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Coprophilous Fungi Recovered from Dung of Herbivore and Their Correlation with Physio-Chemical Factors

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ABSTRACT:
The ecological studies of fungi occurring in different habitats/substrates have enough been done both by Indians and foreign investigators. *Schreiners and Mihara 2009*; Becerra et al 2009; Thind et al 2009. Ecological studies were undertaken for Buffalo dung. Dung Samples were collected as fresh as possible, periodically and relates to seasonal variation in fungal flora and their correlation with some Physio chemical factors analysed for dung. Fungi recovered from dung yielded different fungal forms in which Ascomycota were dominant fungal flora of dung of Buffalo. Dung shows floral variation and variation in chemical factors considered also exhibited variations.

KEYWORDS:
Coprophilous, Physiochemical, correlation, sporulation

INTRODUCTION:
The studies on coprophilous fungi done so far by both Indians and foreign investigators, Gams et at; 1984; Pfister; 1994, Webster et al; 1998; Weber & Webster 1998; Webster 2000; Bellis et al 2007; Kilgore et al; 2009. The Ecological studies on coprophilous fungi have not done so much. This paper deals the Ecological studies for the fungi recovered from Buffalo dung relates to the seasonal variation in fungal flora and their correlation with some physiochemical factors analyzed.

MATERIAL AND METHODS:
Dung samples were periodically collected as fresh as possible with sterilized spatula and placed in sterilized plastic bags with all possible care. Dung samples were subjected to some physicochemical factors like pH, Na, K, electrical conductivity and moisture content Air temperature and atmospheric humidity data of the day were also recorded and correlates with fungi and other factors.

HYDROGEN ION CONCENTRATION:
Dung samples were mixed with distilled water (1:2) and Hydrogen ion concentration was recorded with the help of Portable pH meter, Hanna instruments England.

ELECTRICAL CONDUCTANCE:
The dung samples were made in distilled water (1:2) and electrical conductivity were estimated with the help of Deluxe conductivity meter Model 601E.

SODIUM AND POTASSIUM:
Sodium and Potassium were estimated by Flame photometrically using EEL Flame Photometer of Evans Electroselenium Ltd. Halstead, Essex, England.

MOISTURE CONTENT:
Present moisture content was estimated by drying the fresh dung in an oven for 24 hrs. at 60ºC.

OBSERVATION:
Fungi recovered from Buffalo dung have been listed in table-1 As would be evident from the table that Buffalo dung yielded 51 fungal forms. Members of Ascomycota dominated the fungal flora of dung. The members of fungi recovered has shown correlation with some physiochemical factors like air temperature has shown negative and significant to highly significant correlation with the fungi recovered from dung (r = -0.727) with the number of fungi sodium bears positive and significant correlation (r = 0.715) with the fungi recovered from dung. Potassium has not exhibited any correlation with the dung studied. The highest maximum air temperature was noted in April and May (39^0C) and maximum lowest in month of December and January (25^0C and 23^0C). The lowest minimum air temperature was noted in January (6.4^0C) and the highest minimum temperature (26^0C) was in June. The atmospheric relative humidity was highest in July (95%) while lowest was recorded in April (56%). The hydrogen ion concentration recorded for Buffalo dung was lowest (6.9) in May and highest (8.3) was in November and January. The moisture content was lowest in August (76%) and highest in January (88.7%). Electrical Conductivity recorded for dung was lowest in May (0.533 μmhos / cm) and highest was in the month of September and October (1.06 μmhos / cm).Potassium has been the lowest (130 mgμ) in month of February and highest (240 mgμ) was in November. Sodium was recorded lowest in the month of May and July (30 mgμ) while highest Sodium was in the month of January (88 mgμ). Among the factors correlation has also been observed. The hydrogen ion concentration has negative and highly significant correlation with air temperature. Relative humidity of air bears negative and significant correlation (r = 0.576) with temperature. Moisture content bears positive and significant (r = 0.501) with pH and negative and significant (r = -0.510) with air temperature. Electrical conductivity has positive and significant correlation (r = 0.659) with Potassium. Sodium exhibits positive and significant correlation with pH (r = 0.626) and negative and highly significant correlation with air temperature (r = -0.821). Potassium shows negative and significant correlation (r = -0.538) with air temperature.

