Pegler 1977), Singapore & Selangor (Heinemann 1980) and Martinique (Pegler 1983). A full account of the taxonomy of the species is given by Pegler and Rayner (1969).

This conspicuous species is easily recognized by the dark brown radial squamules of the pileus and the elongate stipe base which bruises bright yellow particularly towards the base. *A. endoxanthus* grows in large troops, forming caespitose clusters. Petch and Bisby (1950) reported it to grow every year in the Peradeniya area, near bamboo clumps under partial shade. We have always collected the materials from under bamboo clumps. This species can cause an acute though brief digestive upset in person who are sensitive or allergic to it (personal observation). It is better to avoid yellowing species of *Agaricus*.

Habit & Habitat : Scattered on ground in groups under bamboos

Specimens examined : India. Kerala state, Thiruvananthapuram Distric, TBGRI campus, 17 June 1999, No. 3270, 29 April 1999, No. 4443, 1 June 2006, No. 9710; 26 October 2006, No. 10057, Wayanad District, Kattikulam, 13 August 2008, No. 11743; Thirunelli, 25 September 2008, No. 12016.

***Amanita muscaria* (L. per Fr.) Hooker, Flora Scotica 2:19 (1821)**

Agaricus muscarius (L.) Fr. Syst. Mycol. 1:16 (1821).

Amanita muscaria (L. per Fr.) Lanmark, Encyclop. Method. Bot. Vol. 1:111 (1783).

Hyophyllum muscarium (L.) Paulet, Soc. Med. pl. 11 (1779).

Venenarius muscarius (L. Fr.) Earle, Bull. New York Bot. Gard. 5:450 (1909)

Venenarius muscarius (L. Fr.) Murrill, Mycologia 5(2) : 75 (1913).

Amanita muscaria (L.) Gilb., Iconographia Mycologica de Bresadola : 76 (1940).

Agaricus imperialis Batsch, Elench. Fung. 56 (1783).

Agaricus nobilis Bolton, Hist. Fung. 2 : 46 (1788).

The species was originally described by Linnaeus (1752) and validated by Fries (1821). It is characterized by the blood-red pileus with whitish, floccose volval warts or patches, a whitish stem with a white annulus and the typical ascending rings of whitish volval material on basal bulb and lower stems. This is a hallucinogenic mushroom and is used as an intoxicant by many tribes. The species is also poisonous when used in large quantities (Singer, 1986). *A. muscaria* can be found in many sections of Europe, Asia and other areas of the world. In Australia and South Africa it is found only under the pines which were introduced from Europe and probably arrived as mycelium on their roots. Materials from Kerala were also collected from under the pines. An illustrated description can be found in Jenkins and Petersen (1976), Jenkins (1977) and Knudsen and Borgent (1987).

Habit & Habitat: Scattered on ground in a Pine forest.

Specimen examined: India : Kerala state, Idukki District, Munnar, 29 Aug. 1997, No. 4127; 27 July 1999, No. 4775.

***Amantia phalloides* (Vaill. ex Fr.) Seer., Mycol. Suisse 1:8 (1883)**

Agaricus phalloides Vaill ex Fr., Syst. Mycol. 1:13 (1821).

Venenarius phalloides (Fr. ex Fr.) Murr., Mycologia 4: 240 (1912).

Amanita phalloides (Vaill ex Fr.) E.J. Gilb., Bres., Icon. Mycol. 21, Suppl. 1:78 (1941).

This highly toxic fungus, commonly known as the 'death' is widely known by name due to its high toxic property. It is characterized by a yellowish green to olivaceous or tannish olivaceous pileus, a margin which is whitish and non-striate, a white, membranous, pendant, persistent annulus and a saccate, white, membranous volva. It is common in Europe, North America, China, Japan, Nepal and East Africa (Neville and Poumarat, 2004). Illustrated account of the species are provided by Ammirati *et al.* (1977), Pegler (1977), and Jenkins (1986).

This is the most poisonous fungus known; even small pieces eaten can cause death. Symptoms

appear in two phases. In the first phase, 8-15 hours after the meal, symptoms include stomach pains, nausea, vomiting, diarrhea and dryness of mouth. Symptoms can be very severe but in a couple of days an apparent recovery follows. During this period, however, the poison affects the liver and kidneys, after which the symptoms begin again and often death results (Harkonen *et al.*, 2003).

Habit & Habitat : Scattered in troops on ground in an *Acacia* plantation

Specimens examined : India : Kerala state, *Thiruvananthapuram District, Perayam*, 19 April, 2004, No. 7086; 20 April, 2004, No. 7087; 21 April, No. 7093; 22 April 2004, No. 7097; 28 April 2004, No. 7104; 29 April 2004, No. 7107; *TBGRI campus*, 11 April 2005; No. 8572, *TBGRI campus*, 26 April 2006, No. 9651; *Thannimoodu*, 30 May 2006, No. 9685; *Perayam*, 2 June 2006, No. 9715; *TBGRI campus*, 13 April 2007, No. 10185; *Thannimoodu*, 16 April 2007, No. 10187; *Perayam*, 17 April 2007, No. 10195, *TBGRI campus*, 20 April 2007, No. 10198; 24 April 2007, No. 10212; *Perayam*, 25 April 2007, No. 10216; 16 May 2007, No. 10290; *TBGRI campus*, 1 April 2008, No. 10812; 2 April 2008, No. 10814; 17 June 2008, No. 11127; 20 April 2009, No. 12395, 2 June 2009, No. 12516.

Amanita solitaria* (Bull. ex Fr.) Merat, *Nouv. Fl. Envir. Paris 4 Ed., 1:121 (1836)

Agaricus solitarius Bull., *Herb. France*, pl. 48 (1780).

Agaricus solitarius Bull., : Fr., *Syst. Mycol.* 1:17 (1821).

Venenarius solitarius (Bull., : Fr.), Murr., *Mycologia* 4 : 240 (1912).

Aspidella solitaria (Bull. : Fr.) E.J. Gilb., *Bres., Iconogr. Mycol.* 27(1) : 79 (1940).

Amanita echinocephala (Vitt.) Quel., *Champ. Jura Vosges I in Mem. Soc. Emul. Montebeliard II 5 : 321 (1872)*.

Lepiota echinocephala (Vitt.) Gill., *Hymen. Descr. Champ. France* 69 (1874).

Lepidella echinocephala (Vitt.) E.J. Gilb., *Bres. Iconogr. Mycol.* 27 (1) : 7. (1940).

Aspidella echinocephala (Vitt.) E. J. Gilb., *Bres. Iconogr. Mycol.* 27 (1) : 79. (1940).

Armillaria echinocephala (Vitt.) Locquin *Bull. Soc. Mycol. France* 68 : 167 (1852).

Amanita umbella var. *echinocephala* (Vitt.) Vesety,

Annls Mycol. 31 : 285 (1933).

Amanita flandinia Plee, *Types Fam. Genres Pl. France 2 : pl. 12 (1844-1864)*.

Amanita umbella var. *echinocephala* f. *bicollariata* (Boud.) E.J. Gilb., *Genre Amanita* 101. (1918).

Lepidella echinocephala f. *bicollariata* (Boud.) Konr. and Maubl., 1c. *Sel. Fung., Fasc.* 2:38 (1926).

Amanita solitaria subf. *bicollariata* (Boud.) Neville and Poumarat. *Doc mycol.* 26 (10) : 68 (1996).

