



A checklist of macrofungi of Gorakhpur District, U.P. India

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Abstract

This paper deals with the survey and identification of macrofungi of the north eastern part of Uttar Pradesh, especially Gorakhpur. During field surveys carried out in 2011–2015, a total of 250 macrofungi were collected. On the basis of macroscopic and microscopic study, a checklist of 153 species of macrofungi belonging to 34 families is presented. This checklist confirms the notion that north eastern parts of Uttar Pradesh host a rich biodiversity of macrofungi.

Key words – biodiversity – fungi – mushroom – taxonomy

Introduction

Fungi are occupying prominent position in the biological world, because of their variety and economic environmental importance (Soosairaj et al. 2012). Fungi are extremely abundant. It is estimated that there are about 1.5 million species exist in nature, but only about 50% have been characterized until now (Manoharachary et al. 2005). Mushrooms alone are represented by about 41,000 species, of which approximately 850 species are recorded from India (Deshmukh 2004).

Gorakhpur District is situated in north-eastern part of Uttar Pradesh from latitude of 26°43' to 26°50'N and longitude of 83°20' to 83°27'E. It has subtropical climate and also includes Terai region which is famous for its monsoon climate. The annual average temperature is 25–30°C. Gorakhpur region receives a total annual average rainfall of about 1814 mm and relative humidity ranges between 74–87%. The soil of this area is gangetic alluvial brought down by Rapti, Rohini, Ghaghara and Gandak rivers from the Himalayas. It is situated on the basin of Rapti and Rohini rivers, hence its geographical shape is a bowl type. Gorakhpur District has good vegetational cover and also dense –forest which is close to the foothills of the Himalayas. Gorakhpur District is one of the major and largest District of Uttar Pradesh, India.

The north eastern part of Uttar Pradesh (India) is bestowed with varied climatic conditions and soil types that make it a natural place for fungal diversity, but only few works viz., Chandrawati et al. (2014), Srivastava et al. (2011), Vishwakarma et al. (2014, 2016) had been carried out in this area. Thus, this paper provides a check list of macrofungi of the Gorakhpur District.

Materials & Methods

Macrofungi were collected periodically from Gorakhpur District between 2011 and 2015.

Macroscopic and ecological characteristics of the samples were recorded and photographed in their natural habitats. Samples were brought to laboratory for further studies. Spore prints were prepared and microscopic studies were done in laboratory. The morphology of spores such as shape and size of spores were recorded with the help of microscope. Specimens were identified using the relevant literature (Ellis & Ellis 1990, Jordan 1995, Moser 1983, Phillips 1981) and confirmed by mycokeys (www.mushroomexpert.com and www.myckeys.com).

Taxa and their authors were given according to an amended CABI Bioscience electronic version (<http://www.speciesfungorum.org/AuthorsOfFungalNames.html>). Samples were wet preserved in 4% formaldehyde solution. The specimen were deposited at the herbarium of Botany department, DDU Gorakhpur University.

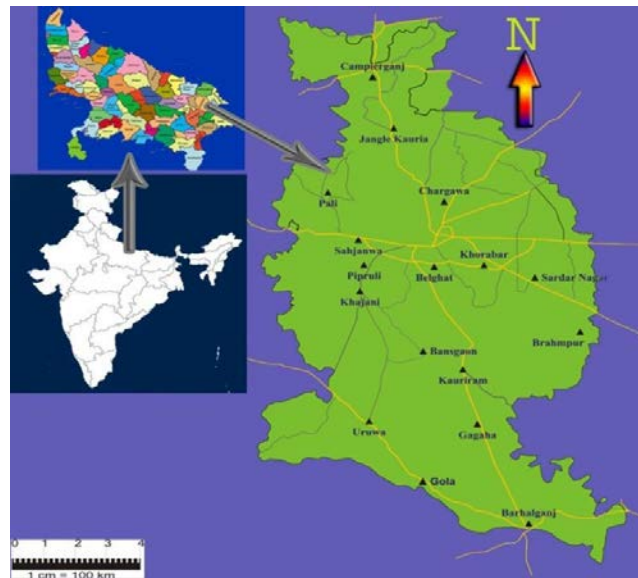


Fig. 1 – Map of Gorakhpur District ▲ representing surveyed area

Results

In present study 153 species of macrofungi belonging to 34 families were identified. The distribution of the species in their families are Agaricaceae (20 species), Amanitaceae (2 species), Auriculariaceae (3 species), Bolbitiaceae (3 species), Bondarzewiaceae (2 species), Cantharellaceae (2 species), Clavariaceae (1 species), Coprinaceae (7 species), Fomitopsidaceae (6 species), Ganodermataceae (4 species), Geastraceae (1 species), Helotiaceae (1 species), Hygrophoraceae (3 species), Hymenochaetaceae (4 species), Inocybaceae (3 species), Lentinaceae (4 species), Lycoperdaceae (5 species), Lyophyllaceae (7 species), Marasmiaceae (6 species), Meripiliaceae (1 species), Meruliaceae (1 species), Mycenaceae (5 species), Phallaceae (2 species), Pleurotaceae (5 species), Pluteaceae (7 species), Polyporaceae (14 species), Psathyrellaceae (9 species), Russulaceae (2 species), Schizophyllaceae (1 species), Sparassidiaceae (1 species), Stereaceae (1 species), Tricholomataceae (14 species), Tuberaceae (1 species) and Xylariaceae (5 species). Macrofungal family, habit and habitat, place and date of collection are given below: (Fig. 1)

List of Taxa

Family: Xylariaceae

1. *Daldinia concentrica* (Bolton) Ces. & De Not.: Saprobitic, in group, on decaying wood log, Uttar Pradesh, Gorakhpur District, Khajni tehsil, Khajni block, Rudrapur village, 29/8/2011.

