Environmental Biotechnology
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Lecture – 18
Microbiology of Environmental Engineering System (Contd.,)

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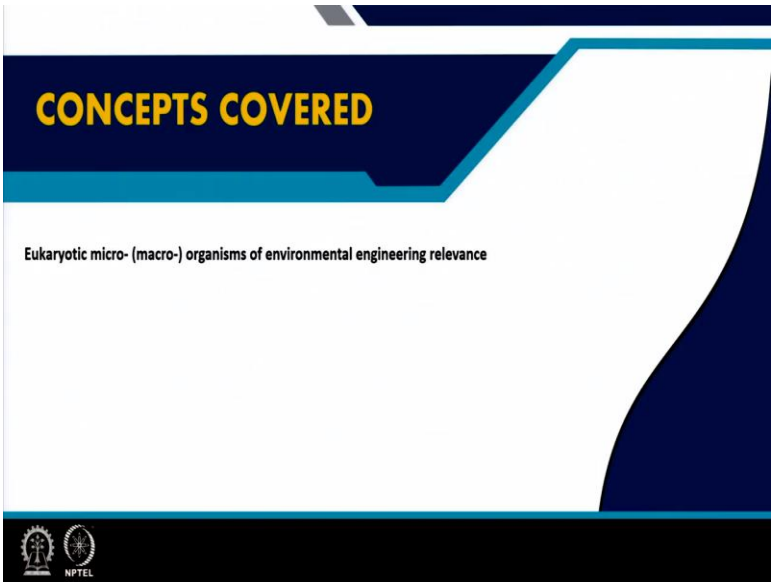

Welcome to this lecture on microbiology of environmental engineering system and in this particular lecture we will talk about the eukaryotic micro and macro organisms of environmental engineering relations.

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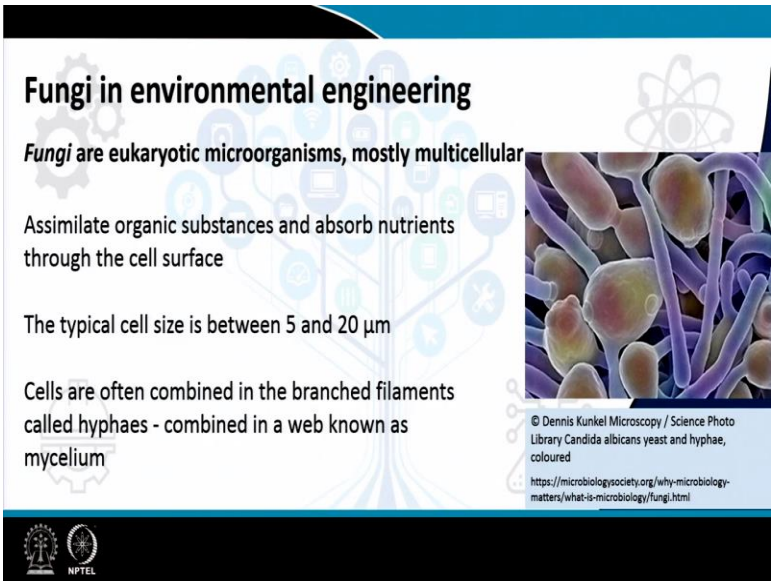

So we will start with fungi with respect to their role in environmental engineering system. Now, fungi are eukaryotic microorganisms mostly multi-cellular and this is true with respect to the environmental engineering system, because we are not going to discuss or emphasize more on the macroscopic fungi. So this fungi type of organisms, they assimilate organic substances and absorb nutrients through the cell wall or cell surface.

So these are basically heterotrophic microorganisms they utilize the organic substances. The cell, size varies between 5 to 20 micrometer and cells are often combined in the branch filaments called hyphaes and combined in a wave form, which is called mycelium.

