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**SUTDY OF DIFFERENT MORPHOTYPES OF PSEUDOPODIA IN TESTATE AMOEBAE
COLLECTED FROM FRESH WATER BODIES AROUND WAI**

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ABSTRACT

Testate amoebae are a group of protists (unicellular animals) which form external shells (tests). They are predominantly fresh water and are also inhabitants of mosses, damp soils, freshwater lake bottoms and floating algal mat. They occur in different geographical settings. These organisms have an amoeboid sarcodine cell with pseudopods and a simple sac like test, either flattened or rounded with an aperture located on or near the tapered end with an invaginated aperture. Testate amoebae have been recorded from different kind of water bodies, soil samples and also in paleontological soil investigations in form of their empty test. Current efforts are made to investigate different types of pseudopodia of testate amoebae (or Arcellaceans or Thecamoebians) in fresh water bodies around Wai, Dist. Satara. Different varieties are found and they have been identified. Photographs and movies recorded. Different morphotypes of pseudopodia are discussed in this research paper.

Keywords: Testate amoebae, Protists, Wai, Satara

INTRODUCTION

The terms such as “testate amoebae” have been used by various authors for “Thecamoebians” are a group of protists (unicellular animals) which form external shells (tests) and live in freshwaters and wet soils classified in the order Testacea of class Rhizopoda (Von Siebold). They occur in different geographical settings. The fauna of

testate amoebae (thecamoebians) are predominantly fresh water. They are inhabitants of mosses, damp soils, freshwater lake bottoms, in association of succulent aquatic plants and floating algal mat. These are not only are diverse in themselves, but they typically occur with a diversity of algae and other micro-

organisms. Playing a critical role in food webs as the intermediate between bacterial and benthic invertebrate communities. They depend upon other protists, flagellates, diatoms and fragments of mosses and lichens for food supply. They take an active part in diverse biological processes in water ecosystems. These organisms have an amoeboid sarcodine cell with pseudopods and a simple unilocular (monothalamous) sac like test, either flattened or rounded with an aperture located on corner the tapered end with only one invaginated aperture for the emergence of pseudopodia. It is gelatinous, pseudo-chitinous or keratinous in composition secreted by the cytoplasm. The classification is based on the structure of either shell or pseudopodia. Basic morphotypes in naked amoebae have been studied in detail by [1]. Based on this study current efforts are made to find out similar morphotypes in list testate amoebae from two families; family *Arcellidae* and family *Diflugiidae* from selected fresh water bodies around Wai.

MATERIALS AND METHODS

The Topography of Wai: The geographical location of Wai can be stated as Latitude 17° 57' N and Longitude 73° 56' E. It is in the district Satara of State Maharashtra. The town Wai is approximately 95 km south of the city of Pune. It has an average elevation of 718 metres (2355 feet). Its average

rainfall is 965mm /year with an average rainfall of 994 mm during last 10 years. It is surrounded by the mountainous region of the Sahyādris. The Dhom Dam has been constructed in the vicinity of Wai about 06 km away.

Methodology: For the collection of freshwater heliozoan; water samples along with some waterweeds, algae, bottom ooze and flocculent matter arising out of washing waterweeds and aquatic plants brought to the laboratory and stored in wide mouthed specimen jars made of glass. Then observed for occurrence of heliozoan under low and high power of compound microscope. Their presence and progressive / retrogressive changes were recorded within the month of the collection of the sample with the help of good quality compound research microscope at 10x10, 10x45 and 10x100 magnifications. For this observation and microphotography Labo (Germany make) trinocular compound microscope and Abbott digital eyepiece 2MP with USB adaptor is used. Selected Sampling Stations for the Proposed Work Water samples from following sources were selected for study of protozoan diversity around Wai.

- a) Krishna river around Wai.
- b) Stagnant Canal water.
- c) Leaked canal water bodies.
- d) Artificial water storage tanks.
- e) Perennial water bodies.

f) Seasonal ponds.

For the collection of freshwater testaceans water samples along with some waterweeds, algae, bottom ooze and flocculent matter arising out of washing waterweeds and aquatic plants brought to the laboratory and stored in wide mouthed specimen jars made of glass. Then observed for occurrence of testate amoebae under low and high power of compound microscope. The presence of the these testate amoebae and progressive / retrogressive changes were recorded within the month of the collection of the sample with the help of good quality compound research microscope at 10x10, 10x45 and 10x100 magnifications. For this observation and microphotography of Arcellaceans Labo (Germany make) trinocular compound microscope and Abbott digital eyepiece 2MP with USB adaptor is used.