A. solitaria is a very variable species which has been discussed under a variety of names (Murrill, 1913). This is a large and beautiful mushroom and can be easily identified because of its floccose nature and the large bulb at the base of the stem. The cap is sometimes tinged with brown as are the angular, erect warts which are generally numerous, but often falling off or few and scattered. The flesh is white and smells like chloride of lime. The volva is broken up in to floccose scales which cling to bulb at the lower part of the stem. These scales may be white and mealy or brownish which is easily removed by rubbing. The annulus is torn, a part often adhering to the margin of the pileus and of the gills. This and the long, tapering, rooting bulb are often the marked characteristics. *A. solitaria* is rather easy to recognize because of its numerous, small, conical warts on the whitish or greyish cap. the greenish-yellow gills, the striate, membranous ring and the more or less conspicuous, imbricate scales at the mostly enlarged base of the stem.

The species was described from Europe and known in the United States (Murrill, 1913). Detailed description of the species is provided by Bas (1969).

Habit & Habitat : Solitary on ground under forest trees.

Specimens examined : India : Kerala state *Thiruvananthapuram District, Kallar*, 2 Nov. 2006, No. 10080, *TBGRI campus*, 24 Nov. 2008, No. 12294; 17 June 2009, No. 12626; 15 Sept. 2009, No. 12921; 16 Sept. 2009, No. 12932.

Amantia verna* (Bull. Fr.) Lamarck, *Encyclopedie Methodique Botanique 1 : 113. (1783)

Agaricus (Amanita) vernus Bull., *Fr., Syst., Mycol.* 1 : 13 (1821).

Amanita phalloides var. *verna* (Bull. Fr.) Rea, *Brit. Basid* : 98 (1922).

Agaricus vernalis Bolton, Hist. Fung. Halifaz. pl. 48 pp.

This is a highly toxic species and does not appear to be very common (Benedict *et al.*, 1970). Pure white fruit body, basal bulb globose bulb, membranous saccate volva and white pendant annulus are the main characteristics.

The species is distributed in Africa, Nepal, China (Neville and Poumarat, 2004).

Habit & Habitat : Solitary on ground

Specimens examined : India : Kerala state Thiruvananthapuram District, TBGRI campus, 15 April 2005, No. 8627.

Amanita volvata (Pk.) Lloyd. Mycol. Writings (Volvae). 9, 15 (1898).

A. volvata has a whitish pileus with occasional brownish disc with white to creamy white, thin, floccose patches of randomly distributed volval remnants, exannulate stipe and a saccate membranous volva. There are no pinkish tinges anywhere on the fruit body.

The species is reported to cause poisoning (Kauffman, 1971). Romagnesi (1984), Romero de la Osa (1996), Neville and Poumarat (2004) have provided detailed descriptions of the species.

Habit & Habitat : Solitary on ground under forest trees.

Specimens examined : India : Kerala state, Thiruvananthapuram District, TBGRI campus, 20 July 2006, No. 9848; 28 July 2006, No. 9867; 5 July 2007, No. 10407.

***Chlorophyllum molybdites* (Meyer ex Fr.) Masee, Bull. Misc. Inf. Kew 1898. 136 (1898).**

Chlorophyllum molybdites is a common species of wide tropical-subtropical distribution, easily recognized by the large, scaly, pileus and the unique green colouration of the lamellae and spores. It is distributed throughout Asia, North America, South America and Africa (Wasser, 1993). *Chlorophyllum* is a monotypic genus (Pegler, 1977), although Heinemann (1968) recognized several species

largely on difference in spore size and edibility. This species causes stomach upset of varying severity involving thirst, nausea, vomiting and diarrhea (Harkonen *et al.*, 2003). Information gathered from country folklore in Kerala, revealed that this species causes allergy and hallucinogenic effects and hence the name "prandan koon"—the mad mushroom. Several cases of mushroom poisoning recently reported from Kerala were found to be caused by *C. molybdites*. This dreadly sickener was frequently mistaken for the parasol mushroom which is also common in Kerala. *Chlorophyllum* is most closely related to the genus *Macrolepiota*.

Detailed descriptions of the species are provided by Heinemann (1968) and Pegler (1977;1983).

Habit & Habitat : Solitary to scattered among grass on ground.

Specimens examined : India : Kerala state, Thiruvananthapuram District, TBGRI campus, 7 June, 1994, No. 680; Palode, 5 Sept. 1994, No. 1487; TBGRI campus, 5 Oct. 1994, No. 1584; 30 May 1994, No. 1870; Perayam, 31 May 1995, No. 1873; TBGRI campus, 14 June 1995, No. 2017; 22 Sept. 1995, No. 2439; 15 Sept. 1996, No. 3252; 4 Nov. 1997, No. 4235; 25 June 1998, No. 4325; 29 April 1999, No. 4503; 18 July 2003, No. 6274; 3 June 2004, No. 6800; 10 June 2004, No. 7292; Braemoor, 20 Aug. 2004, No. 7878; TBGRI campus, 10 June 2005, No. 7989; 11 June 2005, No. 8063; Perayam, 13 April 2006, No. 8592; TBG Junction, 9 Sept. 2005, No. 9245; TBGRI campus, 22 July 2008, No. 11486; 25 July 2008, No. 11504; 15 June 2009, 12591; 23 June 2009, No. 12650.

***Copelandia cyanescens* (Berk. & Br.) Singer, Lilloa 22 : 473 (1951).**

Agaricus papilionaceus sensu Berk., Hooker, Lond. Journ. Bot. 6 : 489 bis (1847), non

A. papilionaceus Bull. Fr., Syst. Mycol. 1:301 (1821).

A. campanulatus sensu Berk., Hooker, Lond. Journ. Bot. 6 : 489 bis (1847), non

A. campanulatus Linn., Sp. Plant 2 : 1175 (1753).

Agaricus cyanescens Berk & Br., Journ. Linn. Soc., Bot. 11: 557 (1871).

A. caliginosus sensu Bres., Hedwigia 53 : 51 (1913).

Campanularis anomalus Murrill, Mycologia 10: 32

(1918).

Panaeolus anomalus (Murr.) Sacc. & A. Trotter, Syll. Fung. 23 : 323 (1925).

P. westii Murr., Lloydia 5: 154 (1942).

Panaeolus cyanescens (Berk. & Br.) Sacc., Syll Fug. 5: 11233 (1887).

Copelandia westii (Murr.) Singer, Mycologia 36 : 552 (1944).

This is mainly a tropical to subtropical species and has been reported from S. America (Dennis, 1970), Mexico (Guzman and Perezpatrica, 1972), E. Africa (Pegler, 1977), India (Natarajan and Raman, 1983), Sri Lanka (Pegler, 1986) and Australia (Young, 1989).

Clusters of fruiting bodies with light grey caps can be found on the forest floor where elephant dung has been deposited. This species bruises blue with in minutes of handling, evidence the hallucinogenic drug inside.

Habit & Habitat : Solitary or in groups on elephant dung.

Specimens examined : India : Kerala state, Thiruvananthapuram District, TBGRI campus, 6 April 1995, No. 60; 7 April 1994, No. 553; Amboori, 9 Dec. 1996, No. 3720; TBGRI campus, 10 Oct. 2003, No. 6700; Karakulam, 22 Dec. 2006, No. 10147.

***Hygrocybe conica* (Scop. Fr.) Kummer, Fuhr, Pilzk :111 (1871).**

Agaricus conicus Scop. Fr., Syst. Mycol. 1:103 (1821); Scop., Fl. Carn. Ed. 2, 2: 443 (1772).

Hygrophorus conicus (Scop. Fr.) Fr., Epicrisis: 331 (1838).

Godfrinia conica (Scop. : Fr.) Maire, Bull Soc. Mycol. Fr. 18: 117 (1902).