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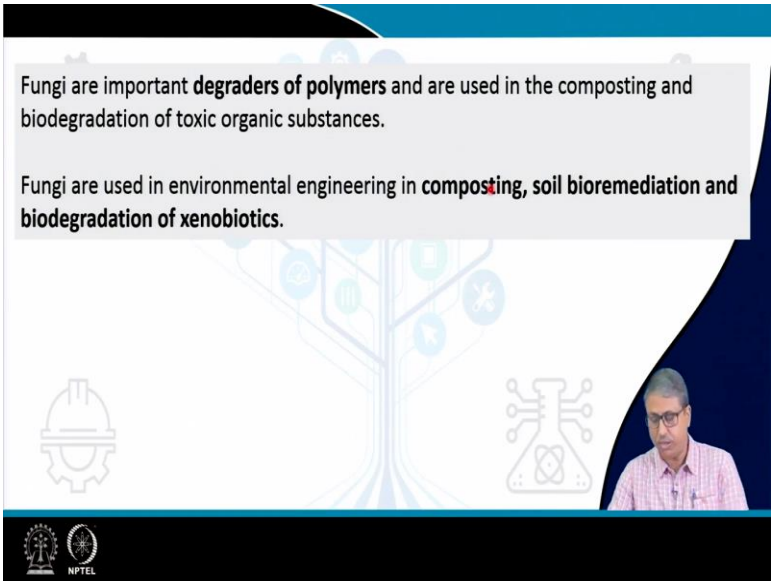

Fungi are very important for environmental systems because they are playing very critical role or important role with respect to degradation of diverse polymers and are used in the composting and biodegradation of toxic organic substances. So, in environmental biotechnology use of fungi is very well reported and well practiced owing to their catabolic role in terms of utilizing and degrading diverse type of polymeric substances, including some of the toxic xenobiotic compounds.

And it is not only that, these compounds are degraded by fungi and fungal enzymes but also, as these compounds are degraded in natural environment or the controlled environment, where environmental processes are being carried out, the degraded products are often supplied or utilized by other organisms, particularly the other bacteria present in the environment and going to their such critical importance fungi are used widely in environmental engineering systems, particularly with respect to composting, soil bioremediation and as I mentioned earlier, biodegradation diverse xenobiotics.

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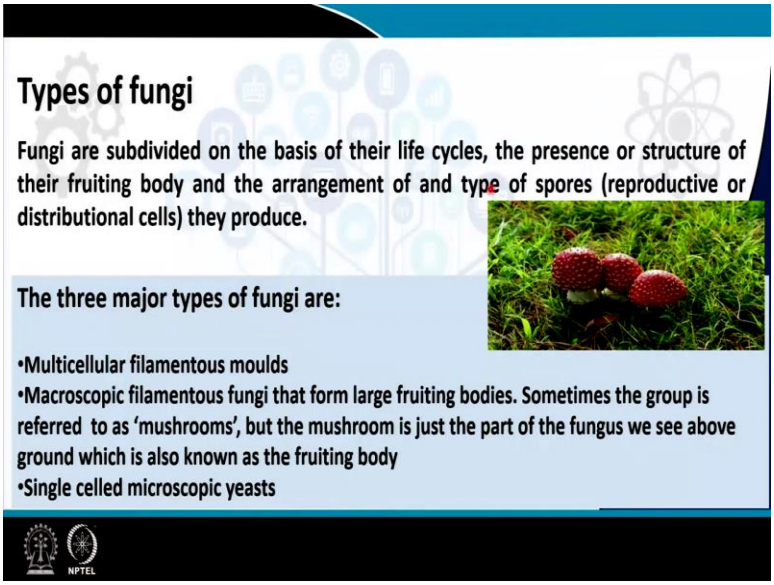

Types of fungi: Fungi are subdivided on the basis of their life cycles, the presence of structure of their fruiting body and the arrangement of and the type of sports that is the reproductive, or distributional cells, that they produce. And we found that there are three major types of fungi, of environmental elements. First is the multi cellular filament molds, second is the macroscopic filamentous fungi that form the large fruiting bodies.

Sometimes the group is referred to as the mushrooms, but the mushrooms is just the part of the fungus we see about ground, which also known as the fruiting body. So there is a whole lot of other cellular growth, like the mycelia and all those things, filamentous growth. Single celled, microscopic is, are also important.