***Xylaria carpophila* (Pers.) Fr.:** Grows on manure, in group, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Khorabar block, Kushmi Jungle, 4/7/15.

***Xylaria hypoxylon* (L.) Grev.:** Saprobitic, scattered to gregarious on rotting wood, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Chargawan block, Gularia village, 3/7/2014.

- *Xylaria longiana* **Rehm.**: Saprobic, in group, gregariously on decaying wood, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Pali block, Palikhas village, 27/6/2013.
- *Xylaria polymorpha* (**Pers.**) **Grev.**: In group on decaying wood log, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Khorabar block, Kushmi Jungle, 5/8/14.

Family: Tuberaceae

- *Tuber aestivum* **Vitt.**: Saprobic, in group, gregariously on decaying wood, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Khorabar block, Kushmi Jungle, 10/7/2013.

Family: Helotiaceae

- *Ascocoryne sarcoides* (**Jacq.**) **J.W. Groves & D.E. Wilson.**: Parasitic on *Ficus racemosa*, gregarious, in cluster on hardwood, Uttar Pradesh, Gorakhpur District, Khajni tehsil, Belghat block, Jaiti village, 7/4/2012.

Family: Auriculariaceae

- *Auricularia auricula-judae* (**Bull.**) **Quél.**: Parasitic on *Tecoma capensis*, in group, on healthy tree, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Khorabar block, Kushmi Jungle, 4/7/2014.
- *Auricularia mesenterica* (**Dicks.**) **Pers.**: Saprobic, in group on decaying wood log, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Chargawan block, Maniram village, 14/7/2013.
- *Auricularia polytricha* (**Mont.**) **Sacc.**: Parasitic on *Mangifera indica* tree, in group, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Piprauli block, Badhgahan village, 19/08/2011.

Family: Schizophyllaceae

- *Schizophyllum commune* **Fries**: Saprobic on *Mangifera indica* tree in group, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Sahjanwan block, Gida, 11/8/2011.

Family: Stereaceae

- *Stereum hirsutum* (**Wild.**) **Pers.**: Saprobic on deadwood, gregarious, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Piprauli block, Bhilora Khurd village, 9/5/2013.

Family: Cantharellaceae

- *Cantharellus minor* **Peck**: Saprobic, growing solitary or in groups under *Bambusa arundinacea*, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Piprauli block, Badhgahan village, 19/08/2011.
- *Cantharellus subalbidus* **Smith & Morse**: Saprobic, in group, scattered, on decaying litter, Uttar Pradesh, Gorakhpur District, Khajni tehsil, Khajni block, Rudrapur village, 31/8/2012.

Family: Clavariaceae

- *Clavulinopsis laeticolor* (**Berk. & M.A. Curtis**) **R.H. Petersen**: Saprobic, scattered, gregariously, in group on decaying wood log, Uttar Pradesh, Gorakhpur District, Bansaon tehsil, Kauriram block, Belipar village, 16/7/2012.

Family: Sparassidiaceae

- *Sparassis crispa* (**Wulf**) **Fr.**: Saprobic, in group, on decaying wood log, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Piprauli block, Bhilora Khurd village, 18/8/2011.

Family: Fomitopsidaceae

- *Fomitopsis cajanderi* (**P. Karst**) **Kotl. & Pouzar**: Saprobic on dead wood, in group, perennial, Uttar Pradesh, Gorakhpur District, Gola tehsil, Gola block, Hatwa village, 6/9/2013.
- *Fomitopsis pinicola* (**Sw.**) **P. Karst.**: Saprobic on decaying tree (*Mangifera indica*), perennial, solitary to group, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Piprauli block, Badhgahan village, 5/8/2012.
- *Ischnoderma benzoinum* (**Wahlenb.**) **P. Karst.**: Saprobic on decaying wood log, in group, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Khorabar block, Kushmi Jungle, 28/9/2015.
- *Laetiporus sulphureus* (**Bull.**) **Murrill**: Saprobic on cut wood log forming shelves, Uttar Pradesh, Gorakhpur District, Campierganj tehsil, Campierganj block, Campierganj Jungle, 26/9/2011.
- *Piptoporus betulinus* (**Bull.**) **P. Karst.**: Saprobic on decaying wood log, in group, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Khorabar block, Kushmi Jungle, 28/9/15.

Postia stiptica (**Pers.**) **Jülich**: Saprobic, in group on decaying wood log, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Chargawan block, Maniram village, 5/7/2014.