DISCUSSION:
There is very little information available with regards to ecological studies of coprophilous in India (Lodha 1974). However ecological studies of fungi from some other substrates and habitats and some ecological studies on coprophilous fungi from abroad (Harper & Webster) 1964; Nagy & However, 1979; Wickblow & Angel, 1980) that are in Print Justify and support the present observation that fungi

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show variation in their number and group they belong to, depending upon the substrate dung type they have been sought for. The fungi exhibit seasonal variation also (Mishra, 1980; Shukla, 1987) Hashing 2002; Tiwari, 2002; Bahoray, 2003; Pant, 2009). In present study varying fungi in different months were isolated indicating that there by that they vary in number in different months of the year. As regards the chemical factors studied for the dung the relationships were seen between the fungal numbers and the Hydrogen ion concentration and sodium. pH effects flora it has positive and highly significant correlation with the fungal number. Moisture and pH have correlation among themselves.

Table -1. Fungi recovered from Buffalo dung during a year.

Fungi/Months	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
Alternaria diathicola	-	-	-	-	-	-	-	-	-	-	-	+
Arthrobotrys elegans	+	-	-	-	-	-	-	-	-	-	-	-
Arthrobotrys oligospora	+	-	-	-	-	-	-	-	-	-	-	-
Arthrobotrys thaumasia	-	-	+	-	-	-	-	+	-	-	-	-
Ascobolus albidus	-	-	+	-	-	-	-	-	-	-	+	-
Ascobolus amoenus	-	-	-	-	-	-	-	-	-	-	+	+
Ascobolus crenulatus	+	-	-	-	-	-	-	-	-	-	+	+
Ascobolus furfuraceus	-	+	+	+	-	-	-	-	+	-	+	+
Ascobolus immerses	-	-	-	-	-	-	-	-	-	-	+	+
Ascobolus stictoideus	-	-	-	-	-	-	-	-	-	-	+	+
Ascolous sp. 1	-	-	-	-	-	-	+	+	+	-	-	-
Ascolous sp. 2	-	-	-	-	-	-	-	-	-	-	+	-
Aspergillus flavus	-	-	-	-	-	+	-	-	-	+	+	+
Cephaliophora irregularis	-	-	+	+	-	-	-	-	-	-	-	-
Cercophora mirabilis	-	-	-	+	+	-	-	-	-	-	-	-
Chaetomium brasiliense	-	-	-	-	-	-	-	-	-	-	+	+
Chaetomium spinosum	-	-	-	-	-	-	-	-	-	-	+	+
Chilymenia theleboloides	-	+	-	-	-	-	-	-	-	-	-	-
Circinella simplex	-	-	-	-	-	-	-	-	-	-	-	-
Circinella spinosa	-	-	-	-	+	+	-	+	-	-	-	-
Coprinus comatus	+	-	-	-	-	-	-	-	-	-	-	-
Coprinus filamentifer	+	-	-	-	-	-	-	-	-	-	-	-
Coprinus radiates	-	-	-	+	-	-	-	-	-	-	-	-
Dactylaria brochophaga	-	-	-	+	-	-	-	-	-	-	-	-
Dactyleria bembicodes	-	-	-	-	-	-	-	-	+	-	-	-
Fusarium sp.	-	-	-	+	+	+	+	-	-	-	-	-
Gonytrichum sp.	-	-	-	-	-	-	-	-	-	+	+	+
Helicostylum lucknowense	-	-	-	-	+	-	-	-	-	-	-	-
Isaria brachiate	-	+	+	-	-	-	-	-	-	-	-	-
Kernia nitidia	-	-	-	-	-	-	-	-	-	-	+	+
Lasiobolus ciliates	-	-	+	+	-	-	-	-	-	-	-	-
Mucor disperses	-	-	-	-	-	+	-	-	-	-	-	-
Mucor mucedo	-	+	+	-	-	-	-	-	+	+	+	-
Neocosmospora tenuicristata	-	-	-	-	-	-	-	-	-	-	+	-
Oidiodendron sp	-	+	-	-	-	-	-	-	-	-	-	-
Peziza vesiculosa	-	-	-	-	-	-	-	+	-	-	-	-
Pilobolus crystallinus	+	+	+	-	-	-	-	-	-	-	+	+
Pilobolus intermedius	-	-	-	-	+	+	+	+	-	-	-	-
Pilobolus longipes	+	+	+	-	-	-	-	-	-	-	-	-
Piptocephalis debaryana	+	-	-	+	-	-	-	-	-	-	-	-
Podospora pectinata	-	-	-	-	+	-	-	-	-	-	-	-
Podospora pyriformis	-	-	+	+	+	-	-	-	-	-	-	-
Preussia cylindrispora	-	-	-	-	-	-	-	+	-	-	-	-
Rhopalomyces elegans	+	-	-	-	-	-	-	-	-	-	-	-
Saccobolus minimus	+	-	+	+	-	-	-	-	-	-	-	-
Saccobolus versicolor	-	-	-	-	-	-	-	-	-	-	+	-