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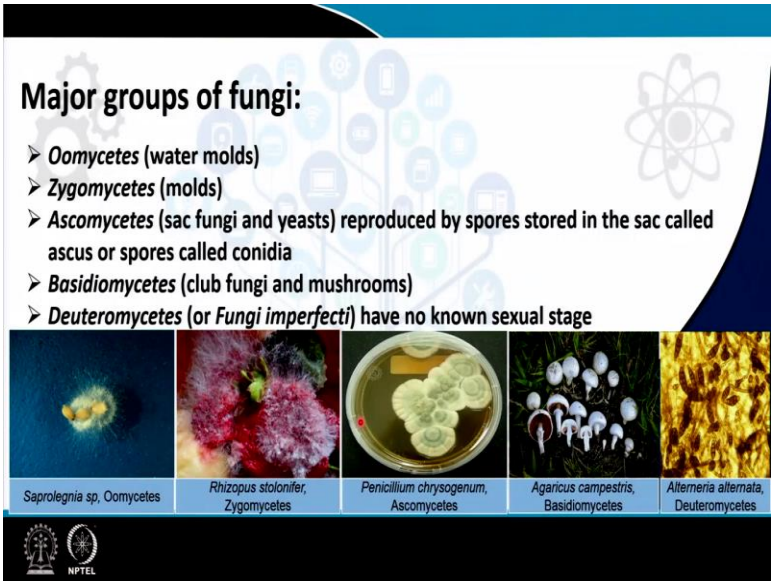

Now, taxonomically there could be at least these five very well demarcated fungal groups the first one is the Oomycetes or water molds, then the zygomycetes, followed by the Ascomycetes reproduced by spores stored in the sac called the ascus, or spores called the canidia. Basidiomycetes the club fungi and the mushrooms and Deuteromycetes are the fungi, imperfectly, which have no known sexual stages.

So with respect to the soil, bioremediation or landfill, bioremediation or their function, or the microbiology of other environmental engineering system, this, fungal activities, are considerably important.

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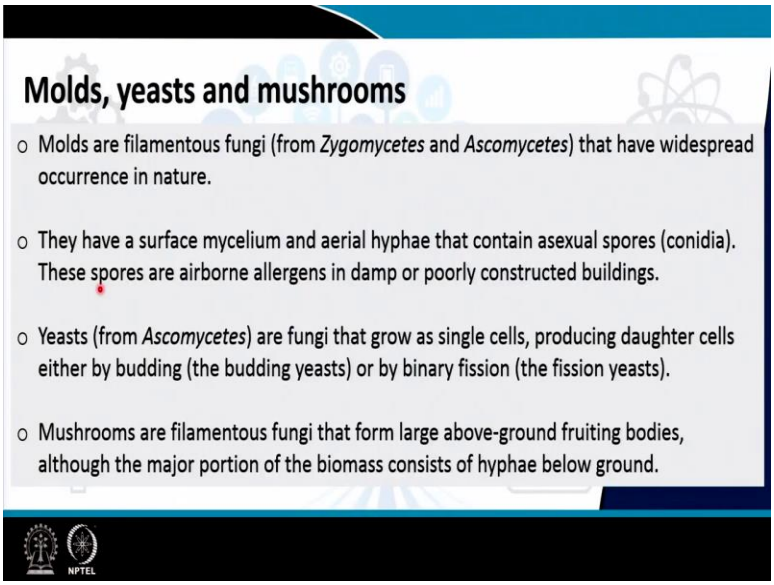

The molds, yeast and mushrooms need some special discussion or mention. Molds are filamentous fungi from zygomycetes, and ascomycetes that have widespread occurrence in nature. These molds and yeast have a surface mycelium and aerial high that contain the essex well spores of the canidia and these spores are airborne allergens to other organisms, particularly human, in damp, of poorly constructed buildings.

So, with respect to deterioration of building, building paintings and building structures often we found, found that these fungi are playing very important role yeast from the ascomycetes group are the fungi that grow as single cells, producing daughter cells, either by budding, that is the budding yeast or by minor efficient that is. The mushrooms or filamentous funky, that form large above ground fruiting bodies. Although a major portion of the biomass consist of the hyphae below the ground.

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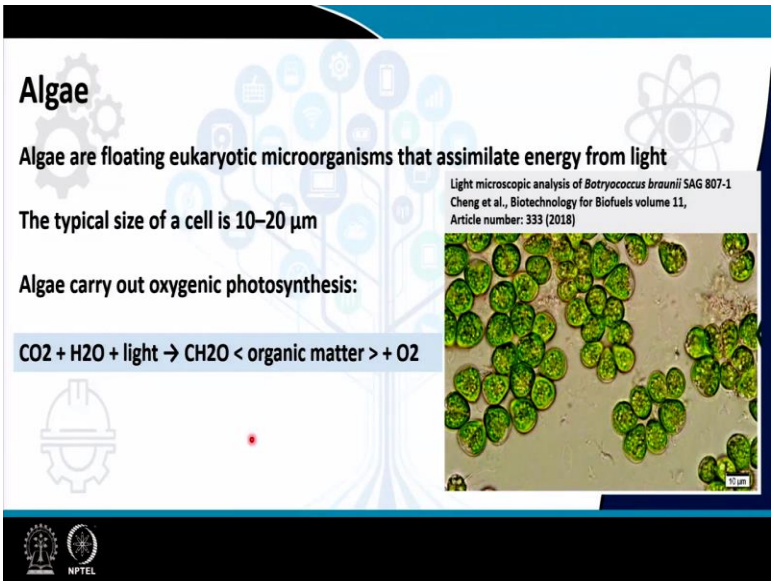

