Agarics of Konkan, India

Pramod Borkar¹, Anila Doshi², Makarand Joshi¹, Sudhir Navathe¹

1. Dr. B. S. Konkan Krishi Vidyapeeth (Agricultural University), Dapoli, Maharashtra, India
2. Maharana Pratap University of Agriculture and Technology, Udaipur, Rajasthan, India

Corresponding Author: Department of Plant Pathology, Dr. B. S. Konkan Krishi Vidyapeeth (Agricultural University) Dapoli, Maharashtra, India-415712; Email: pramodgb@gmail.com

Publication History
Received: 22 July 2014
Accepted: 27 August 2014
Published: 17 December 2014

Citation

ABSTRACT
The family Agaricaeae is the largest mushroom family with its most of the members in the genus Agaricus. Many Indian mycologists have reported different species of this genus from different states of the country. During present study five mushrooms from family Agaricaeae viz., Agaricus arvensis, Agaricus trisulphuratus, Agaricus placomyces, Macrolepiotraprocera, and Leucoperinusbrinbaumii, collected from different places in Konkan, are described.

Key words: mushrooms, morpho-taxonomy, Agaricaeae.

1. INTRODUCTION
The mushrooms are most fascinating macro fungi. There is tremendous variation in their morphology and habitats. Some of them are on the verge of extinction due to deforestation, urbanization, climate change and their uncontrolled harvest from wild habitats. This situation demands an urgent need to collect, document and conserve their diversity. The Konkan region is bestowed with diverse vegetation. Mushroom diversity of the region has also remained untapped with the exception of few mushrooms documented earlier by Prof. A. V. Sathe and his team in early eighties of the past century. Present study is a maiden effort to make inroads in the hidden treasure of mushrooms in Konkan region.
2. MATERIALS AND METHODS
Mushrooms from four districts of Konkan region viz. Thane, Raigad, Ratnagiri and Sindhudurg were collected for four consecutive monsoon seasons from 2007 to 2012. While collecting mushrooms in the region, the pockets with wide vegetation diversity were selected. Selected spots included Amboli, the well-known high altitude biodiversity hot spot of this region, sea shore area like Murud, horticultural plantations with mango, cashew, coconut and arecanut at Wakavali, Kelsi, Inampangari, lateritic soil vegetation in Sindhudurg district comprising places like Kudal, Malvan, Pandur, Koloshi and Kanakvali and black soil area such as Wada and Palghar in Thane district and thick forest areas in Rajapur, Lanja, Sangameshwar, Ratnagiri, Chiplun and Dapoli. Identification of the collected mushroom specimens was done on the basis of their macroscopic and microscopic characters. For recording field observations, a pro-forma was prepared to record the morphological features such as pileus, stipe, lamellae, etc., (Grimes, 1994). While collecting the mushrooms, date of collection, locality and habitat were recorded. Every specimen was recorded with a collection number. Descriptions are based on fresh collections. Microscopic details were recorded by taking free hand sections mounted in lectophenol cotton blue. All collections studied are deposited at the mycological herbarium of Department of Plant Pathology, Dr. B. S. Konkan Krishi Vidyapeeth Dapoli Dist. Ratnagiri.

3. RESULTS AND DISCUSSIONS
The family Agaricaeae is the largest mushroom family with its most of the members in the genus Agaricus. Many Indian mycologists have reported different species of this genus from different states of the country (Bhavani Devi, 1995, Lakhanpal, 1995, Saini and Atri, 1995, Verma et al., 1995, Patil et al. 1995) reported that, 41 species of this genus were recorded from Maharashtra. Purkayastha and Chandra (1976) described 4 spies of Agaricus viz. A. arvensis, A. campestris, A. sylvaticus, and A. trisulphuratus from West Bengal. The members of the genus recorded from Rajasthani include, A. abruptus, A. arvensis, A. campestris, A. bitorquis, A. placomyces, A. silvaticus and A. silvicola (Doshi and Sharma, 1997). Morphological characters of the five species of this genus collected during the present research are discussed here.