Family: Meripiliaceae

23. *Grifola frondosa* (Dicks.) Gray: Saprobiic on decaying wood from tree furrow (*Tectona grandis*), Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Pali block, Bankatia village, 25/8/2011.

Family: Meruliaceae

24. *Abortiporus biennis* (Bull.) Singer: Saprobiic, growing alone or in group forming shelves, gregariously around the base of the stumps and living trees especially with *Bambusa arundinacea*, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Piprauli block, Barahua village, 24/6/2013.

Family: Polyporaceae

25. *Fomes fomentarius* (L.) Fr.: Saprobiic on decaying wood log, in group, Uttar Pradesh, Gorakhpur District, Campierganj tehsil, Campierganj block, Dumaria village, 28/8/2014.

26. *Fomes hemitephrus* (Berk.) Cooke: Saprobiic on *Tectona grandis*, solitary, Uttar Pradesh, Gorakhpur District, Chauri Chaura tehsil, Brahmapur block, Barahi village, 17/8/2013.

27. *Funalia trogii* (Berk.) Bondartsev & Singer: Saprobiic on *Artocarpus heterophyllus*, in group, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Chargawan block, Jungle Tinkonia, 5/7/2014.

28. *Lenzites betulina* (L.) Fr.: Saprobiic on deadwood, in group with overlapping cluster, Uttar Pradesh, Gorakhpur District, Gola tehsil, Gola block, Gopalpur village, 4/4/2012.

29. *Lenzites sepiaria* (Wulfen) Fr.: Saprobiic, in group, on decaying wood log, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Pali block, Bankatia village, 13/7/12.

30. *Microporus xanthopus* (Fr.) Kuntze: Saprobiic on deadwood of hard wood, in group, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Khorabar block, Kushmi Jungle, 27/6/2012.

31. *Polyporus alveolaris* (DC.) Bondartsev & Singer: Saprobiic on decaying logs, solitary to cluster, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Khorabar block, Jungle Belwar, 4/7/2014.

32. *Polyporus brumalis* (Pers.) Fr.: Saprobiic on decaying wood, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Chargawan block, Jungle Tinkonia, 27/3/2012.

33. *Polyporus umbellatus* (Pers.) Fr.: Saprobiic on decaying wood log, in group, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Khorabar block, Kushmi Jungle, 28/9/15.

34. *Pycnoporus cinnabarinus* (Jacq.) P. Karst.: Saprobiic on dead wood, solitary to group, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Chargawan block, Jungle Tinkonia, 27/3/2012.

35. *Trametes elegans* (Spreng.) Fr.: Saprobiic on dead wood of hard woods, annual, solitary or in groups, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Piprauli block, Bhilora Khurd village, 6/8/2013.

36. *Trametes gibbosa* (Pers.) Fr.: Saprobiic on decaying wood log, forming rosettes on top of cut stump, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Jungle Kauria block, Belghat Khurd village, 5/12/2011.

37. *Trametes hirsutus* (Wulfen) Pat.: Saprobiic on dead woods, annual, growing in group, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Chargawan block, Jungle Tinkonia, 5/7/2014.

38. *Trametes versicolor* (L.) Lloyd: Saprobiic on decaying wood log, forming rosettes on top of cut stump, Uttar Pradesh, Gorakhpur District, Chauri Chaura tehsil, Brahmapur block, Dubauli village, 13/09/2012.

Family: Bondarzewiaceae

39. *Amyloporus campbellii* (Berk.) Ryvarden: Saprobiic, scattered in grassy area, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Khorabar block, Kushmi Jungle, 4/7/2011.

40. *Heterobasidion annosum* (Fr.) Bref.: On humid soil, scattered, solitary to in group, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Khorabar block, Kushmi Jungle, 4/7/2011.

Family: Ganodermataceae

41. *Ganoderma adspersum* (Schulzer) Donk: Saprobiic on decaying wood from tree furrow (*Tectona grandis*), Uttar Pradesh, Gorakhpur District, Sadar tehsil, Khorabar block, Kushmi Jungle, 5/7/2015.

***Ganoderma appplanatum* (Pers.) Pat.:** Saprobiic on *Tectona grandis*, from furrow, in group, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Pali block, Ghaghsara village, 23/9/2011.

43. *Ganoderma lucidum* (Curtis) P. Karst.: Saprobiic on dead woods of hard woods, solitary or in groups of 2-3, Uttar Pradesh, Gorakhpur District, Gola tehsil, Uruwa block, Siswa village, 6/8/2012.

44. *Ganoderma tsugae* Murrill: Saprobiic on decaying tree, solitary, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Piprauli block, Barahua village, 21/10/2011.

Family: Hymenochaetaceae

45. *Coltricia cinnamomea* (Jacq.) Murrill: Saprobiic, growing alone under hardwood, on humid soil, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Piprauli block, Barahua village, 18/10/2011.

46. *Inonotus cuticularis* (Bull.) P. Karst.: Saprobiic on decaying wood log, annual, in group forming shelves, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Piprauli block, Badhgahan village, 9/2/2012.