Hygrophorus mutabilis Petch, Ann. Roy. Bot. Gard., Peradeniya 7: 280 (1922).

This bright scarlet coloured fungus with a pointed cap changes colour with age and immediately after being picked. There is a doubtful report that this species caused the death of 4 individuals in China (Dickinson and Lucas, 1979). Some believe it is also hallucinogenic (Lincoff, 1981).

The species is distributed in Europe, N. America

and Asia.

Detailed description of the species is provided by Hesler and Smith (1963), Arnolds (1990), Pegler (1986), Boertmann (1995) and Desjardin and Hemmes (1997).

Habit & Habitat : Solitary or in groups in grassy places.

Specimens examined : India : Kerala state, Thiruvananthapuram District, TBGRI campus, 25 April, 1995, No. 2068; 24 April 1996, No. 2977; 6 Sept. 1996. 3561, 18 July 2006, No. 9838.

***Inocybe virosa* Vrinda & Pradeep, Mycotaxon 57: 171-174 (1996).**

This species was first described from Kerala, India. A closely allied species, *Inocybe cutifracta* was reported from Sri Lanka (Pegler, 1986). This toxic species is recognized by its yellowish brown, rimose pileal surface and a yellowish white smooth stipe. A rapid, uncomplicated dose-response assay was conducted on albino rats to test the toxicity of the species. Good illustrations of this species accompany the original description (Vrinda et al., 1996).

Habit & Habitat : Scattered in groups on ground, probably in mycorrhizal association with *Aporosa acuminata* Thw. (Euphorbiaceae) and *Knema attenuata* (Wall. ex Hook. f. Thomas) Warb. (Myrsinaceae).

Specimens examined : India : Kerala state, Thiruvananthapuram District, TBGRI campus, 19 Oct. 1993, No. 34; 21 Oct. 1993, No. 74; 24 Nov. 1993, No. 431; 24 Nov. 1993, No. 436; 20 Nov. 1993, No. 441; 26 Nov. 1993, No. 445; 22 April, 1994, No. 642, Palakkad District, Silent Valley, 18 May 1994, No. 718; Thiruvananthapuram District, TBGRI Campus, 24 May 1994, No. 753; Kallar : 17 June 1994, No. 884; TBGRI campus, 14 June 1994, No. 911; 16 July 1994, No. 1098; 28 July 1994, No. 1218; Agasthyamala, 26 July 1994, No. 1258; 28 July 1994, No. 1276; TBGRI campus, 4 Aug. 1994, No. 1300, Ernakulam District, Iringle sacred grove, 16 Aug. 1994, No. 1370; 19 Sept. 1994, No. 1613; Thiruvananthapuram District, TBGRI Campus, 1 Aug. 1995, No. 1677, 2 Aug. 1995, No. 1693; 4 Aug. 1995, No. 1756; 16 Nov. 1994, Np. 1981; 17

Nov. 1994, No. 1989; 6 Aug. 1995, No. 2060; 25 April, 1995, No. 2079; 18 May 1995, No. 2180; 7 Aug. 1995, No. 2385; *Agasthyamala*, 3 Aug. 1995, No. 2421; 4 Aug. 1995, No. 2425; *TBGRI campus*, 18 Sept. 1995, No. 2517, 18 Sept. 1995, No. 2518; 17 Oct. 1995, No. 2607; 23 Oct. 1995, No. 2629; 17 Nov. 1995, No. 2710; 21 Nov. 1995, No. 2759; 15 Sept. 1996, No. 3240; 9 Sept. 1996, No. 3580; 8 Oct. 1996, No. 3630; 16 Nov. 1996, No. 3684; 26 June 1997, No. 3901; 4 Aug. 1998, No. 4420; 25 June 1999, No. 4718; *Idukki District, Devikulam*, 29 July 1999, No. 4781; *Thiruvananthapuram District, TBGRI campus*, 15 Oct. 1999, No. 4860; 12 June, 2000, No. 5026; 10 Oct. 2000, No. 5211; 1 July 2003, No. 5894; 6 Aug. 2003, No. 6418; 2 Sept. 2003, No. 6655; 8 Oct. 2003, No. 6686; 23 June, 2004, No. 7319; 24 June 2004, No. 7331; 12 July, 2004, No. 7486; 13 July 2004, No. 7496; 15 July 2004, No. 7520; 27 2004, No. 7587; *Kollam District, Kulathupuzha*, 29 July 2004, No. 7638, *Thiruvananthapuram District, TBGRI campus*, 23 Sept 2004, No. 7936; *Kollam District, Thenmala*, 24 Sept. 2004, No. 7944; *Thiruvananthapuram District, TBGRI campus*, 27 Sept. 2004, No. 7994; 20 April 2005, No. 8711; 9 Oct 2006, No. 10011; 17 July 2007, No. 10428; *Perya* 16 Aug. 2007, No. 10495; *Begur*, 26 Sept. 2007, No. 10570; *TBGRI campus*, 15 Oct. 2007, No. 10601; *Wayanad District, Thamarassery*, 16 July 2008, No. 11367; *TBGRI campus*, 28 July 2008, No. 11536; 26 Aug. 2008, No. 11831; 28 Aug. 2008, No. 11844; 1 Sept. 2008, No. 11846; 9 Sept. 2008, No. 11881; 15 Sept. 2008, No. 11898; 17 Sept. 2008, No. 11909; 18 Sept. 2008, No. 11917; *Wayanad District, Muthanga*, 23 Sept. 2008, No. 11967; *Ponkuzhy*, 24 Sept. 2008, No. 11991, *TBGRI campus*, 16 Oct. 2008, No. 12078; 20 Oct. 2008, No. 12103; 23 Oct. 2008, No. 12117; 31 Nov. 2008, No. 12177; 27 April 2009, No. 12413; 10 July 2009, No. 12743; 1 Oct. 2009, No. 12956.

***Lepiota brunneoincarnata* Chod & Mart. Bull. Soc. Bot. Genere 5 : 222 (1889).**

Lepiota brunneoincarnata is a highly toxic species, causing just as *Amanita phalloides*, severe damage to liver, which can result in death (Vellinga, 2001). The small, umbonate pileus with brownish scales on a white background and somewhat scaly stem without a ring and the fruity smell distinguishes this species. It grows mainly on soil rich in nutrients, and is widespread in Europe but

rare elsewhere (Vellinga, 2001).

A detailed description of the species is provided by Vellinga (2001).

Habit & Habitat : Solitary or scattered, terrestrial.

Specimens examined : India : *Thiruvananthapuram District, TBGRI campus*, 9 June 2008, No. 11024; 12 June 2008, No. 11073; 30 July 2008, No. 11553; 17 Sept. 2008, No. 11912.

***Lepiota clypeolaria* (Bull. ex Fr.) Kummer, *Fuhr. Pilzk.* : 137 (1871).**

Agaricus clypeolaris Bull., France : pl. 405 (1789).
Agaricus clypeolaria bull. : Fr., Syst. Mycol. 1 : 21 (1821).

Agaricus colubrinus Pers., Syn. meth. Fung.: 258 (1801).

Lepiota colubrina (Pers.) S. F. Gray, Nat. Arr. Br. Pl. 1: 601 (1821)

Lepiota ochraceosulfurescens Locq. Ex M. Bon in Doc. Mycol. 16 (61) : 46 (1985).

The species is widely distributed in Europe, N. America, Asia and N. Africa (Breitenbach and Kranzlin, 1995).

This is a variable and widely distributed species. Along with its fusiform spore and characteristic pileipellis, it is distinguished by its floccose-fibrillose partial veil, which often does not form a distinct annulus, but leaves delicate remnants spread along the length of the stipe below the poorly defined annular zone. In North America it is reported to be poisonous (Soothill and Fairhurst, 1978; Miller, 1972).