Agaricus arvensis Schaeff
Habitat: Growing in decaying plant litter of perennials collected from the all the four districts during monsoon seasons of year 2008, 2009, 2011 and 2012.
Pileus: Fleshy, 15-16 cm in diameter, Buff brown with brown spot in centre, glabrous, convex in shape becoming plano-convex in age with entire margin.
Stipe: Concolorous with pileus, equal, slightly swollen at the base, fibrous, fleshy in texture, measuring: 10-12 cm in length and 2-3 cm in width.
Lamellae: crowded, free, light brown initially, becoming pinkish in age. Spore print dark brown. Annulus present, persisting like frill; Volva absent.
Microscopic Features: Spores dark brown, oval to ellipsoid, thin walled measuring 7 X 2.5 µm. Basidium measured 12.5 X 5 µm while cystidia not observed.
As per Nair (1990), A. arvensis has sub-globose, silky pileus with velar remains at margin. The pileus flattens in age. The gills are crowded, free, white when young turning blackish brown in age. Stipe is cylindrical to club shaped, thick, white, smooth, and stout with a large annulus. The morphological features of the collected specimen were also in concurrence with those given by Kuo (2007) and Mycoweb (www.mycoweb.com).

Agaricus trisulphuratus Berk
Habitat: Growing in soil, Solitary. Also found on the roots of members of Palmaceae(coconut and arecanut). Collection from Ratnagiri district, during monsoon season (2007-2011).
Pileus: Diameter 2.5-3cm, bright orange, fibrillose (flocculose), with imbricate, appressed squamules, convex, with crenate margin.
Stipe: Concolorous with pileus, equal, hollow measuring 4-5.5 cm in length and 2.5-3 mm in width.
Microscopic Features: Spores Dark brown, oval to ellipsoid, measuring 5 X 2.5µm. Basidia: 12.5 X 2.5µm. Cystidia not observed.
The morphological characters of the collected Agaricus trisulphuratus were in conformity with those reported by earlier workers (Saini et al., 1991 and Kumar, 2009).
**Agaricus placomyces Peck**

Habitat: Solitary or in cespitose clusters, in plant debris collected from Ratnagiri, Sindhudurg and Raigad districts during monsoon season of 2007, 2008, 2009 and 2011.

Pileus: Diameter 10 cm, buff white with prominent central dark brown spot and conspicuous brown to black squamules, granulose, convex with entire margin.

Stipe: Buff white, fibrous, equal throughout the length but with abruptly bulbous base measuring 7 to 8 cm in length and 3 cm in width. Lamellae: pink, free, crowded. Spore print pinkish.

Annulus: membranous, veil present initially rupturing at maturity and volva absent. Mushroom with strong odour of turpentine (phenolic compounds).

Microscopic Features: Spores Brown, ellipsoid 5 X 2.5µm (L X B). Basidia admeasuring 15 X 5µm, cystidia not observed.

This mushroom was earlier reported from Kerala, Northwest Himalayas and Rajasthan (Bhavani Devi, 1995; Lakanpal, 1995; Doshi and Sharma, 1997) and Kuo (2007). The morphological characters of the collected specimen matched with those reported by earlier workers. Phonolic odor of the fruit body was the most striking characteristic. The collected specimen was therefore, identified as *Agaricus placomyces*.

**Macrolepiota procera (Scop.) Singer**

Habitat: Solitary, in woods collected from all four districts during monsoon season of year 2008, 2009, 2010 and 2012.

Pileus: Fleshy, buff to light brown, 13.5 cm in diameter, squarrose with dark brown shaggy scales, campanulate and becoming convex in age with rimose margin.

Stipe: Light brown with prominent brown scales, cylindrical, fibrous, hollow measuring 16.5-18 cm in length and 1.5-1.8 cm in width.