47. *Inonotus hispidus* (Bull.) P. Karst.: Saprobiic to parasitic on trees, either alone or forms shelves by joining with other caps, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Piprauli block, Barahua village, 6/7/2014.

48. *Inonotus radiatus* (Sowerby) P. Karst.: Saprobiic, in group, on decaying wood log, Uttar Pradesh, Gorakhpur District, Khajni tehsil, Khajni block, Satuabhar village, 5/7/2013.

Family: Hygrophoraceae

49. *Hygrocybe intermedia* (Pass.) Fayod: Saprobiic on litter, solitary or in groups, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Khorabar block, Kushmi Jungle, 28/8/2014.

50. *Hygrophorus cossus* (Sowerby) Fr.: Scattered on wet soil, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Piprauli block, Badhgahan village, 9/2/2012.

51. *Hygrophorus eburneus* (Bull.) Fr.: Saprobiic, solitary, on humus rich soil and on straw heap, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Pali block, Bankatia village, 23/9/2011.

Family: Tricholomataceae

52. *Clitocybe bicolor* (Pers.) Murrill: In association with *Morus alba* tree, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Chargawan block, Jungle Tinkonia, 7/7/2014.

53. *Clitocybe inversa* (Scop.) Quél.: Saprobiic on litter, solitary or in groups, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Piprauli block, Barahua village, 18/08/2011.

54. *Clitocybe vibecina* (Fr.) Quél.: Saprobiic, scattered, on decaying litter under hardwood, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Pali block, Ghaghsara village, 23/9/2011.

55. *Collybia dryophila* (Bull.) P. Kumm.: Saprobiic, growing alone under hardwood, on humid soil, Uttar Pradesh, Gorakhpur District, Campierganj tehsil, Campierganj block, Campierganj Jungle, 26/09/2011.

56. *Collybia fuscopurpurea* (Pers.) P. Kumm.: Saprobiic, in group, on decaying litter, Uttar Pradesh, Gorakhpur District, Khajni tehsil, Khajni block, Satuabhar village, 5/7/2013.

57. *Collybia fusipes* (Bull.) Quél. Saprobiic, in group, on decaying wood log, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Khorabar block, Jungle Belwar, 4/7/2014.

58. *Lepista flaccid* (Sowerby) Pat.: Saprobiic, in group under mixed forest, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Khorabar block, Jungle Belwar, 4/7/2014.

59. *Lepista luscina* (Fr.) Singer: Saprobiic, in group on humus, Uttar Pradesh, Gorakhpur District, Khajni tehsil, Khajni block, Rudrapur village, 31/8/2012.

60. *Lepista nuda* (Bull.) Cooke: Scattered on sandy soil, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Chargawan block, Jungle Tinkonia, 5/7/2014.

61. *Lyophyllum connatum* (Schumach.) Singer: In association with *Tamarindus indica* tree, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Piprauli block, Bokta village, 20/7/2012.

62. *Omphalina ericetorum* (Pers.) M. Lange: Saprobiic, in small groups, on *Bambusa arundinacea* leaf litter, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Chargawan block, Jungle Tinkonia, 7/7/2014.

Omphalina postii (Fr.) Singer: Saprobiic, solitary to in group in grassy areas, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Chargawan block, Maniram village, 5/7/2014.