The next is the algae: Algae are floating you karaoke microorganisms that assimilate energy from light and with respect to environmental systems, they have tremendous importance because they fix the atmospheric carbon dioxide produce the organic mass, organic matter, and that organic matter can be utilized subsequently to other organisms, including bacteria. The typical size of the algal cells varies between 10 to 20 micrometer.

And algae carry out the oxygen photosynthesis that is the produce oxygen while they carry out the photosynthetic reaction so they play a dual role. So on the one hand, they consume the carbon dioxide at the other hand, they produce the oxygen. Since we have already learned the use of oxygen in the biodegradation or the metabolism of carbon substances, and that is, overall going to play important role in my to be a metabolism.

Availability of oxygen, which is made through these algal photosynthetic, or oxygen photosynthesis therefore is identified to be a very important or significant part in driving the carbon metabolism within the aquatic habitats in particular the phototropic, the photosynthetic algae are also present, along with the different.

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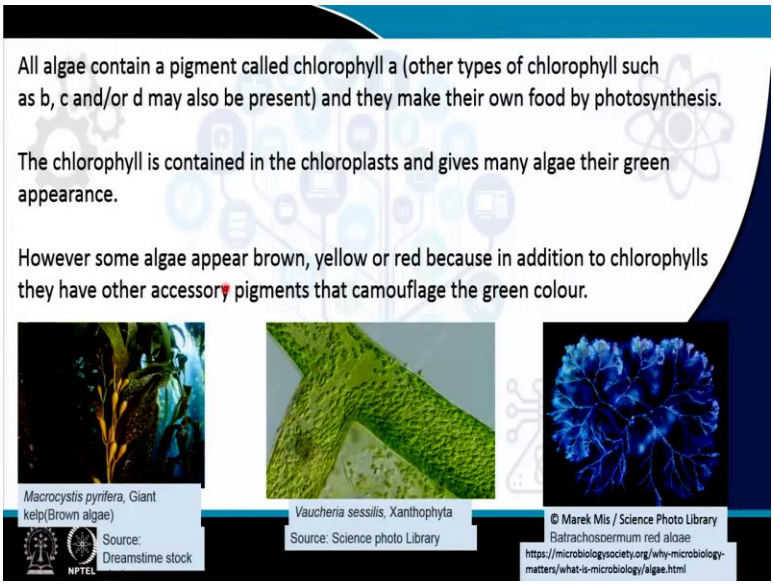

Other bacteria algae contain a pigment that is called profilea although other types of chlorophyll, such as the b, c and or d may also be present, and they make their own food by photosynthesis. So, all algae's are capable of doing photosynthesis. The chlorophyll is content in the chrotoplast and gives many algae their green appearance, so all the green algae basically continued the green pigment, or chlorophyll.

However, some algae appears brown, yellow or red because in addition to cholorophyll they have other accessory pigments that can camouflage their green colour.

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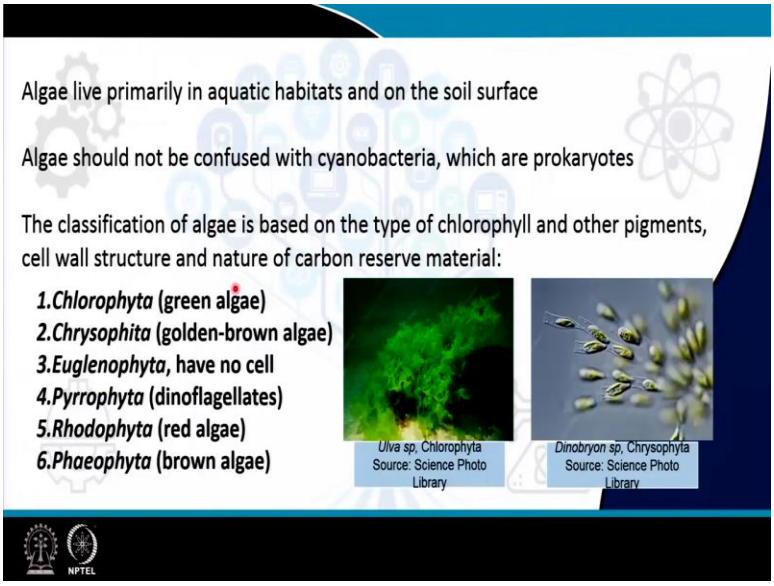