[1] has given a very useful and detailed analysis of locomotive forms of gymnamobae which has been used as the basis of present work so as to describe basic locomotive forms in testate amoeba. That makes testate amoebae more significantly distinguished as particular species.

OBSERVATIONS AND DISCUSSION

Water samples collected from selected spots showed presence of following testate amoebae.

a) *Arcella vulgaris*, (Ehrenberg, 1830): It is one of the more common testate

amoebae. The lorica is organic and in older cells usually becomes brown. The dorsal surface of the lorica of this genus is usually domed, and the ventral surface has a single round aperture or hole through which the pseudopodia emerge. These organisms usually eat detritus (the food vacuoles contain bacteria). There are two nuclei (4 and 10 o clock) (distinguished by the large rounded nucleoli) and a single contractile vacuole.

b) *Arcella bathystoma*, (Deflandre, 1928):

It is also one of the more common testate amoebae. The lorica is organic and in older cells usually becomes brown. This is probably the species referred to as *A. bathystoma* in which the dorsal surface is high-domed and dimpled.

c) *Arcella gibbosa*, (Penard, 1890):

This species is distinguished by a brown domed test with multiple concave facets on the aboral surface. The aperture is recessed in a conical depression. - Large species of *Arcella* with high dome and an internal collar. Surface has typical honeycomb pattern, often with dented surface, and gets darker with age.

d) *Arcella excavata*, (Cunningham, 1919):

According to the original description the shape of the shell is "somewhat like a quarter-section of cantaloupe, the mouth being situated in the cup. The color is

brown to almost black. The shell is colourless or yellowish in young specimens and brown in older specimens, oval or circular in apertural view and croissant-like in lateral view the large axis of the shell (length) in almost all observed specimens is in perpendicular direction to the shell's protuberances, when the shape of the shell in apertural view is not circular. Rarely (about 5% of the observed individuals) is the large axis of the shell parallel to the shell's protuberances. The aperture surface is deeply invaginated forming two pronounced protuberances with circular or elliptical aperture at the bottom of invagination. The aperture is bordered by a small lip,

- e) ***Centropyxis aculeata*, (Griffiths & Heneray, 1883)**: Testate amoeba, test discoidal, flat, somewhat beret-shaped; dorsal surface rounded, ventral flat to concave; aperture ventral, may be circular to uneven but displaced towards one end; fine spines present on edge, may be at one end only or all around the periphery; surface smooth, dorsally with many quartz grains and a little cement, ventrally polished-looking due to more cement and much smaller grains in test.
- f) ***Arcella arenaria*, (Greeff, 1866)**: Testate amoeba, organic test, with lobose pseudopodia emerging from central

ventral aperture. The shell is brown, circular and has a conical dorsal region. The apertural surface is usually smooth but often has small pores towards the basal collar. The aboral region is smooth and appears to be divided into segments. These divisions are formed by folds on the shell surface that run from the flat crown to the basal collar. The aperture is invaginated, circular, bordered by a lip and about twenty large pores. The pores often seem to be blocked. Diameter of shell 60-130 microns, depth 21-50 microns, diameter of aperture 14-28 microns, number of apertual pores 8-24.

- g) ***Arcella megastoma*, (Penard)**: Shell very flattened with a wide aperture, 0.4 to 0.6 of the entire diameter; with 36 to 200 nuclei. Large bubbles are seen mostly due to CO₂ formation, help in floating.
- h) ***Arcella artocrea*, (Leidy, 1876)**: Testate amoeba, organic test, with lobose pseudopodia emerging from central basal aperture. The shell is brown, circular and has a conical aboral region which is often covered by dents or depressions. The basal collar is usually prominent and smooth. The aperture is invaginated, circular, has a small lip and is surrounded by about thirty large and some small pores.

i) *Netzelia walesi*: The shell is ovoid, circular in cross-section, pseudostome lobed with a thick organic rim or a necklace made of small idiosomes. These xenosomes are always smoothed and modified by the deposition of silica (Anderson, 1987). The idiosomes often have a nail like shape. All particles are held in position by perforated cement units and are arranged in a single layer. Usually outline regular.

