Determination of Coprophilous fungal species and their diversity on the dung substrates

Parkhe Babasaheb & Kalpana Palghadmal
Department of Botany, Arts, Commerce, and Science College Satral, Tal .Rahuri, Dis. Ahmednagar, M. S.

Received: February 21, 2019 Accepted: April 01, 2019

ABSTRACT: : *Coprophils represents a diverse community of morphologically and physiologically specialised mycota which provides a biological force for the decomposition and recycling of animal faeces. Hence in the present investigation 12 fungal species were isolated from 3 herbivorous animal dung samples (Cow, Horse and Goat) collected from 3 areas (Rahuri, Sangamner and Shrirampur Tahsil). In that 6 microfungi and 4 macrofungi were observed. In the present study, 12 species of coprophilous fungi belongs to 3 classes. The majority of isolated species were belonging to Ascomycetes (05) followed by Basidiomycetes (04) and Zygomycetes (03) species. The highest number of isolated species were found associated with domestic Cow dung sample while minimal number of isolated species was associated with goat dung sample.*

Key Words: *Coprophils, Herbivorous animal dung samples,*

Introduction:

The coprophilous fungi are the dung-loving fungi. The undigested carbohydrates, hemi-celluloses and lignin, along with amino acids, vitamins, growth factors and minerals in the herbivore dung, aid colonisation and growth of diverse fungi(Altayyar*et al.*,2017). Coprophils represents a diverse community of morphologically and physiologically specialised mycota which provides a biological force for the decomposition and recycling of animal feces(Khiralla,2007).

The varying fungal components of animal dung are difficult to relate to a specific cause; many fungal conidia are ingested by herbivorous animals while grazing (Amandeep kaur,2014).Coprophilous fungi exist in a broad range of habitats, fulfilling significant roles in a diversity of ecosystems. These are a subgroup of saprophytic fungi that can inhabit faeces, most commonly herbivore faces. As the waste products of the digestive processes, herbivore faeces are predominantly composed of the most recalcitrant and indigestible parts of the plants; the cell wall polymers cellulose, hemi-celluloses, and lignin. Therefore the potential for the secretomes of coprophilous fungi to contain novel enzymes for efficient plant cell wall degradation is high.

Dung contains a large quantity of readily available nutrients such as carbohydrates, high nitrogen content, vitamins and growth factors (Lundqvist,1960). Some physicochemical factors such as temperature and moisture content, pH, stage of decay and type of animal have profound influence on dung mycobiota. Hence efforts were made to observe the different types of coprophilous fungi found on domestic as well as stray dung samples.

Matarials and Methods

Dung samples were collected from domestic and stray animals, during the study period. The animals were namely Cow(*Bos taurus),* Horse(*Equus caballus*) and Goat(*Capra aegagrus hirctus*). Most of these dung samples were collected from different localities i.e. from Shrirampur, Rahuri and Sangamner Tahsil. Each dung sample was collected in a clean, air tight polythene bag and taken to the laboratory.The dung samples were subjected to isolation and enumeration of saprophytic and coprophilous fungi by moist chamber method (Hawksworth, 1974). Each dung samples of the domesticated and stray animals was kept in moist chamber plates equidistantly with wide space for the growth of fungi. The samples were incubated for 5 to 10 days at 25±3˚C temperature for fungal growth and their sporulation. The moist chamber plates don't need any special type of medium for the growth of saprophytic as well as coprophilous fungi on the dung samples. In this method the fungi grow on its own on the host i.e. dung. All the plates were incubated at 25±3˚C temperature in the incubation chamber in dark conditions.

The fungal slide mounts were carefully observed under a transmitted light binocular microscope and all diagnostic features were noticed and noted down. Identification of the isolated fungi was made based

on the morphological characteristics, such as colour, texture, appearance. The fungal mycelia and spores was lifted carefully using a sterilised fine tipped needle from the dung surface and observed under a compound microscope and binocular light microscope. The fungal genera were identified possibly up to genus level on morphology of fungal structures under compound microscope and binocular microscope and were subsequently confirmed by consulting with experts and relevant literature.

Moist chamber method (Hawksworth, 1974): Large-sized (20 cm diam.) petri-plates were used in this method. The basal lid, lined with a thin layer of absorbent cotton and superimposed by a blotting paper, was flooded with tap water. Excess water was drained off. The blotting paper was lined by 2-3 glass slides. The moist chamber was sterilized in autoclave at 15lb/psi and 121˚C temperature for 15m. The dung samples was placed in the moist chamber and labelled appropriately. The plates were incubated at 23-25˚C in the laboratory, near a day light illumination. The plates were examined at regular intervals from the second day onwards, for the fungi appearing from time to time. In this method, 100% moisture trapped inside the chamber and ambient temperature provided optimal condition for growth of the resident fungi.