- 64. *Tricholoma argyraceum* (Bull.) Gillet:** Saprobic, on decaying wood log, in group, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Chargawan block, Jungle Tinkonia, 27/3/2012.
- 65. *Tricholoma giganteum* Masee:** Saprobic, scattered on leaf litter, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Khorabar block, Jungle Belwar, 4/7/2014.
- Family: Amanitaceae**
- 66. *Amanita cokeri* E.-J. Gilbert & Kühner ex E.-J. Gilbert:** Mycorrhizal with *Tectona grandis*, solitary, scattered, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Piprauli block, Bokta village, 20/7/2012
- 67. *Amanita virosa* Fr.:** Solitary, on humus rich soil, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Piprauli block, Barahua village, 18/8/2011.
- Family: Agaricaceae**
- 68. *Agaricus arvensis* Schaeffe.:** Saprobic, in group in grassy areas, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Pali block, Ghaghsara village, 23/9/2011.
- 69. *Agaricus augustus* Fr.:** Saprobic, scattered on humid soil in grassy area, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Chargawan block, Maniram village, 5/7/2014.
- 70. *Agaricus bernardii* Quél.:** Saprobic, in group, forms fairy ring, found in grassy areas, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Khorabar block, Jungle Belwar, 11/7/2012
- 71. *Agaricus bitorquis* (Quél.) Sacc.:** Saprobic, in group forming fairy ring, on manure and sandy soil, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Chargawan block, Jungle Tinkonia, 5/7/2014.
- 72. *Agaricus impudicus* (Rea) Pilát:** Saprobic, in group, scattered on humus, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Khorabar block, Jungle Belwar, 11/7/2012.
- 73. *Agaricus langei* (F.H. Møller):** Saprobic, in group on soil under mixed wood, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Chargawan block, Jungle Tinkonia, 5/7/2014.
- 74. *Agaricus silvaticus* Schaeff. ex. Secr.:** Saprobic, solitary to in group on soil, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Piprauli block, Bokta village, 20/7/2012.
- 75. *Agaricus silvicola* (Vittad.) Peck:** Saprobic on decaying litters, solitary, scattered, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Piprauli block, Bokta village, 11/8/2011.
- 76. *Chlorophyllum molybdites* (G. Mey.) Masee:** Saprobic, growing gregariously in lawn and garden, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Pali block, Palikhash village, 3/7/2013.
- 77. *Chlorophyllum rachodes* (Vittad.) Vellinga:** Saprobic, growing in troops in gardens, Uttar Pradesh, Gorakhpur District, Chauri Chaura tehsil, Sardarnagar block, Phulawaria village, 9/7/2013.
- 78. *Lepiota aspera* (Pers.) quell.:** Saprobic, in group or scattered in hardwood leaf litter, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Piprauli block, Bhilora Khurd village, 1/10/2011.
- 79. *Lepiota atrodisca* Zeller:** Saprobic, solitary to group, on decaying leaf litters, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Khorabar block, Kushmi Jungle, 4/7/2014.
- 80. *Lepiota castaneidisca* Murrill:** Solitary to scattered under hardwood trees, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Pali block, Ghaghsara village, 23/9/2011.
- 81. *Lepiota ignivolvata* Bousset & Joss.:** On soil under broad leaf trees, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Piprauli block, Bhilora Khurd village, 23/8/2011.
- 82. *Lepiota naucina* (Fr.) P. Kumm.:** Saprobic, on decaying wood log, in group, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Chargawan block, Jungle Tinkonia, 27/3/2012.
- 83. *Leucoagaricus americanus* (Peck) Vellinga:** Saprobic, in group on humus, Uttar Pradesh, Gorakhpur District, Khajni tehsil, Khajni block, Satuabhar village, 5/7/2013.
- 84. *Leucoagaricus rubrotinctus* (Peck) Singer:** Saprobic in group near *Bambusa arundinacea* culm, Uttar Pradesh, Gorakhpur District, Campierganj tehsil, Campierganj block, Campierganj Jungle, 29/9/2011.
- Leucocoprinus brebissonii* (Godey) Locq.:** Saprobic, solitary, scattered under hardwood, on litter, Uttar Pradesh, Gorakhpur District, Bansaon tehsil, Bansaon block, Godsari village, 16/7/2012.
- 86. *Leucocoprinus cepistipes* (Sowerby) Pat.:** Saprobic, in group on humus rich soil, Uttar Pradesh, Gorakhpur District, Chauri Chaura tehsil, Sardarnagar block, Shivpur village, 24/2/2013.

87. *Macrolepiota procera* (Scop.) Singer: Saprobic, in group in forest, on decaying litter, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Khorabar block, Kushmi Jungle, 23/7/2012.

Family: Pluteaceae

88. *Pluteus luteovirens* Rea: Saprobic, in group, on leaf litters, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Khorabar block, Kushmi Jungle, 4/7/2014.

89. *Pluteus petasatus* (Fries) Gillet: Saprobic, in group, on wood debris, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Piprauli block, Barahua village, 19/8/2011.

90. *Pluteus rimulosus* Kühner & Romagn.: Saprobic, solitary to in small groups, on rotting wood, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Chargawan block, Jungle Tinkonia, 7/7/2014

91. *Volvariella bombycina* (Schaeff.) Singer: Saprobic, in group to scattered, in association with *Ficus bengalensis* tree, Uttar Pradesh, Gorakhpur District, Khajni tehsil, Khajni block, Rudrapur village, 31/8/2012.

92. *Volvariella indica* M.K. Saini, N.J. Kaur & N.S. Atri: Saprobic, in group or scattered in garden, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Piprauli block, Barahua village, 6/7/2014.

93. *Volvariella taylori* (Berk. & Broome) Singer: Saprobic, solitary to in group, scattered in open field, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Sahjanwan block, Pipra village, 25/6/2013.

94. *Volvariella volvacea* (Bull.) Singer: Saprobic, in group on wheat straw or husk, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Piprauli block, Jaitpur village, 3/9/2012.

Family: Coprinaceae

95. *Coprinus comatus* (O.F. Müll.) Pers.: Saprobic, in group on manure, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Piprauli block, Jaitpur village, 7/7/2012.

96. *Coprinus disseminates* (Pers.:Fries) J.E. Lange: Saprobic on rotting tree branch, in group, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Pali block, Bankatia village, 23/9/2011.

97. *Coprinus domesticus* (Bolton) Gray: Saprobic, gregariously in small troops, on decaying wood log, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Piprauli block, Nagwa village, 4/7/2012

98. *Coprinus lagopus* (Fr.) Fr.: Saprobic, solitary to in group on decaying wood log, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Piprauli block, Jaitpur village, 7/7/2012.

99. *Coprinus pellucidus* P. Karst.: Saprobic, in group, gregariously on dead hardwood stump, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Pali block, Bankatia village, 19/9/2011.

