

Morphology, Occurrence, Natural habitat, Structure and Texture of *Geastrum*

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Research Article

Abstract: *Geastrum* is a genus of fungi belonging to class: Basidiomycetes, order: Lycoperdales, family: Lycoperdaceae and sub-family: Geastrae. This genus includes a number of edible and inedible species. *Geastrum coronatum* and *Geastrum entomophilum* are inedible. Two species of *Geastrum* are found in Jharkhand, both of them are edible. They taste delicious; they are sold in the market with high price. One species occurs as the rainy season starts in the months of June-July which is locally known as *jaitputu* or *rugra*. Second species appears a bit later locally known as *kherputu*. Many species of *Geastrum* are commonly known as earthstars because when its fruiting body is young and unopened resembles small spheres lying in the soil but as it matures the thick leathery outer layer of tissue called peridium splits star-like to form a number of fleshy arms, which curves downward to reveal the inner spore sac which contains the fertile tissue known as the gleba. The network of fertile tissue inside the inner peridium, the capillitium arises from the columella. The spore sac has a narrow grooved opening at the top from which the spores are released. The fungus is saprobic and grows on the ground, in leaf litter, or on decomposing wood. In Jharkhand it is found abundantly in the *Sal* (*Shorea robusta*) forest.

Key words: *Geastrum*, edible fungus, *rugra*

Introduction:

Geastrum is a genus of fungi belonging to class: Basidiomycetes, order: Lycoperdales (stomach fungi), family: Lycoperdaceae and sub-family: Geastrae (Krieger, 2007). *Geastrum coronatum* and *Geastrum entomophilum* are inedible (Fazolino, 2008). It is a terrestrial fungus in which fruit-body development begins underground and comes at the soil surface as the fruiting body mature. In order to ensure that the fruit bodies are not covered in leaf litter, the outer layer of the fruit body, exoperidium splits and folds back at maturity, raising the inner "puffball" above ground level in a star-like arrangement therefore many species of *Geastrum* are commonly known as earthstars (Wikipedia). The endoperidium contains the spores, which are released via a pore at the tip. The network of fertile tissue inside the inner peridium, the capillitium, arises from the columella (Johnson, Minnie May, 1928). *Geastrum* occurs on the ground, in woods, sand

dunes and Jharkhand it seems to grow in association with *Sal* tree (*Shorea robusta*). The fruiting body is round to flattened or bulblike when young, the outer wall splitting at maturity into four to eight rays which unfold then bend under the spore case. The rays are thick, fleshy, pinkish and the upper surface cracks into patches. The spore case is pale to dark in colour. The spore mass is deep brown to smoky brown and powdery when matures. *Geastrum indicum* is supposedly edible when young. Six *Geastrum* species are reported from the Amazon forest: *G. entomophilum*, *G. fimbriatum*, *G. javanicum*, *G. lageniforme*, *G. lilloi*, and *G. saccatum*. *Geastrum javanicum* and *G. lilloi* represent first records from Brazil (Gomes, 2011). *Geastrum xerophilum*, a xerophytic species found in the Brazilian semi-arid region (da Silva, 2011). Basidiomata of three earthstars-*Geastrum campestre*, *G. corollinum*, *G. hungaricum* were collected from sand dunes of the Japanese coasts. (Kasuya, 2011).

Materials and Methods:



(Fruiting body of *Geastrum* at the soil surface, full mature fruiting body, stages of maturation)

The field trips were made as the rainy season was started in the months of June and July as well as in the non rainy months to the *Sal* forest with the village women who were acquainted with habitats where *Geastrum* is found abundantly. One species of *Geastrum* locally known as *jaitputu* was found growing just after the early summer rain. Second species which is locally known as *kherputu* was found growing a month later once the rainy season had

started. *Geastrum's* Morphology, occurrence, natural habitat, structure and texture were studied. The fruiting bodies of *Geastrum* were collected and their photographs were taken. In the non-rainy months *Geastrum* fruiting body was found in the matured form, exoperidium had opened and looked like a star. Since *Geastrum* is not yet cultivated in the artificial media, an effort was done to prepare spawn on the PDA medium as well as directly on the boiled autoclaved wheat grains.