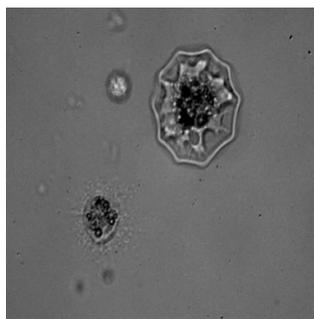
As mentioned above naked amoebae had been distinguished by their morphotypes with respect to shape of pseudopodia and kind of locomotion. This effort has been made to similar classification of morphotypes in testate amoebae or *Arcella* and *Diffugia*. Most of the types have been

described in naked amoebae by [1]. Those which have not been described but seen in testate amoebae, we have suggested their suitable morphotype. It is necessary to classify Rhzopods by different means which may provide most suitable method to distinguish different varieties from each other.

Fresh water bodies around Wai exhibited still several varieties of testate and naked amoebae which needs further studies as this region is also a part of Western Ghats and Protists have been neglected by researchers. Testate amoeba divide very rapidly and they possess pseudochitin test. Study in this direction also may provide some clues for commercial purposes.



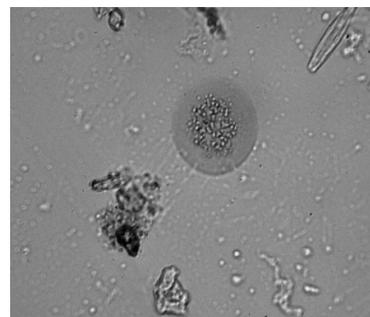
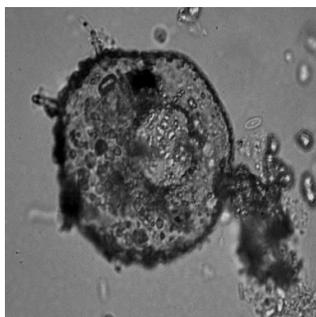
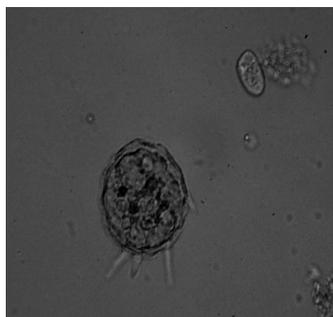
a. *Arcella vulgaris*



b. *Arcella bathystoma*



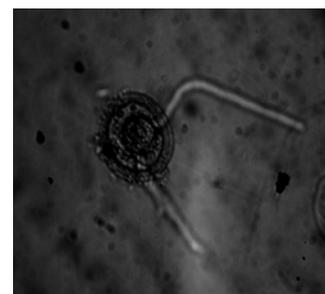
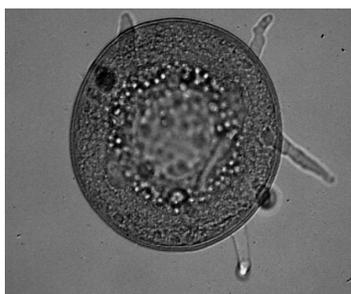
c. *Arcella gibbosa*



d. *Arcella excavata*

e. *Centropyxi aculeata*

f. *Arcella arinaria*



g. *Arcella megastoma*

h. *Arcella artocrea*

i. *Netzelia wailesi*

Figure 1: Images of Different Varieties of Testate amoebae

Table1: Suggested Morphotypes in Testate Amoebae with Description and Examples

Basic Morphotype	Description	Example
Rhizomonotactic	Amoebae in rapid locomotion monopodial.	<i>Arcella vulgaris</i>
Flamellian	Amoeba flattened and expanded, or only the frontal part is flattened. Subpseudopodia, lobes and waves are formed from the frontal hyaloplasm.	<i>Arcella bathystoma</i>
Flabellate	Flattened, usually irregular, triangular cells with prominent anterior hyaloplasm and uneven frontal edge.	<i>Arcella gibbosa</i> <i>Arcella arinaria</i>
Dactylopodial	Amoebae of this morphotype produce characteristic finger-shaped hyaline subpseudopodia (dactylopodia) and only rarely (and temporarily) conical or mamilliform pseudopodia.	<i>Arcella excavata</i>
Palmate	Polypodial amoebae; with numerous pseudopodia of approximately equal size, which are formed from the basal part of the body.	<i>Centropyxis aculeata</i>
Filitate	Elongate, filamentous, like tentacles of higher animals.	<i>Arcella artocrea</i>
Palmate	Polypodial amoebae; with numerous pseudopodia of approximately equal size, which are formed from the basal part of the body.	<i>Arcella Megastoma</i>
Ditactic	Whenever observed found two elongated pseudopodia so suggested as ditactic.	<i>Netzelia wailesi</i>

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