100. *Coprinus niveus* (Pers.) Fr.: Saprobic, scattered on sandy soil, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Khorabar block, Jungle Belwar, 4/7/2014.

101. *Coprinus truncorum* (Scop.) Fr.: Saprobic, in group on decaying wood log, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Sahjanwan block, Pipra village, 25/6/2013.

Family: Psathyrellaceae

102. *Coprinellus micaceus* (Bull.) Vilgalys, Hopple & Jacq. Johnson: Saprobic, in group, on humus rich soil, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Piprauli block, Barahua village, 19/8/2011.

103. *Coprinopsis atramentaria* (Bull.) Redhead, Vilgalys & Moncalvo: Saprobic, on rotting tree stump in group, Uttar Pradesh, Gorakhpur District, Campierganj tehsil, Campierganj block, Campierganj Jungle, 26/9/2011.

104. *Coprinopsis cothurnata* (Godey) Redhead: Coprophilous, on animal dung, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Piprauli block, Chappiya village, 23/6/2014.

105. *Coprinopsis ephemeroidea* (DC.) G. Moreno: Saprobic, solitary to in group, on humus, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Khorabar block, Jungle Belwar, 4/7/2014.

***Coprinopsis foetidella* (P. D. Orton) Atri, A. Kaur & M. Kaur:** Coprophilous, on animal dung, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Piprauli block, Chappiya village, 23/6/2014.

107. *Coprinopsis friesii* (Quélet) P. Karsten: Saprobic, solitary to in group on husk residue, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Piprauli block, Barahua village, 19/8/2011.

108. *Panaeolus ater* (J.E. Lange) Kühner & Romagn.: Saprobic, in small group, scattered on soil or on manure, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Piprauli block, Bokta village, 11/8/2011.

109. *Panaeolus papilionaceus* (Bull.) Quélel: Saprobic, in group on cow dung manure, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Piprauli block, Bokta village, 20/7/2012.

110. *Psathyrella automata* (Fr.) Quélel: Saprobic, solitary, scattered on soil in grassland, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Sahjanwan block, Pipra village, 25/6/2013.

Family: Pleurotaceae

111. *Pleurotus cystidiosus* O.K. Mill.: Parasitic on *Ficus benghalensis*, in group, Uttar Pradesh, Gorakhpur District, Bansaon tehsil, Gagaha block, Gagaha village, 21/7/2013.

112. *Pleurotus dryinus* (Pers.) P. Kumm.: Parasitic, in group, in association with *Dalbergia sissoo* tree, Uttar Pradesh, Gorakhpur District, Gola tehsil, Barhalganj block, Sidhuapar village, 22/8/2013.

113. *Pleurotus flabellatus* Sacc.: Saprobic, in group, on decaying wood, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Piprauli block, Nagwa village, 24/6/2013.

114. *Pleurotus florida* (Mont.) Singer: Parasitic, in group, forming shelves, in association with *Ficus religiosa*, Uttar Pradesh, Gorakhpur District, Khajni tehsil, Khajni block, Rudrapur village, 25/8/2012.

115. *Pleurotus ostreatus* (Jacq.) P. Kumm.: Parasitic on *Mangifera indica*, forms shelves, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Piprauli block, Nagwa village, 8/7/2012.

Family: Russulaceae

116. *Russula aquosa* Leclair: Saprobic, scattered on moist and humid soil, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Khorabar block, Kushmi Jungle, 4/7/2014.

117. *Russula sororia* Fr.: Saprobic, solitary to in group, on litter, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Chargaon block, Jungle Tinkonia, 7/7/2014.

Family: Lentinaceae

118. *Lentinus conatus* Berk.: Saprobic, in group on decaying wood log, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Khorabar block, Kushmi Jungle, 4/7/2014.

119. *Lentinus squarrosulus* Mont.: Saprobic, on decaying wood log, in group, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Piprauli block, Chappiya village, 23/6/2014

120. *Lentinus tigrinus* (Bull.) Fr.: Saprobic, growing on rotting wood log, Uttar Pradesh, Gorakhpur District, Bansaon tehsil, Kauriram block, Banspar village, 16/7/2012.

121. *Lentinus torulosus* (Pers.) Lloyd: Saprobic on decaying logs, solitary to cluster, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Khorabar block, Jungle Belwar, 4/7/2014.

Family: Bolbitiaceae

122. *Bolbitius coprophilus* (Peck) Hongo: Saprobic, in group, scattered on compost, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Pali block, Bankatia village, 13/7/2012.

123. *Bolbitius reticulatus* (Pers.) Ricken: Saprobic, on decaying wood log, in group, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Chargaon block, Jungle Tinkonia, 27/3/2012.

124. *Bolbitius vitellinus* (Pers.) Fr.: Saprobic, growing alone scattered, on goat dung, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Piprauli block, Nagwa village, 13/7/2012.

Family: Inocybaceae

125. *Inocybe asterospora* Quélel: Saprobic, scattered on moist soil, Uttar Pradesh, Gorakhpur District, Gola tehsil, Uruwa block, Siswa village, 6/8/2012.

126. *Inocybe dulcamara* (Pers.) P. Kumm.: Saprobic, solitary to in group, on decaying leaf litter, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Khorabar block, Kushmi Jungle, 4/7/2014.