Algae live primarily in aquatic habitats, and on the soil surface and with respect to the

bioremediation or contamination control in style habitats, or in different types of aquatic habitats, including the waste effluents, stagnated water, lake river systems, the role of algae is very important. Algae should not be confused with sino bacteria because sino bacteria is basically a prokaryotic organism, whereas the algae that we are talking today is eukaryotic organism.

The classification of algae is based on the type of chlorophyll and other pigments present in cell wall structured in the nature of carbon dissolved material that they produced and this includes the Chlorophyta, Chrysophita, Euglenophyta, pyrrophyta, phodophyta and Rhaeophyta.

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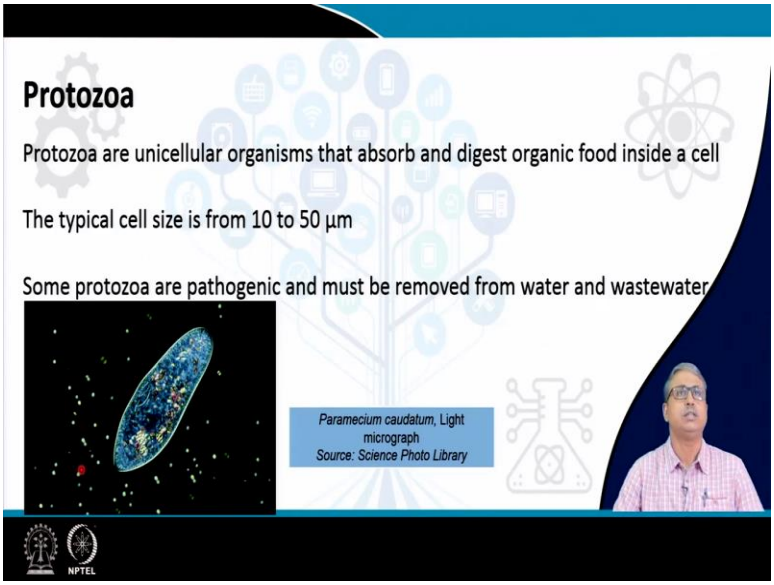

The next, the group is the protozoa, protozoa are usually cellular organisms that absorb and digest organic food inside a cell. A typical cell side is little larger, like 10 to 50 micrometers. Some protozoa are pathogenic and must be removed from water and waste water. So from environmental engineering perspective, they are very important because they quality control issue is very well connected to the abundance of protozoa because they are responsible for many, many diseases and health conditions.

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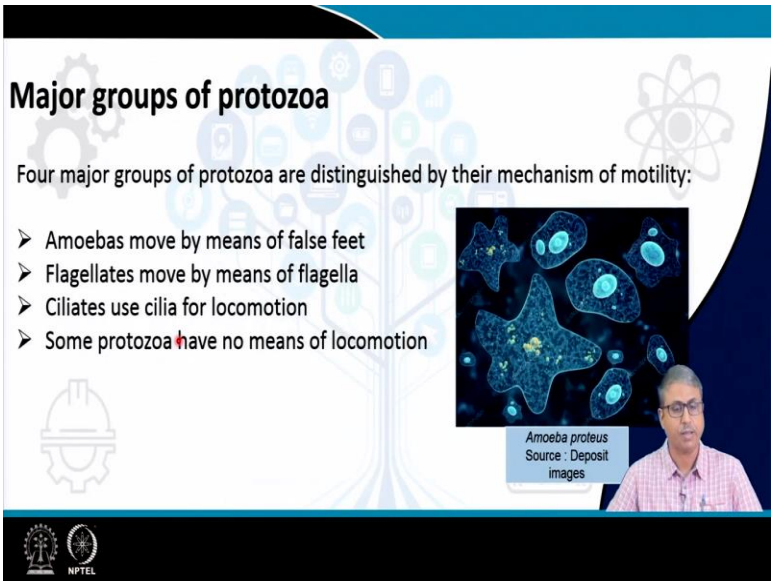

Major groups of protozoa are 4, the first one is the Amoebas, which move by means of the false feet, flagellates that move by the means of the flagella, Ciliates, which use the cilia for locomotion and some protozoa which have no means of locomotion.