Results and Disscussions-

From this study, it was established that animal dungs are the good substrates for the production of coprophilous fungi. A total of 12 sps. of coprophilous fungi were obtained, out of which 8 are microfungi and 4 were macrofungi supported by (Ibrahim Ali Altayyar *et. al.),* 2017. The difference in number and type of fungi isolated is probably reflections of physiochemical and type of plant species consumed by these animals. The factors affecting diversity of coprophilous mycoflora are nutritional factors, ecological factors, pH, aeration, moisture content, temperature, light periodicity, competition, predation etc.

Considering the importance of these fungi, some are edible; some of them are poisonous, while some are enzyme producers. As saphrotrophs they play a significant role in decomposition of organic matters, hence measuring, soil fertility. They are used in the production of drugs in pharmaceuticals and also employed in textile industries for their secretome producing activity. Simply, coprophilous fungi play an important role in the ecosystems, being responsible for the recycling of nutrients in the animal dungs. Domestic cow dung showed higher diversity of coprophilous fungi than stray cow dung sample and domestic horse and goat dung sample collected from different places i.e. from Rahuri and SangamnerTahsil; this results were supported by Afra Ahmed Ismail Khiralla, (2007). The food performance and feeding habit of the animals may play a role in the determination of the fungal species composition and their diversity on the dung substrates.

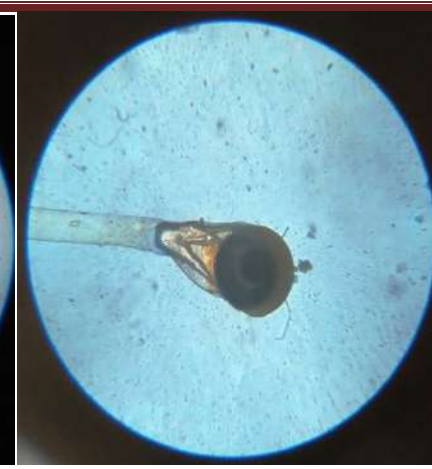
In the present study, generally, coprophilous fungi showed a high diversity, occurrence and richness on samples collected from July to March months, revealing fungi such as *Pilobolus*sp., *Ascobolus*sp., *Parasola*sp., *Chaetomium*sp., *Cheilymenia*sp., *Coprinellus*sp., *Panaeolus* sp., *Podospora* sp., *Rhizopus*sp. and *Mucor* sp. were obtained.

Fungi on different dung samples.

Sr. No.	Name of Fungi	Dung Samples of			
		Cow		Horse	Goat
		Domestic	Stray	(Domestic)	(Domestic)
1.	***Pilobolus***	+	-	-	+
2.	***Parasola***	-	-	+	-
3.	***Mucor***	+	+	+	+
4.	***Rhizopus***	+	-	-	-
5.	***Panaeolus***	-	-	+	-
6.	***Podospora***	+	-	-	-
7.	***Chaetomium***	-	+	-	-
8.	***Ascobolus***	-	+	-	-
9.	***Cheilymenia***	+	-	-	-
10.	***Coprinellus***	-	-	+	-
11.	***Unidentified***	+	-	-	-
12.	***Unidentified***	+	-	-	-

e ISSN 2348 –1269, Print ISSN 2349-5138
Cosmos Impact Factor 4.236

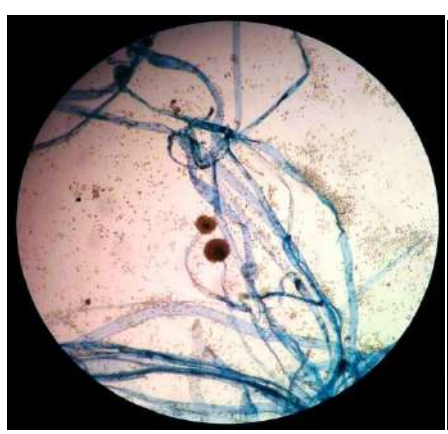
Slide 1 *: Pilobolus* sp.
Sporangium with Black Cap



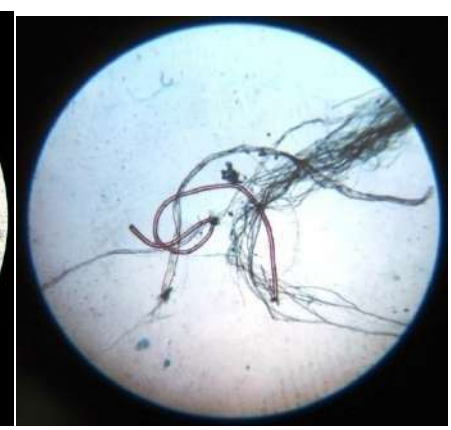
Slide 2 : *Pilobolus* sp.
Sporangiophore