A full description of the species is provided by, Akers and Sundberg (2000) and Vellinga (2001).

Habit & Habitat : Solitary or scattered in small groups, terrestrial.

Specimens examined : India : Kerala state : *Wayanad District, Kuppadi*, 17 Aug. 2007, No. 10504 & 10506.

***Lepiota cristata* (Bolt ex Fr.) Kummer, *Der Fuhrerin die pilzkunde*. 1871.**

Agaricus cristatus Bolt., *Hist. Fung. Halifax* 1:7

(1788, non *Agaricus cristatus* Scop., (1774).

Agaricus cristatus Bolt. : Fr., Syst. Mycol. 1:22 (1821).

Lepiota cristata var. *felinoides* M. Bon, Doc. Mycol. 11 (43) : 34 (1981).

Lepiota felinoides (M. Bon) P.D. Orton, Notes R. bot. Gdn Edinb. 41 : 591 (1984, non *Lepiota felinoides* Peck, (1900).

Lepiota subfelinoides Bon & Orton, Doc. Mycol. 14 (56): 56 (1985).

Lepiota cristata var. *exannulata* M. Bon Doc. Mycol. 11 (43): 34 (1981).

Lepiota cristata var. *pallidior* Boud. ex M. Bon Doc Mycol. 11 (43) : 34 (1981).

This small poisonous species is well characterized by its small to medium sized, white cap with concentric rings of reddish brown scales, white, free gills, white stipe tending to turn yellow or reddish brown, ring on stalk and the pungent odour. The smell of the gills and the spore shape make this species distinctive. It is reported to be poisonous by many authors (Soothill and Fairhurst, 1978, Huffman *et al.*, 1989).

It is distributed world wide. A detailed description of the species from California is provided by Sundberg (1989).

Habit & Habitat : Scattered in groups in flower beds in the garden.

Specimens examined : India : Kerala State : Thiruvananthapuram District, TBGRI campus, 1 June 1994, No. 823; Kollam District, Thenmala, 8 Nov. 2005, No. 9484; 9 Nov. 2005, No. 9485.

***Lepiota subincarnata* J. Lange, Fl. Agar. Dan. 5:5 (1940).**

Lepiota josserandii Bon & Boiff., Bull. Trimest. Soc. Mycol. Fr. 90:289 (1975).

Leucoagaricus josserandii (Bonj & Boiff) Raitelhuber, Metrodiana 17 : 75 (1989).

Lepiota subincarnata var. *josserandii* (Bon & Boiff) Gminder, Beitr. Kemntn. Pilze Milleleur. 12:69 (1999).

Lepiota josserandii var. *rosabrunnea* Raitelhuber, Metrodiana 16:42 (1988).

Lepiota subincarnata, like *L. brunneoincarnata*, is very toxic because of the presence of amanitins, it

also contains amotoxins (Vellinga, 2001). Distinguishing characters of the species are the small to medium sized basidiocarp with reddish brown centre, concentrically arranged reddish brown squamules distributed on a pinkish cream background, free white lamellae and scaly stipe surface.

L. subincarnata is widespread in Europe, also recorded from North America (Vellinga, 2001). Illustrated description of the Kenyan species is provided by Pegler (1977).

Habit & Habitat : Gregarious in small groups, terrestrial, on humus rich soil.

Specimens examined : India : Kerala state : Kollam District, Thenmala, 14 June 2005, No. 8944; 14 June 2005, No. 8945.

***Lepiota xanthophylla* P.D. Orton, Trans. Br. Mycol. Soc. 43 : 289 (1960).**

L. citrophylla, sensu auctt. Europ., non Berk & Br. (1871).

This small species occurs either solitary or scattered and is characterized by a sulphur yellow pileus with brown granular squamules, yellow lamellae and a yellow stipe with floccose velar remnants. The spores are subcylindric.

The species is reported from Africa (Pegler, 1977). Detailed illustrated account is provided by Orton (1960), Reid (1968) and Vellinga (2001).

Habit & Habitat : Solitary to scattered on ground among litter.

Specimens examined : India : Kerala state . Thiruvananthapuram District, TBGRI campus, 6 Sept. 1994, No. 1489; 6 Nov. 1997, No. 4238; Perayam, 12 Sept. 2007, No. 10516; TBGRI campus, 8 Sept. 2008, No. 11871; 28 Oct. 2008, No. 12121; 18 June 2009, No. 12631; 19 June 2009, No. 12641; 22 June 2009, No. 12644.

***Leucoagaricus hortensis* (Murr.) Pegler, Kew Bull. Add. Ser. 9. 414-415 (1983).**

Lepiota hortensis Murr. North Amer. Fl. 10: 59 (1914).

L. americana sensu Baker & Dale, CMI Mycol. Pap. 33 : 88 (1951) non

L. americana (Peck) Sacc.

This is a wide spread neotropical species reported from Venezuela, Colombia, the Caribbean, Mexico and the Gulf coastal USA (Akers and Sundberg, 1977). It occurs in grasslands and gardens on dung manure and is common in Western Ghats of Kerala (Vrinda *et al.*, 1999 a).

The species was originally described from New York (Murrill, 1914). Detailed descriptions of the species are provided by Murrill (1914). Dennis (1912) and Pegler (1983).

Its overall aspects recall a small species of *Macrolepiota* or *Chlorophyllum molybdites* but with a pale cream spore deposit. The species is recognized in the field by the white pileus with patches of scales, striate pileal margin and reddening of the basidiomes on bruising.

Habit & Habitat : Solitary to scattered on richly manured ground.

Specimens examined : India : Kerala state : Thiruvananthapuram District, TBGRI campus, 7 June 1994, No. 678, 679; 15 July 1994, No. 1073; 21 July 1994, No. 1152; 21 July 1994, No. 1155; 1 Aug. 1995, No. 1574; 29 Aug. 1996, No. 1865; 29 May 1997, No. 1869; 2 June 1997, No. 1885; 8 June 1997, No. 2100; 3 Aug. 1997, No. 2421, 2426; 25 March 1998, No. 3743; 27 May 1998, No. 3864; 14 June 1998, No. 4314, Ernakulam District, Iringole 3 July 2000, No. 5307; Thiruvananthapuram District, TBGRI campus 17 June 2002, No. 5584; Perayam, 15 Sept. 2004, No. 7832; 17 Sept. 2004, No. 7863; Kollam District, Kadakkal, 27 March 2005, No. 8518; 31 March 2005, No. 8520; Thiruvananthapuram District, Thannimoodu, 7 April 2005, No. 8551; Perayam, 11 April 2005, No. 8560; TBGRI campus, 12 April 2005, No. 8574; 31 Oct. 2005, No. 9408; 17 April 2006, No. 9640; 23 May 2006, No. 9661; Karakulam, 26 May 2006, No. 9662; TBGRI campus, 21 Aug. 2006, No. 9929.

***Leucoagaricus leucothites* (Vitt.) S. Wasser, Ukr. bot. Zh. 34: 308 (1977)**

Agaricus leucothitus Vitt., Descr. Fung. Mang., Italia : 310 (1835).

Lepiota leucothites (Vitt.) P.D. Orton, Trans. Br.

Mycol. Soc. 43 : 177 (1960).

Agaricus holosericeus Fr., Epicrisis : 16 (1838).

Leucocoprinus holosericeus (Fr.) Locq., Bull. Mens. Soc. Linn. Lyon 12 : 95 (1943).

Leucoagaricus holosericeus (Fr.) Mos., Rohrlinge, Blatterpilze, 3. Aufl. : 185. (1967).