Results and Discussion:

It was discovered that two species of *Geastrum* are found in Jharkhand which are edible. One of them appears with the early rain. Fruiting bodies occur single or double. They are formed underground but come to the soil surface due to rain. Fruit body appears brownish. Spore sac is white in colour when it is young but becomes blackish when spores mature. Spores are roughly spherical and have ornamentations on the surface. The spores often contain a drop of oil. The shape of fruit body is spherical; it has leathery covering

known as peridium which is divided into two layers exoperidium and endoperidium. The exoperidium splits open from the top and the sections open outwards in a star-like arrangement therefore they commonly known as earthstar. The endoperidium contains the spores, which are released via a pore at the tip. Species which appears early forms very less mycelia thread whereas the other species which appears a bit later has abundance of mycelia thread which look like a cobweb. Many fruiting bodies are formed at one place. Fruiting bodies are formed underground and as fruiting bodies mature the earth surface gets cracked which shows that fruiting bodies are beneath. It was observed that *Geastrum* is usually found in the *Sal* forest. Village women collect them from the forest and earn a good amount of money. If it is eaten when it is young it tastes delicious. Mycelia taken from the gleba of the young fruiting body grows on the wheat grains but mycelium does not grow on the PDA medium it maybe needing some nutrients enrichment from *Sal* root extract (*Shorea robusta*).

Difference between *Geastrum* and *Lycoperdon*

Fungi

Spores borne in asci.....Class Ascomycetes

Spores borne on club shape basidia.....Class Basidiomycetes

Basidiomycetes

Basidia borne on a hymenium.....Order Agaricales

Basidia borne on a container (peridium).....Order Lycoperdales

Lycoperdales

Fruit-body growing underground or slightly exposed.....Family Hymenogastraceae

Fruit body growing above ground

Spores develop in an ill-smelling slimy liquid (gleba).....Family Phallaceae

Spores develop as dry powder.....Family Lycoperdaceae

Spores develop within one or more tiny, viscid, or dry and hard, peridioles which may not be attached to the wall of enveloping peridium.....Family Nidulariaceae

Lycoperdaceae

Distinct stem (columella) present within; gleba like, contorted, divided into irregular spaces, or uniform in structure.....sub-family Podaxae

Columella indistinct or absent Gleba without peridioles, peridia elevated on a long or short stem (short stems may be numerous), outer peridium in conspicuous and disappearing, breaking away in flakes or splitting and becoming star shaped.....sub family Geastrae

Peridiasessil or with a sterile base which may or may not be cellular; outer peridium spiny or warty, or thin and forming mere discoloured patches on the inner one.....sub family Lycoperdae

Gleba composed of cell-like spaces which may appear as distinct, spore filled, large or small, peridioles, or as small areas circumscribed by white lines.....sub family Sclerodermataceae

Sub family: Geastrae

Both peridia on a distinct stem

Outer peridium inconspicuous, disappearing.

Peridium remaining attached to the stem; apical mouth distinct.....*Tylostoma*

Peridium becoming detached from the stem, mouth absent...*Queletia*
 Both peridia persistent, outer one falling away in thick pieces, in one thin but tough, mouth bright colored, raised and variously formed..... Calostoma
 Inner peridium alone more or less elevated on one or more narrow stems; outer peridium splitting and becoming star shaped
 Inner peridium with but one stem and one apical mouth..... *Geaster*
 Inner peridium with many stems and mouths scattered over the upper surface.....*Myriostoma*

Sub-family :Lycoperdaea

Outer peridium thin. Inner peridium firm or papery. Mature plant loosened from place of growth
 Capillitium of separate thread, with slender pointed branches, inner peridium papery.....Genus *Bovista*
 Capillitium of separate thread bearing spiny points. Inner peridium thick, firm, cork-like...
Genus *Mycenastrum*
 Capillitium threads broken into short fragments with blunt ends. Inner peridium with a basal, instead of an apical mouth.....Genus *Catostoma*
 Outer peridium thin, inner peridium usually flaccid. Plants normally remaining attached to a place of growth
 Capillitium of separate threads with slender, pointed branches.....Genus *Bovistella*
 Capillitium of long threads more or less broken into fragments. Peridium opening by a definite apical mouth....
Genus *Lycoperdon*
 Peridium irregularly ruptured..... Genus *Calvatia*

(identification key is adapted from Krieger, L. C. C., A guide to the Mushrooms: Their Botanical Position, Mode of Growth, Physiology, Habitat, Ecology and Economic importance)



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