Slide 3 :*Podospora* sp.
Ascospores X100

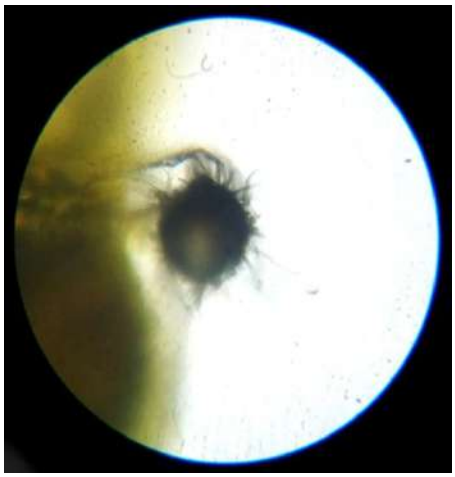
Slide 4 :*Rhizopus stolonifer*
Sporangium and Sporangiophore



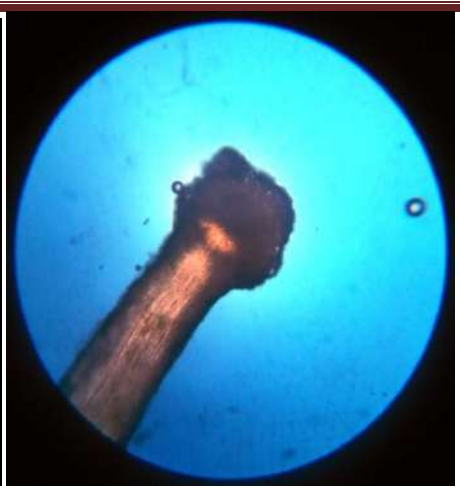
Slide 5 : *Rhizopus* sp.
Sporangium and Rhizoids X45



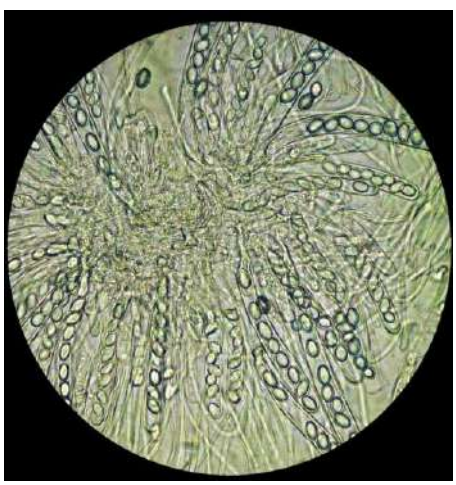
Slide 6 : *Unidentified* sp.



Slide 7 *: Chaetomium* sp. Perithecium X100



Slide 8 : Unidentified sp.



Slide 9 *: Ascobolus* sp. Mature apothecium X100

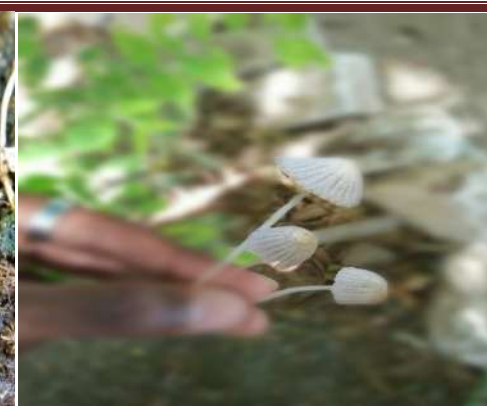
Slide 10 *: Cheilymenia* sp. Marginal hairs

Specimen found on different dung samples

Specimen 1 : *Ascobolus* sp. Fruiting Bodies

Specimen 2 : *Parasola* sp. Fruiting Body

Specimen 3 : *Panaeolus* sp. Fruiting Bodies



Specimen 4 : *Coprinellus* sp. Fruiting Bodies

Colonies Appeared on Dung samples after Incubation

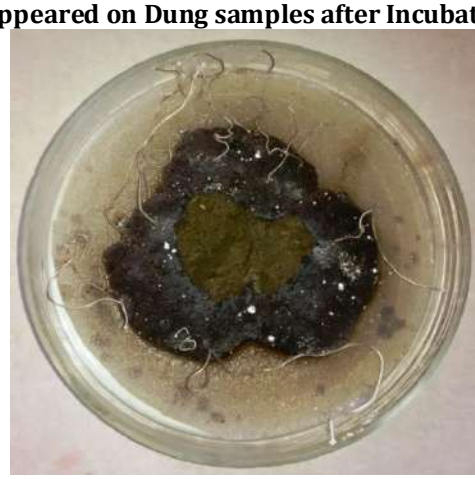


Plate 1 :Showing Colonies of *Pilobolus* sp.