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Protozoa are initial organism, and that they obtain the nutrients by ingesting other microbes, or by ingesting macromolecules. So they play important role in cycling of the and also determining the abundance of some of the microorganisms, because they may act as predators, to the organisms, or microorganisms, bacteria, including which might have a very important role in the particular environment.

The cells form cysts, so many prototypes are the form cysts under adverse environmental conditions, and these things are resistant to starvation, high temperature and disinfection. So often these, the protozoa cysts this they remain in the environmental system, or the water or the soil, which is being treated, and they may again revive under the unrecoverable condition.

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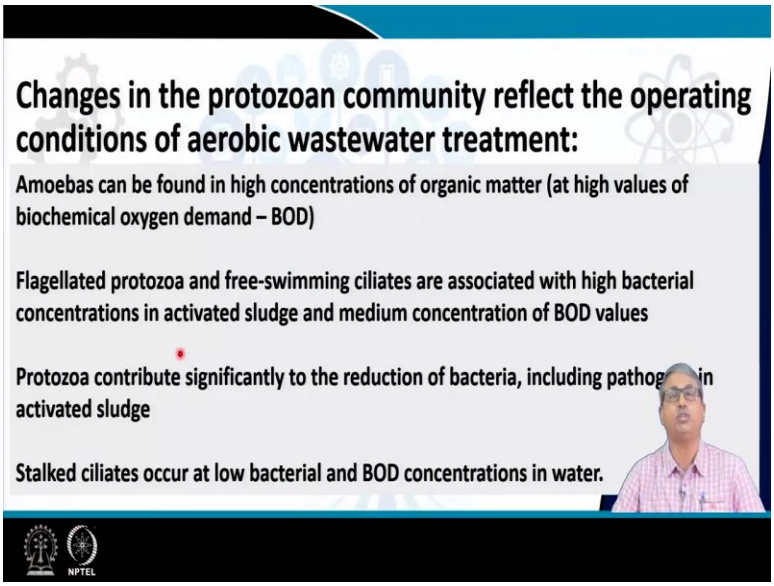

Changes in the protozoa community reflect the operating conditions of aerobic waste water treatment because in the effluence system were protozoa present and how efficiently the waste water is being treated that can be easily derived by monitoring the protozoa community. Amoebas can be found in high concentration of organic matter, at high values of BOD. So in the organic carbon reach waste water solution, we can see that we can get high abundance of Amoabas.

Flagellate protozoa and free swimming ciliates are associated with the high bacterial concentration in activated sludge and medium concentration of BOD values. So because they are often predator organisms, so they live on by eating the bacteria and other organisms. Protozoa contribute significantly to the reduction of bacteria, including the pathogenic bacteria in activated sludge, but also, they might be feeding on the useful bacteria in the system as well. Stalked cillates occur at low bacterial and BOD concentration in water.

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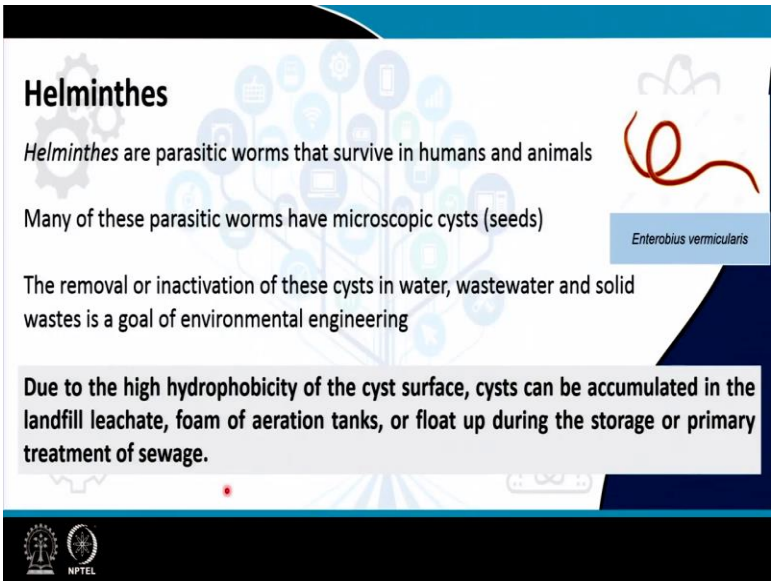