127. *Inocybe fastigiata* (Schaeff.) Quélel: Saprobic, solitary to in group on soil, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Chargaon block, Gularia village, 3/7/2014.

Family: Lyophyllaceae

128. *Calocybe gambosa* (Fr.) Donk: Mycorrhizal, in group, in association with *Azadirachta indica* and *Ficus bengalensis*, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Piprauli block, Jaitpur village, 7/7/2012.

129. *Calocybe indica* Purkay. & A. Chandra: Saprobic, in group on manure and husk residue, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Jungle Kauria block, Rasoolpur village, 18/6/2013.

130. *Termitomyces clypeatus* R. Heim: Mycorrhizal, in association with termites nest, Uttar Pradesh, Gorakhpur District, Campierganj tehsil, Campierganj block, Campierganj Jungle, 26/9/2011.

131. *Termitomyces heimii* K. Natarajan: Mycorrhizal, in association with termites nest, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Khorabar block, Kushmi Jungle, 14/7/2012.

132. *Termitomyces mammiformis* R. Heim: Mycorrhizal, in association with termites nest, Uttar Pradesh, Gorakhpur District, Campierganj tehsil, Campierganj block, Dumaria village 28/8/14.

133. *Termitomyces microcarpus* (Berk. & Broome) R. Heim: Mycorrhizal, in association with termites nest, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Khorabar block, Kushmi Jungle village, 25/8/2011.

134. *Termitomyces robustus* (Beeli) R. Heim: Mycorrhizal, in association with termites nest, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Khorabar block, Kushmi Jungle, 28/9/15.

Family: Marasmiaceae

135. *Marasmius curreyi* Berk. & Broome: Saprobic, in group, on rotting wood log, abundant, Uttar Pradesh, Gorakhpur District, Khajni tehsil, Belghat block, Jaiti village, 24/8/2011.

136. *Marasmius epiphyllus* (Pers.) Fr.: Saprobic, on decaying wood log, in group, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Khorabar block, Kushmi Jungle, 28/8/2011.

137. *Marasmius oreades* (Bolton) Fr.: Saprobic, on decaying wood log, in group, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Khorabar block, Kushmi Jungle, 14/7/2012.

138. *Marasmius pulcherripes* Peck: Saprobic, solitary to in group on litter, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Chargawan block, Jungle Tinkonia, 5/7/2014.

139. *Marasmius rotula* (Scop.) Fr.: Saprobic, on decaying wood log, in group, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Piprauli block, Nagwa village, 13/7/2012.

140. *Marasmius sicci* Murrill: Saprobic, on decaying wood log and leaf litter, Uttar Pradesh, Gorakhpur District, Gola tehsil, Barhalganj block, Sidhuapar village, 29/8/2013.

Family: Mycenaceae

141. *Favolaschia pustulosa* (Jungh.) Kuntze: Saprobic on dead wood, gregarious, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Piprauli block, Barahua village, 21/10/2011.

142. *Mycena abramsii* (Murrill) Murrill: Saprobic, on decaying wood log, in group, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Chargawan block, Jungle Tinkonia, 27/3/2012.

143. *Mycena alcalina* (Fr.) P. Kumm.: Saprobic, on decaying wood log, in group, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Chargawan block, Jungle Tinkonia, 27/3/2012.

144. *Mycena galericulata* (Scop.) Gray: Saprobic, on decaying wood log, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Chargawan block, Jungle Tinkonia. 5/7/2014.

145. *Mycena pearsoniana* Dennis: Saprobic on leaf litter, in group, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Khorabar block, Kushmi Jungle village, 14/7/2012.

Family: Phallaceae

146. *Mutinus caninus* (Huds.) Fr.: Saprobic, growing alone or gregariously in garden, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Chargawan block, Jungle Tinkonia, 5/7/2014.

147. *Phallus duplicatus* Bosc: Saprobic, growing alone or gregariously in garden, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Piprauli block, Jaitpur village, 6/7/2013.

Family: Lycoperdaceae

148. *Bovista plumbea* Pers.: Saprobic, scattered in troops in short grasses, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Khorabar block, Kushmi Jungle, 10/7/2013.

Calvatia gigantea (Batsch) Lloyd: Saprobic, scattered, solitary on humid soil, Uttar Pradesh, Gorakhpur District, Khajni tehsil, Khajni block, Rudrapur village, 29/8/2011.

150. *Bovista pusilla* (Batsch) Pers.: Saprobic, scattered in troops in short grasses, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Chargawan block, Jungle Tinkonia, 5/7/2014.

151. *Lycoperdon perlatum* Pers.: Saprobic, in group, along road side, Uttar Pradesh, Gorakhpur District, Sahjanwan tehsil, Piprauli block, Jaitpur village, 7/7/2012.

152. *Lycoperdon pyriforme* Schaeff.: Saprobic on decaying wood log, in group, Uttar Pradesh, Gorakhpur District, Sadar tehsil, Chargawan block, Jungle Tinkonia, 27/3/2012.