Agaricus naucinus Fr., Epicrisis : 16 (1838)

Lepiota naucina (Fr.) Kumm., Fuhr. Pilzk. : 136. (1871).

Leucoagaricus naucinus (Fr.) Sing., Lilloa 22 : 423 (1951).

Lepiota densifolia Gillet, Champ. France : 68. (1874).

Leucoagaricus densifolius (Gillet) Babos, Szujko - Lacza, F1. Hortobagy Natn. Park : 82. (1982)

Lepiota carneifolia Gillet, Hymenomyces: 65. (1874).

Leucocoprinus carneifolius (Gillet) Locq., Bull. Mens. Soc. Linn. Lyon 14:93 (1945).

Leucoagaricus carneifolius (Gillet) M. Bon, Doc. Mycol. 7 (27-28): 21. (1977).

Leucoagaricus carneifolius (Gillet) Wasser, Ukr. Bot. Zh. 34 : 307. (1977).

Lepiota olgae Velen., Ceske Houby : 210. (1920).

Leucocoprinus olgae (Velen.) Locq., Bull. Mens. Soc. Lin. Lyon 14 : 92 (1945).

Leucoagaricus subcretaceus M. Bon, Doc. Mycol. 13(49):49. (1983).

Leucoagaricus leucothites is widespread throughout the northern hemisphere, southern hemisphere, Netherlands, Europe, Asia, North America, South America and Africa (Wasser, 1993; Vellinga, 2001). The species is characterized by a robust fruit body, white pileus with powdery coating all over, bulbous stipe base and large ellipsoid spores with a germ pore. This large pure white species is common in pastures and among the edges of roads. It is allergic and likely to cause stomach upsets (Hemmes and Desjardin, 2002). According to one source it is the most frequent cause of mushroom poisoning in the Pacific North west (Arora, 1979). Ammirati *et al.* (1985) note that while some can eat it, it can act as a gastrointestinal irritant to others, although symptoms are not severe. Shepherd and Totterdell (1988) also noted that it is considered by some to be edible, but it is not recommended because some people appear to be allergic to it resulting in nausea and vomiting. *L. leucothites* looks very similar to some good edible *Agaricus* species differing mainly in forming white gills and spores when mature, instead of pink to

brown gills and brown spore as in *Agaricus*. It is also known as *L. naucinus*.

A detailed illustrated account of the African material is provided by Reid and Eicker (1993).

Habit & Habitat : Solitary or in groups in grasslands, gardens and parks.

Specimens examined : India Kerala state : *Thiruvananthapuram District, Kallar, 17 June 1994, No. 886.*

***Leucoagaricus rubrotinctus* (Peck) Sing., Sydowia 2: 36 (1948).**

Agaricus rubrotinctus Peck, Annual report on the New York State Museum of National History, 35, p. 155. (1984).

The species is distributed in Europe, N. America and Asia. *L. rubrotinctus* is characterized by the bright red pileus especially when young, the relatively large spores, the large, clavate cheilocystidia and the partly gelatinized pileipellis. It is reported from North America (Murrill, 1918), Trinidad (Dennis, 1952), Venezuela (Dennis, 1970 as *Lepiota*) and Vietnam (Yang, 2000).

Habit & Habitat : Solitary to gregarious on flower beds.

Specimens examined : India : Kerala state : *Thiruvananthapuram District, Pazhakutty, 18 June 2003, No. 4920; Kollam District, Achenkovil, 17 June 2004, No. 7281; Cheenikkala, 12 Aug. 2004, No. 7725; Thiruvananthapuram District, Kallar, 3 May 2005, No. 8803; TBGRI campus, 26 July 2005, No. 9859; Wayanad District, Thamarassery, 19 June 2007, No. 10342; Muthanga, 20 June 2007, No. 10352; Thiruvananthapuram District, TBGRI campus, 5 June 2008, No. 10995; 6 June 2008, No. 11006; 9 June 2008, No. 11023; 12 June 2008, 11081.*

***Leucocoprinus birnbaumii* (Corda) Sing., Sydowia 15:67, 1962**

Agaricus luteus Bolton, Hist. Fung. Halifax 2: pl. 50 (1788) non *A. luteus* Fr., Syst. Mycol. 1:55 (1821).

A. birnbaumii Corda, Icon. Fung. 3:48 (1839).

A. flos-sulphuris Schnizlein, Sturm, Deut. Fl. 3 (31)

: 1., pl. 1 (1851).

A. cepaestipes Sow. : Fr. var. *flos-sulphuris* (Schnizlein) Oudemans, Arch. Neer. Sci. exact. Nat. 2: 19 (1867).

A. cepaestipes Sensu Berk., Hooker, Lond. Journ. Bot. 6 : 481 bis (1847); Berk. & Br., Journ. Linn. Soc., Bot. 11 : 499 (1871); Petch, Ann. Roy. Bot. Gard., Peradeniya 4 : 383 (1910), non *A. cepaestipes* Sow. Fr., Syst. Mycol. 1 : 280 (1821). *Lepiota cepaestipes* (Sow. : Fr.) Kummer var. *lutea* (Bolton) Quel., Enchirid. : 7 (1886).

L. lutea (Bolton) Godfrin, Bull. Soc. Mycol. Fr. 13 : 33 (1897).

L. aurea Masee, Bull. Misc. Inf. Kew 1912 : 189 (1912).

L. pseudolicmophora Rea, Brit. Basid. : 74 (1922).

L. coprinoides Beeli, Fl. Icon. Champ. Congo 2: 42 (1936).

Leucocoprinus luteus (Bolton) Locq., Bull. Soc. Linn. Lyon 14 : 93 (1945).

This beautiful species can easily be identified in the field by the shape of the cap and bright yellow colour of the fruit body with floccose squamules all over. The stem, which bears a simple, fixed ring, is often conspicuously enlarged and clavate towards the base. The species is widely distributed in Europe, Asia, N. America, S. America and Africa (Wasser, 1993).

It is reported to cause gastrointestinal upsets (Lincoff 1981, Hemmes and Desjardin, 2002). Detailed description of the species is provided by Pegler, (1977), Smith (1981), Candusso and Lanzoni (1990) and Wasser (1993).

Habit & Habitat : Solitary or scattered on soil or on rotten wood or sometimes on wall.

Specimens examined : India Kerala state, *Thiruvananthapuram District, TBGRI campus, 10 April, 1996, No. 2801; 11 April, 1996, No. 2833; 22 April, 1996, No. 2946; Idukki District, Munnar, 28 Aug. 1997, No. 4103; Kollam District, Kulathupuzha, 3 May 2001, No. 5287; Thiruvanthapuram Dist., TBGRI campus, 30 May 2002, No. 5529; Varkala, 28 June 2004, No. 7355; TBGRI campus, 28 April, 2005, No. 8766; Ponmudi, 30 May 2005, No. 8842, Varkala, 29 June 2006, No. 9664; TBGRI campus, 6 July 2006, No. 9795; Karimancode, 7 July 2006, No. 9800; TBGRI campus, 27 June 2007, No. 10334; 26 Aug. 2008,*

No. 11828; 25 May 2009, No. 12464, 12468.

***Leucocoprinus bresadolae* (Schulz.) S. Wasser, Novit. Syst. Plant. Vasc. et on Vasc., 4 : 23, 1978.**

Agaricus cupreus Schulzer, Vera. Zool. Bot. Ges. 27 : 112 (1877). Nec. Secretan.

Lepiota bresadolae Schulzer nom. nov., Hedwigia 24 : 132 (1885).