Sordaria fimicola	-	-	-	-	-	-	+	-	-	-	-	-
Stysanus sp.	+	-	-	-	-	-	-	-	-	-	+	+
Thielavia ampullata	-	-	-	-	-	+	-	+	+	-	-	-
Zygopleurage zygospora	-	-	-	-	-	-	-	-	-	-	+	-
Unknown 10	+	-	-	-	-	-	-	-	-	-	-	-
Total	**12**	**7**	**11**	**10**	**7**	**6**	**4**	**6**	**5**	**3**	**18**	**12**

Table-2: Physico Chemical Factors Studied during the Year

Month Factors	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Max Temp	23.4	26.1	29.2	39	39.6	36.9	33.5	34	29.4	32.7	28.8	24.8
Min. Temp	6.4	12.5	14	22.2	25	25.7	24.7	24.4	21.9	20.5	13.8	9.98
Rel. Humi	83.2	88.1	72.1	55.9	71.9	76	94.7	90.1	91.5	80.9	87.4	91.4
Hydrogen Ion Concentration	8.3	7.8	7.5	7.3	6.9	7.4	7.3	7.2	6.7	7.4	8.3	7.8
Moisture Content (%)	88.7	84	85	83	85	86	82.3	76	81.1	82.5	84	84
Electrical Conductivity (μmhos / cm)	0.95	1	1.03	0.96	0.53	0.68	0.91	0.92	1.06	1.06	1.02	0.93
Potassium (mg/l)	150	130	224	198	116	150	161	184	192	212	240	209
Sodium (mg/l)	88	62	70	52	30	56	30	52	68	42	72	78

Table -3 Correlation coefficient (r) among the parameters and the fungi recovered from the Buffalo dung

Parameters	Fungi	Moisture Content %	Electrical Conductivity	K	Na	pH	Humidity %	Temperature Minimum	Temperature Maximum
Fungi		0.361	0.139	0.374	0.615*	0.727**	-0.041	-0.649*	-0.303
Moisture Content %		-	-0.239	-0.243	0.359	0.501*	-0.297	-0.510*	-0.086
Electrical Conductivity			-	0.659*	0.476	0.304	0.293	-0.457	-0.5
K				-	0.347	0.216	0.01	-0.216	-0.538*
Na					-	0.626*	0.163	-0.821**	-0.358
pH						-	0.154	-0.805**	-0.141
Humidity %							-	-0.195	-0.129
Temperature Minimum								-	0.187
Temperature Maximum									

***.** P < 0.05 and P < 0.01, respectively.**

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