Lamellae: White initially becoming dirty yellow at maturity, close, free. Spore Print, white. Annulus moving freely along the stipe and volva absent.

Microscopic Features: Spores hyaline, broadly ellipsoid to oval, apiculate measured 9.25 X 5µm Basidia admeasuring 17.5 X 2.5µm while cystidiameter measured 26.25 X 10 µm.

Members of the genus *Macrolepiota* are of worldwide occurrence. Like many other countries this mushroom was reported by a number of workers from India. Morphology of collected specimen is in agreement with the description reported by Nair (1980).

**Leucocoprinus brinbaumii (Corda) Singer**

Habitat: Growing in coco peat collected from Thane district during 2007 and from Ratnagiri during 2010, 2011 and 2012.

Pileus: Lemon yellow, 3-4 cm in diameter, fibrillose, striate to plicate, conic, with a blunt umbo becoming convex in age, with a crenate, striate to sulcate margin.

Stipe: Concolorous with pileus, equal, slightly broad at the base, hollow, 3-4 cm in length and 1-1.5 mm in width.

Lamellae: Concolorous with pileus, close, free. Spore print, white. Annulus present, moving freely all along the stipe length and volva absent.

Microscopic Features: Spores Hyaline, ellipsoid 5 X 2.5µm. Basidia and cystidia not observed.

During the present study, this mushroom was collected from coco pit in a farmer’s nursery in Thane district. Singer (1986) recognized 13 species in genus *Leucocoprinus* while Wasser (1993) mentioned 18 species. According to recent literature (Kirk et al, 2008) there are 40 species in this genus. Manjula (1983) documented five species from India, Natarajan (2005) listed 6 species; Kumar et al reported a new species from Kerala state. Only one species has been reported from Karnataka (Pushpa and Purushothama, 2011).

The morphological details by Pushpa and Purushothama (2011) state that the the pileus is 1.5-3 cm in diameter, conical becoming campanulate in age, membranous; surface yellow, floccose squamulose; plicate striate, with velar remains. The morphology of the collected specimen is in conformity with the earlier reports.

**4. CONCLUSIONS**

During present study five mushrooms from family Agaricaceaeviz., *Agaricus orvensis, Agaricus sulphuratus, Agaricus placomyces, Macrolepiota procera* and *Leucocoprinus brinbaumii*, collected from different places in Konkan.
SUMMARY OF RESEARCH
1. Forays conducted in different four districts of Konkan region viz. Thane, Raigad, Ratnagiri and Sindhudurg for four consecutive monsoon seasons of the years from 2007 to 2012.
2. Identification of mushroom specimens collected was done on the basis of their macroscopic (morphological) and microscopic characters.
3. During the study three species of Genus Agaricus, a species of Macroleiota and Leucocoprinus were reported.

FUTURE ISSUES
There is a need to make consistent efforts to document more agarics of Konkan region and research needs to be done to obtain the pure cultures of edible mushrooms to standardize their production technology.

DISCLOSURE STATEMENT
There is no financial support for this research work from the funding agency.

ACKNOWLEDGEMENT
Authors are thankful to the Department of Plant Pathology, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth (Agricultural University) Dapoli, India for providing necessary facilities.

REFERENCE
Figure 1
a. Pileus with entire margin  
b. Stipe with annulus  
c. Basidia  
d. Dark brown, ellipsoid spores

*Agaricus arvensis*
Figure 2

a. Solitary growing in soil
b. Bright orange pileus
c. Basidia
d. Dark brown oval spores

Agaricus trisulphuratus
Figure 3
a. Buff white pileus with squamules
b. Free crowded lamellae
c. Basidia
d. Brown ellipsoid spores
Figure 4
a. Campanulate pileus, stipe with annulus
b. Squirose pileus
c. Basidia and cystidia
d. Ellipsoid to oval apiculate spores