Leucoagaricus bresadolae (Schulzer) Bon, Docums Mycol. 7 (27-28) : 15 (1977).

Leucocoprinus bresadolae usually fruits in clusters of relatively large basidiomes and is characterized by their robust fruit bodies with dark brown squamules over the surface. This species can be easily recognized by its intense colour changes on bruising, which varies from yellow or saffron, to reddish-brown and finally blackish brown, on all parts of the fruit body. *L. bresadolae* grows in richly manured ground, on soil among grasses and heaps of compost or cow dung.

Illustrated descriptions of the species is provided by Reid (1990), Wasser (1993). *L. bresadolae* is widely distributed in Europe and Asia (Reid, 1990). Some authors regard this as poisonous and some others are of opinion that, they found no toxic effect and the well-cooked mushroom, proved to be tasty (Babos, 1979).

Habit & Habitat : Scattered or in caespitose clusters on cow dung heaps

Specimens examined : India Kerala state, Thiruvananthapuram district, 26 May 2005, No. 531; 3 June 1996, No. 632; 10 June 1996, No. 693; 14 June 1996, No. 700; 1 Aug. 1996, No. 903; 3 April 1997, No. 1848; 17 April 1997, No. 1851; 17 April 1998, No. 1853; 30 May 1998, No., 1871; 5 June 1998, No. 1888; Wayanad District, Thirunelli 12 Aug. 1998, No. 4453; 13 Aug. 1998, No. 4454, 4471, 4472; Palakkad District, Silent Valley 28 Oct. 1998, No. 4554; Thiruvananthapuram District, TBGRI campus, 19 June 2000, No. 5262; 30 June 2003, No. 5873; 7 July 2003, No. 5960; 14 July 2003, No. 6048; 16 July 2003, No. 6222; 18 July 2003, No. 6271; 25 July 2003, No. 6363; 30 July 2003, No. 6376; 31 July 2003, No. 6385; 4 Aug. 2003, No. 6394; 30 May 2004, No. 6416; 6 Aug. 2004, No. 6419; 3 June 2004, No. 6548; 1 April 2005, No. 7023; 6 April 2005, No. 7033; 15 April 2005, No. 8626; 31 May 2005, No. 8845; Thannimoodu, 30

May 2006, No. 9681; TBGRI campus, 6 Aug. 2008, No. 11628; 30 March 2009, No. 12380.

***Nothopanus eugrammus* (Mont.) Singer, Mycologia 36:364 (1944).**

Agaricus eugrammus Mont., Ann. Sci. Nat., Bot. Ser. 2,8 : 366 (1837).

Lentinus eugrammus (Mont.) Mont., Pl. Cell. Cuba : 414 (1842).

Agaricus lobulatus Lev., Ann. Sci. Nat., Bot. ser. 3,5:116 (1846).

Panus eugrammus (Mont.) Fr., Nova Acta Soc. Sci., Upsal. ER. 3,1 : 40 (1851).

Panus wrightii Berk. & Curt., Journ. Linn. Soc., Bot. 10 : 299 (1869).

Pleurotus lobulatus (Lev.) Sacc., Syll. Fung. 5 : 371 (1887).

Panellus eugrammus (Mont.) Murr., N. Amer. Fl. 9 : 245 (1915).

Pleurotus eugrammus (Mont.) Dennis, Kew Bull. 8 : 35 (1953).

This is relatively common in the Palaeotropics and SE Asia. Bioluminescence has been recorded for the species by Corner (1981) and Vrinda *et al.* (1999 b). The fruit bodies glow in the dark emitting a pale greenish light. It is often confused with *Pleurotus flabellatus* (Berk. & Br.) Sacc., but differs in its microscopic characters. Detailed illustrated descriptions are provided by Pegler (1986). Illustrated description of the Indian material is provided by Vrinda *et al.*, (1999 b).

Habit & Habitat : Grows in imbricate clusters on living and dead wood of many host species.

Specimens examined : India Kerala state, Thiruvananthapuram District, TBGRI campus, 6 April, 1995, No. 62; 10 April 1995, No. 130; 7 Dec. 1993, No. 458; 8 Dec. 1993, No. 463; 7 July 1994, No. 1018; 26 July 1995, No. 1341; 29 Sept. 1994, No. 1554; 13 Nov. 1994, No. 1943; 15 Nov. 1994, No. 1970; 16 Nov. 1994, No. 1980; 17 Nov. 1994, No. 1982; 5 May 1995, No. 2136; 4 Oct. 1995, No. 2553; 5 Oct. 1995, No. 2557; 6 Oct. 1995, No. 2566; 10 Oct. 1995, No. 2597; 26 Oct. 1995, No. 2625; 21 Oct. 1995, No. 2764; 29 Nov. 1995, No. 2782; 7 Aug. 1996, No. 3499; 25 March 1997, No. 3740; 3 July 1999, No. 4721; 7 June, 1999, No. 4726; 26 June 2000, No. 5092; 5 Aug. 2003, No. 6406; 6 Aug. 2003, No. 6423; 8 Aug. 2003, No. 6468; 28 April, 2004, No. 7103; Kollam District, Aryankavu,

9 June 2004, No. 7215; *Thiruvananthapuram District, TBGRI campus*, 13 June 2004, No. 7381; 1 July 2004, No. 7384; 2 July 2004, No. 7392; 20 Aug. 2004, No. 7804; 23 Sept. 2004, No. 7925; 29 Oct. 2004, No. 8338; 3 Nov. 2004, No. 8376; 27 April 2005, No. 8762; 28 April 2005, No. 8780.15 Oct. 2007, No. 10608; 16 April 2008, No. 10908; 3 June 2008, No. 10982; 25 Aug. 2008, No. 11819, 11823, 11841; 23 sept. 2008, No. 12050; *Kallar, TBGRI campus*, 13 Nov. 2008, No. 12250; 17 Nov. 2008, No. 12268; 20 Nov. 2008, No. 12834.

***Omphalotus olearius* (De ex Fr.) Singer, Pap. Mich. Aca. Sci. 32 : 133 (1946)**

Agaricus olearius Dc ex Fr., Syst. Mycol. 1 : 273 (1821)

A. illudens Schwein, Schrift. Naturf. Ges. Leipzig. 1:82 (1822).

Crepidotus olearius (DC ex Fr.) Duby, Bot. Gall. : 809 (1830).

Agaricus carpini Fr., Epicrisis:210 (1838).

Panus illudens (Schwein.) Fr., Nov. Symb. : 39 (1851).

Agaricus facifer Berk. & Curt., Ann. Mag. Nat. Hist. II, 12 : 421 (1853).

Pleurotus olearius (DC ex Fr.) Gillet, Hymen. Fr. : 344 (1878).

Panus incandescens Berk & Br., Trans. Linn. Soc., Bot. II, 2:55 (1881).

Flammula phosphorea (Batt.) Quel., Assoc., Fr. Avanc. Sci. Suppl. II, 393 (1882).

Clitocybe illudens (Schwein.) Sacc., Syll. fung. 5:162 (1887).

Pleurotus olearius (DC ex Fr.) Gillet var *carpini* (Fr.) Sacc., Syll. Fung. 5 : 346 (1887).

P. facifer (Berk. & Curt.) Sacc., Syll. Fung 5 : 352 (1887).

Dryophila phosphorea (Batt.) Quel., Fl. Mycol. Fr. : 159 (1888).

Monodelphus illudens (Schwein.) Earle in Bull. New York. Bot Gard. 5 : 432 (1900).

Chitocybe olearia (DC ex Fr.) Maire, Bull. Soc. Hist. Nat. Afr. Nord. 6 : 145 (1915).