Helminthes: Helminthes are the parasitic worms that survive in humans and animals. Many of these parasitic worms have microscopic cysts. The removal of or the inactivation of these cysts in water, waste water and solid waste is a goal of environmental engineering. Therefore identifying them and monitoring their presence in any kind of environmental system is a very important part.

Due to the high hydrophobic of the cysts surface, cysts can be accumulated in the landfill leachate, foam of aeration tanks or float up during this storage or the primary treatment of sewage. So, environmental engineers often take utmost care to control these helminthes, along with the protozoa that we talked earlier.

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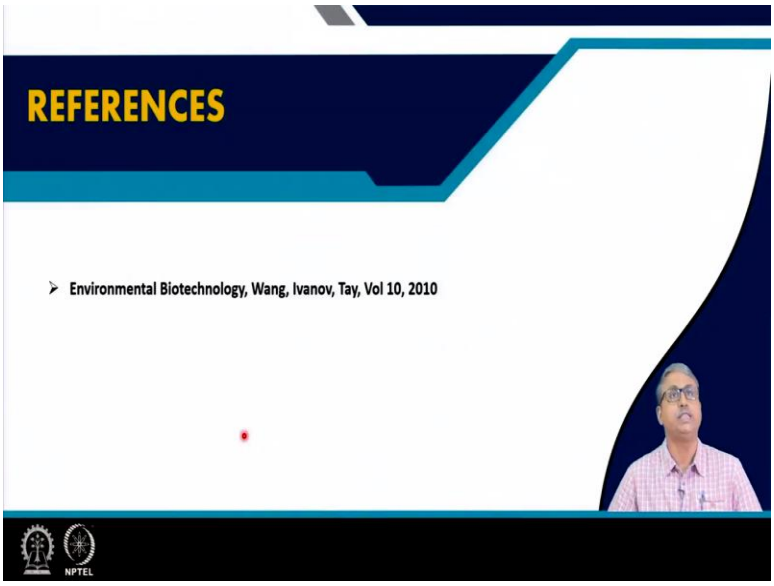

For this part of the lecture the environmental biotechnology book, edited by Wang et al will be or can be used as a reference.

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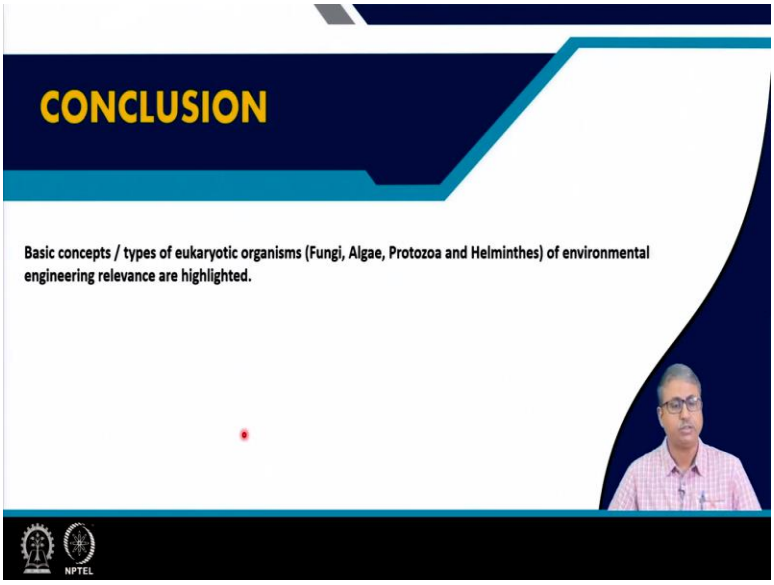

So therefore, in this part of the lecture, the basic concepts of types of eukaryotic microorganisms, or macroorganisms, including the fungi, algae, protozoa and helmetthis I discussed, particularly with respect to their environmental engineering and environmental biotechnology relevance. Particularly keeping in mind the waste water or the contaminated soil treatment, or contaminated soil, thank you.