Plate 2 :Showing magnified Colonies of *Pilobolus* sp.

Plate 3 :Showing Colonies of *Pilobolus* sp.and *Chaetomium* sp.

Plate 4 :Showing Colonies of *Pilobolus* sp. and *Mucor* sp.

References:

1. Afra Ahmed Ismail Khiralla, (2007), A Study on the Ecological Group Coprophilous (Dung) Fungi in Khartoum. University of Khartoum.
2. Amandeep Kaur, NS Atri and Munruchi Kaur, (2014), Two new species of Panaeolus (Psathyrellaceae, Agaricales) from coprophilous habitats of Punjab, India. Journal on New Biological Reports **3**(2):125-132.
3. Amandeep Kaur, N.S. Atri and Munruchi Kaur, (2014), Diversity of coprophilous species of Panaeolus

(Psathyrellaceae, Agaricales) from Punjab, India. BIODI ERSITAS.vol.(15):115-130.
4. Amandeep K, Atri NS and Munruchi K, (2015), Taxonomic study on the coprophilous mushrooms from Punjab, India: new records of family Agaricaceae. Current Research in Environmental and Applied Mycology 5 (1): 27-45.
5. Ann Bell, (2007), An illustrated guide to the coprophilous Ascomycetes of Australia. CZECH MYCOL.59(1):82.
6. Colleen Ebersohn and Albert Eicker, (1997), Determination of the coprophilous fungal fruit body successional phases and the delimitation of species association classes on dung substrates of African game animals.Bot_Bull.Acad.Sin.38: 183-190.
7. B.P. Pandey (2005), College Botany vol.1: Algae, Fungi and Bryophyta. Eugenia Bone, (2011), Mycophilia: Revaluations from the weird world of Mushrooms.
8. Hawksworth,(1974), Moist chamber methods for favourable fungal organisms.
9. Ibrahim Ali Altayyar, Abdulatif Salim Ismail and Samir Khalaf Abdullah, (2017), A Preliminary Study of Coprophilous fungi in North of Jordan.International Journal of Applied Medical and Biological Research. vol. 2(1): p11-15.
10. James B. Gloer and S.M. Truckenbrod, (1988), Interference Competition among Coprophilous Fungi: Production of (+)- Isoepoxydon by Poronia punctata. Applied and Environmental Microbiology.vol. 54 (4):861-864. Lakshmi Thilagam, B.K. Nayak and Anima Nanda, (2015),
11. Studies on the diversity of coprophilous microfungi from hybrid cow dung samples.International Journal of Pharm Tech Research.vol.8(9):135-138.
12. Nils Lundqvist, (1960), Coprophilous Ascomycetes from Northern Spain. Sv.Not.Tidskr.,(54):4.
13. Mohammed N., Shinkafi S.A. and Enagi M.Y.,(2017), Isolation of CoprophilousMycoflora from Different Dung Types in Some Local Government Areas of Niger State, Nigeria.American Journal of Life Sciences.vol.5(3-1):24-29.
14. Paul Stamets,(2005), Mycelium Running: How Mushrooms can Help Save the World.
15. R. Watling and M.J. Richardson,(2010), Coprophilous fungi of the Falkland Islands.Edinburgh Journal of Botany 67(3):399-423.
16. Rohini Iyer, S.K. Ghosh and A.K. Sarbhoy,(1971), Studies on Coprophilous Fungi-I. Journal of Agricultural Research Institute.vol.39,B:2.
17. Robyn Peterson, Jasmine Grinyer and Helena Nevalainen, (2011), Secretome of the Coprophilous Fungus Doratomyces stemonitis C8, Isolated from Koala Feces. Applied and Environmental Microbiology.vol.77(11):3793-3801.
18. Torbati M., Arzanelou M.and Bakshi M.,(2016), Morphological and molecular identification of ascomycetous coprophilous fungi occurring on feces of some bird species. Current Research in Environmental and Applied Mycology.vol.6(3):210-217.
19. Youbert Ghosta, Alireza Poursafar and Jafar FathiQarachal, (2016), Study on Coprophilous fungi: new records for Iran mycobiota.Rostaniha 17(3):115-126.