Family: Geastraceae

153. *Geastrum rufescens* Pers.: Solitary or in small groups of 2-3 on soil among leaf litters, Uttar Pradesh, Gorakhpur District, Khajni tehsil, Belghat block, Jaiti village, 24/8/2011.

Discussion

A total of 153 species of macrofungi were collected from study area. Agaricaceae contains highest number of macrofungi containing 20 species which was followed by Polyporaceae 14 species, Tricholomataceae 14 species, Psathyrellaceae 9, Coprinaceae 7, Lyophyllaceae 7, Pluteaceae 7, Fomitopsidaceae 6, Lycoperdaceae 5, Marasmiaceae 6, Mycenaceae 5, Pleurotaceae 5, Xylariaceae 5, Ganodermataceae 4, Hymenochaetaceae 4, Lentinaceae 4, Auriculariaceae 3, Bolbitiaceae 3, Hygrophoraceae 3, Inocybaceae 3 and rest containing one to two species. Lot of works had been done by various workers to collect and identify macrofungi of India. Amandeep et al. (2013a) collected various species of *Bolbitius* viz., *B. coprophilus*, *B. demangei*, *B. glatfelteri*, *B. marginatipes*, *B. titubans* and *B. vitellinus* from Punjab among which *B. demangei*, *B. glatfelteri* and *B. marginatipes* were new records from India. In another work Amandeep et al. (2013b) identified two new coprophilous varieties of *Panaeolus* viz., *P. africanus* var. *diversistipus* var. nov. and *P. speciosus* var. *pilocystidiosus* var. nov. from Punjab. Amandeep et al. (2014) collected and identified twelve taxa namely *Coprinopsis cinerea*, *C. cothurnata* var. *equisterca*, *C. foetidella*, *C. lagopides* var. *lagopides*, *C. lagopus*, *C. macrocephala*, *C. nivea*, *C. pseudonivea*, *C. radiata*, *C. radiata* var. *macrocarpa*, *C. scobicola* and *C. vermiculifera* from Punjab of which two species, viz., *C. pseudonivea* and *C. vermiculifera* were new records from India. Amandeep et al. (2015) collected various coprophilous species of *Conocybe* viz., *Conocybe albipes*, *C. apala*, *C. brachypodii*, *C. crispa*, *C. fuscimarginata*, *C. lenticulospora*, *C. leucopus*, *C. magnicapitata*, *C. microrrhiza* var. *coprophila* var. nov., *C. moseri*, *C. rickenii*, *C. subpubescens*, *C. subxerophytica* var. *subxerophytica*, *C. subxerophytica* var. *brunnea*, *C. uralensis* and *C. velutipes* from Punjab. Kaur et al. (2015) collected two species of genus *Gymnopilus* viz., *G. pampeanus* and *G. russipes* for the first time from India while one species *G. spectabilis* was first time recorded from North India. Kaur et al. (2013) identified *Lepiota punjabensis* sp. nov. and *Volvariella indica* sp. nov. as new record to science. Kumari et al. (2012) collected *Lepiota roseifolia*, *L. plumbicolor* and *L. atrodiscan* from Patiala.

A lot of *Mycena* species viz., *M. saparna* (Aravindakshan and Manimohan 2012), *M. snigdha* (Aravindakshan and Manimohan 2013a), two new species, *M. mridula* and *M. rasada* were reported as new species (Aravindakshan and Manimohan 2013b), *M. jatila*, *M. lomamaya* and *M. pelava* (Aravindakshan and Manimohan 2014) were collected from Kerala. A new bioluminescent species of *Mycena* viz., *M. deeptha* was collected from Kerala by Aravindakshan et al. (2012). Deepna and Manimohan (2012) reported *Poronia pileiformis* as new record. Anil and Manimohan 2012 reported *Entoloma lomavrithum* sp. nov. while Farook et al. (2013) provided checklist of *Agaricus* (gilled mushroom) of Kerala. Bhosle et al. (2010) studied the diversity of 15 species of *Ganoderma* and 3 varieties of *G. lucidum* from Maharashtra. Das et al. (2013, 2014) reported new species of *Russula* viz., *R. dubdiana*, *R. sikkimensis*, *R. sharmae*, *R. shingbaensis* and *R. thindii* from Sikkim. Kour et al. (2013) described *Strobilomyces echinocephalus* and *S. mollis* from Jammu and Kashmir. First was new record for India while second new to state.

Only few works had been carried out to explore the fungi in this area and no checklist exists. Srivastava et al. (2011) studied about the diversity of *Termitomyces* of this area. Chandrawati et al. (2014) has reported 29 macrofungi belonging to 12 families from different part of Gorakhpur and stated that Tricholomataceae was predominant having maximum number (10) of species Vishwakarma et al. (2014) has studied twelve taxa of macrofungi belonging to eight families from this area. The present finding clearly shows that the north eastern part of Uttar Pradesh is rich store house of macrofungi. This can be due to varied environmental conditions which consist of high rainfall and humidity and wide-ranging soil types which make this area best suited for growth of

various types of mycota. Further investigations will explore the macrofungal diversity and this will certainly add more species composition of macrofungi.

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