Armillariella olearius (DC ex Fr.) Singer, Ann Mycol, Berl. 41 : 19 (1943).

Omphalotus olearius is a bright apricot orange coloured species occurring in clusters on the decaying stumps and roots of trees. It is widely distributed throughout tropical and sub-tropical areas and has luminescent gills. The bright colour,

decurent gills, tendency to grow in clusters and the luminescent nature of the gills are the distinguishing characters of the species. The fungus is toxic and cause serious gastrointestinal poisoning (Miller, 1972, Pegler, 1977). Illustrated description of the Indian material is provided by Vrinda *et al.* (1999 b).

Habit & habitat : Occur in clusters on the decaying stumps and roots of tress. Members are wood inhabiting but often appear terrestrial.

Specimens examined : India Kerala state, *Thiruvananthapuram District, TBGRI campus*, 29 Otc. 1993, No. 150 : 29 June 1994, No. 996; 16 July 1994, No. 1087; 9 Aug. 1994, No. 1329; 1 Sept. 1994, No. 1463; 18 April 1995, No. 2023; *Agasthyamala*, 1 June 1995, No. 2236; 19 Aug. 1996, No. 3531; *Alapuzha distric, Mavelikara*, 5 May 1999, No. 4643; *Thiruvananthapuram District, TBGRI campus*, 2 June 1999, No. 4677; 27 Oct. 1999, No. 4882; 1 Nov. 1999, No. 4905; 20 June 2000, No. 5005; 17 June 2000, No. 5064; 22 June 2000, No. 5085; 8 June 2001, No. 5328; 7 Aug. 2002, No. 5679; 10 July 2003, No. 5958; 11 July 2003, No. 6037, 11 Aug. 2003, No. 6492; 17 Nov. 2003, No. 7000; 2 Aug. 2004, No. 7650; 6 Aug. 2004, No. 7687; 10 Aug. 2004, No. 7714; 13 Aug. 2004, No. 7750; 28 Sep. 2004, No. 8038, 5 Nov. 2004, No. 8401; 30 June 2005, No. 9046; 14 Aug. 2006, No. 9921; *Wayanad District, Muthanga*, 15 Aug. 2007, No. 10459,; *Nadavayal*, 27 Sept. 2007, No. 10589; *Muthanga* 16 July 2008, No. 11412; *Manikkunnumala*, 18 July, 2008, No. 11450; *Thiruvananthapuram District, TBGRI campus*, 19 Sept. 2008, No. 11926; 23 Sept. 2008, No. 12041, 30 Nov. 2008, No. 12161; 21 May 2009, No. 12462; 3 July 2009, No. 12708; 6 July 2009, No. 12718; 14 Aug. 2009, No. 12852.

***Panaeolus africanus* Ola'h in Rev. Mycol. Mem. Ser. 10:125 (1969).**

This species was first described by Ola'h (1969) from Central Africa. *Panaeolus africanus* is a little brown mushroom which small amounts of the hallucinogen psilocybin. It has been found in central Africa and southern Sudan. This is a little brown mushroom that grows on elephant dung. The small, conic grey cap, often with scaly cracks, viscid when moist; grey to white flesh; greyish gills which turn black with a mottled appearance as the spores

mature and the stem which is pruinose at the top are the distinguishing characteristics. Reported from central Africa to the southern regions of the Sudan (Stametes, 1996). Detailed illustrated description of the Indian species is provided by Natarajan and Raman (1983).

Habit & Habitat : Solitary or scattered on elephant dung.

Specimens examined : India, Kerala state, Thiruvananthapuram District, TBGRI campus, 19 April 1996, No. 2920; Kultahupuzha, 23 April, 1996, No. 2961.

***Panaeolus acuminatus* (Schaeff. ex Secr.) Quel., *Champ. Jura Vosges* 1:257 (1872).**

Agaricus acuminatus Schaeff. ex Secr., Mycogr. Suisse 1 : 368 (1833).

Panaeolus acuminatus is a mushroom that grows in grass and in dung. It has been found throughout North America and Europe and is very widely distributed. The species is recognized by the constricted, umbonate pileus which is strongly expallent with a marginal zone when half dry, and the comparatively short stipe. A detailed account of the African species is provided by Pegler (1977).

Habit & Habitat : Scattered in groups on elephant dung.

Specimens examined : India Kerala state, Palakkad District, Silent valley, Poochappara, 29 May 1996, No. 3063; Thiruvananthapuram District, TBGRI campus, 6 Nov. 1996, No. 3669.

***Panaeolus antillarum* (Fr.) Dennis, *Kew Bull.* 15 : 124 (1961)**

Agaricus antillarum Fr., Elenchus Fungorum 1:42 (1828)

A. sepulchralis Berk., Hook., Lond. Jour. Bot. 1:452, pl. 15 (1842).

A. solidipes Peck, Ann. N.Y. State Mus. 23 : 101, pl. 4/1-5 (1872).

A. fortunatus Cooke, Grevillea 9 : 132 (1881).

A. capnolepis Kalchbr., Grevillea 9:132 (1881).

Hypholoma capnolepis (Kalchbr.) Sacc., Syll. Fug. 5:1033 (1887).

Psilocybe antillarum (Fr.) Sacc. Syll. Fug. 5:1052 (1887).

Psilocybe fortunate (Fr.) Sacc. Syll. Fug. 5:1056

(1887).

Panaeolus sepulchralis (Berk.) Sacc. Syll. Fug. 5:1119 (1887).

Panaeolus solidipes (Peck.) Sacc. Syll. Fug. 5:1123 (1887).

Agaricus ovatus (Cooke & Masee), Grevillea 18:4 (1889).

Panaeolus ovatus (Cooke & Masee), Sacc. Syll. Fung. 9:147 (1889).

Campanularis solidipes (Peck) Murr., Mycologia 10:31 (1918)

P. teutonicus Bride & Metrod in Bull. Soc. Mycol. Fr. 66:106, (1950).

P. semiovatus (Sow. Ex Fr.) Lundell forma exannulate Pearson in Trans. Br. Mycol. Soc. 33:309 (1950).

Anellaria sepulchralis (Berk) Singer, Lilloa 22:475 (1951).

P. antillarum is a tall white to silvery grey-capped species that grow in clusters of half a dozen or more fruiting bodies in well-rotted elephant dung. It is distinguished from other black spored dung inhabitants by its cap. more robust and solid white stem that does not stain blue when bruised, and the absence of a partial veil.

P. antillarum is world wide in distribution. According to Murrill (1918), this is the largest and most common species of *Panaeolus* in the West Indies.

Full account of the species is provided by Watling and Gregory (1987), Pegler (1983). The species is reported from India by Natarajan and Raman (1983).

Habit & Habitat : Solitary to scattered on cow/ elephant dung.

Specimens examined : India Kerala state, Thiruvananthapuram District, TBGRI campus, 23 Oct. 1995, No. 2613; 20 April 1996, No. 2932; Idukki District, Devikulam, 12 May 1996, No. 3032; Palakkad District, Silent Valley, 28 May 1996, No. 3059; Ernakulam District, Iringole, 5 Nov. 1998, No. 4592; 16 Dec. 1998, No. 4603, 4610; Kollam District, Sankili, 10 May 2005, No. 8831; Wayanad District, Muthanga, 22 June 2007, No. 10382.

***Panaeolus fimicola* Fr. (Pers. Ex Fr.) Quel., *Champ. Jura Vosges* 1:257 (1872).**

Agaricus fimicola Pers. Ex Fr., Syst. Mycol. 1:301 (1821).

Coprinarius fimicola (Pers. ex Fr.) Quel., *Enchiridion* : 119 (1886).

The species is recognized by its convex, sepia cap and stipe which is never parabolic or campanulate. Spores are more ellipsoid than in most other species of the genus. It is reported to show the presence of psilocybin in some specimens or in populations but not in others (Lincoff and Mitchel, 1977). Illustrated account of the species is provided by Watling and Gregory (1987). The species has a wide distribution and is reported from Americas, Africa and Europe (Stametes, 1996).

Habit & Habitat : Scattered on cow dung among grasses.

Specimens examined : India : Kerala state, Kollam District, Thenmala, 24 July 2003, no. 6285.

***Panaeolus papilionaceus* (Bulliard Fries) Quel. *Champ. Jura Vosges* 1:152 (1872).**

Agaricus papilionaceus Bull., *Hist. Champ. France*, t. 561. (1742).

Chalymota papilionaceus (Bull. ex Fr.) Karst., *Hattsvampar*:519 (1879).

Coprinarius papilionaceus (Bull. ex Fr.) Quel. *Enchiridion* : 119 (1886).

This is a wide spread cosmopolitan species of meadows, recognized by the pale grey pileus which is frequently cracked and the pale stipe. *P. papilionaceus* is commonly called as "laughter mushroom" in Japan (Lincoff and Mitchel, 1977). *A. papilionaceus* has a hemispherical to convex cap with veil remnants on the margin. Said to produce hilarity and a mild form of intoxication if eaten in quantity (Murrill, 1910). Illustrated description of the species is provided by Pegler (1977; 1983).

Habit & Habitat : Scattered in groups on dung or manure.

Specimens examined : India : Kerala state, Kollam District, Palaruvi, 14 Aug. 2003, No. 6538.

***Panaeolus rickenii* Hora, *Trans. Brit. Mycol. Soc.* 43: 454 (1960).**

P. acuminatus Sensu Ricken, *Blatterpilze* : 268 (1915).

The species was originally described by Hora from Europe. (Hora, 1960). *P. rickenii* is recognized by the slender habit, very elongate stipe, dark colour and hygrophanous pileus. *P. rickenii* was well illustrated by Lange (1939) under the name *P. acuminatus*. The species is also known from Lesser Antilles (Pegler, 1983), E. Africa (Pegler, 1977) and Sri Lanka (Pegler, 1986).

Habit & Habitat : Scattered in groups on dung or manure.

Specimens examined : India: Kerala state, Palakkad District, Silent valley Poochappara, 29 May 1996, No. 3089; May 1996, No. 3101, No. 3102;; Kollam District, Sankili, 10 May 2005, No. 8835; 10 May 2005, No. 8836; Wayanad District, Muthanga, 23 Sept. 2008, No. 11948; Ponkuzhy, 24 Sept. 2008, No. 1200.

Panaeolus sphinctrinus* (Fr) Quel., *Memoires de la Societe d'Emulation de Montbeliard ser. II, 5: 121 (1872).

P. campanulatus var. *sphinctrinus* (Fr.) Quel., *Flore Mycol. de France*, 54 (1888).

Agaricus sphinctrinus (Fr.) Epicrisis: 235 (1836).

Chalymota sphinctrinus (Fr.) Karsten, *Hattsvampar* : 518 (1870).

Panaeolus sphinctrinus (Fr.) Quelet., *Champ. Jura Vosges* 1 : 151 (1872).

Coprinarius campaulatus (Fr.) Quelet., var. *sphinctrinus* (Fr.) Quelet., *Ech.* : 119 (1886).

P. sphinctrinus is recognized by its uniform lead grey or smoke grey cap. ornamented with white denticles at the margin and white pruina at the stem apex. It is used as a recreational drug (Watling and Gregory, 1987). The species is reported and described from Africa (Pegler, 1977), India (Natarajan and Raman, 1983), Britain (Watling and Gregory, 1987) and Australia (Young, 1989).

Habit & Habitat : Scattered in groups on cow dung

Specimens examined : India: Kerala state, Thiruvananthapuram District, Enikkara, 23 Nov. 2007, No. 10785.

***Psilocybe cubensis* (Earle) Singer, *Sydowia* 2:37 (1948)**

Stropharia cubensis Earle in *Est. Agron. Cuba* 1 : 249 (1906)

Psilocybe cubensis popularly known as the "magic mushroom" is a gregarious coprophilous species. This is a large, freshly mushroom with a yellowish cap, brown gills and a persistent ring on the stalk. The flesh strongly turns blue when bruised and has a rather strong, unpleasant smell. This species contains the hallucinogenic drug psilocin and is widely used as a recreational mushroom.

It has a wide tropical and subtropical distribution. Detailed description of the species is provided by Singer and Smith (1958). Materials from Lesser Antilles and Netherlands have been illustrated and described by Pegler (1983) and Noordeloos (1999) respectively.

Habit & Habitat : Scattered in groups on elephant dung on the forest floor.

Specimens examined : India : Kerala state, Palakkad District, Silent Valley, 16 May 1994, No. 710; Thiruvananthapuram District, TBGRI campus, 4 June 1996, No. 3121; 7 June 1996, , No. 3152; 10 June 1996, No. 3167; 17 June 1996, No. 3269; 19 June 1996, No. 3303; 19 July 1996, No. 3409; 20 Oct. 1996, No. 3647, Wayanad District, Nadavayal, 17 July 2008, No. 11441; Ponkuzhy, 24 Sept. 2008, No. 11993; 24 Sept. 2009, No. 12004.

***Psilocybe subcubensis* Guzman, Mycotaxon 7:248 (1978).**

Psilocybe subcubensis, the pantropical sister species of *P. cubensis*, was first described by Dr. Gaston Guzman (Guzman, 1978). It is macroscopically identical to *P. cubensis* differing only by its smaller spores and consistently smaller pleurocystidia. It replaces *P. cubensis* throughout much of its tropical range and has recently been reported from Australia, India, and Thailand.

Habit & Habitat : Scattered on elephant dung.

Specimens examined : India : Kerala state, Kollam District, Sankili, 10 May 2005, No. 8822, 8826.

***Russula luteotacta* Rea, Trans. Worcestershire Naturalists' Club 1: 416 (1897).**

R. luteotacta grows in the woods in association with Dipterocarpus trees. The cap is red or pink, often

with white areas. The flesh is white, reddish under the pellicle, granular and brittle. The strongly yellowish context of *R. luteotacta* is a very good identification character, but sometimes this reaction is very slow and clearly visible after many hrs. The species is reported to be poisonous (Philips, 2006).

Habit & Habitat : Solitary on ground under forest trees.

Specimens examined : India : Kerala state, Thiruvananthapuram District, TBGRI Campus, 3 May 1998, No. 4298.

***Stropharia semiglobata* (Batsch : Fr.) Quelet., Memoires de la Societe d'Emulation de Moutbeliard ser. II, 5:112 (1872).**

S. stercoraria (Schum: Fr.) Quel. In Mem. Soc Emul. Montbeliard Ser. II, 5:112 (1872)

S. semiglobata var. *stercoraria* (Schum.:Fr.) J. Lange in Flora Agaricina Danica 4:67 (1939).

S. semiglobata is a very striking species, variable in size but the rounded pale yellow, glutinous cap and large, dark purple-brown spores distinguishes this species. The size is usually dependent on the substrate. *S. semiglobata* has been considered toxic (Watling and Gregory, 1987). Detailed description of the species is provided by Watling and Gregory (1987).

Habit & Habitat : In groups on elephant dung.

Specimens examined : India : Kerala state, Wayanad District, Muthanga, 15 Aug. 2007, No. 10470; Perayam, 16 Aug. 2007, No. 10487.

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