Welcome students. I am Puja Sakhalkar, Assistant Professor at Carmel College of Arts, Science and Commerce for Women. Today we are going to look at module 7 of Paper BOC 102 that is Biodiversity II, Unit Pteridophytes. The module name is Vegetative and Asexual reproduction of *Psilotum*, module 7. To give you an outline of this lecture, first we will look at the modes of reproduction in *Psilotum*, then we look at the types of vegetative reproduction in *Psilotum*, and finally we'll see how *Psilotum* reproduces through spore formation. This module outlines the modes of reproduction in *Psilotum,* it describes the vegetative modes of reproduction in *Psilotum,* it explains the methods of reproduction through spore formation in *Psilotum*.

A brief overview of how *Psilotum* reproduces. *Psilotum* has three basic modes of reproduction. That is, it reproduces through vegetative propagation, it reproduces through spore formation, and it also reproduces through sexual reproduction, that is, through gamete formation. Today, in this module, that is module 7, we are going to look at the first two modes of reproduction.

Vegetative reproduction- Vegetative reproduction is mainly through gemmae formation and this gemmae formation is seen in the sporophyte as well as the gametophyte. Besides that, the gametophyte also produces vegetative buds and it reproduces through vegetative buds.

First is propagation through gemmae. Gemmae are minute, ovoid and multicellular outgrowths. There are 8 to 12 cells at maturity. This is how the gemmae looks when it is attached to the rhizome. The cells of the gemmae are thin-walled and they are rich in reserve food, that is, starch. Gemmae formation was first observed in *Psilotum nudum* by Holloway in 1939 and later Bierhorst in 1954 studied it more in detail.

How do gemmae develop? Gemmae are formed both on the sporophytic and gametophytic plant body. They are small, oval structure of one cell thickness and they protrude out as such initially and later on they divide and grow through the two-sided apical cells to form an ovoid structure. When the gemmae are produced on the sporophyte, they are mostly formed near the apex of the rhizome, and when they are produced on the gametophyte, they are formed on the prothallus from the terminal rhizoidal cells. These gemmae may germinate when they are still attached to the plant body or they may germinate after detaching and falling on a suitable substratum. When the gemmae originates from the sporophyte, it will germinate to give a new sporophyte and when it originates from the gametophyte, it will germinate to give a new prothallus. Now, you know the difference between the sporophyte and the gametophyte? Sporophytes are diploid in nature, whereas gametophytes are haploid in nature.

Next, after gemmae formation, the next type of vegetative propagation is through production of vegetative buds. Vegetative buds are small outgrowths that develop from the cell surfaces, just like the gemmae. However, they differ from the gemmae in their mode of origin. Vegetative buds develop directly on the prothallus, that is, the gametophyte while the gemmae arise from the terminal ends of the rhizoid.

Next, let us look at how *Psilotum* reproduces through spore formation. Sporophytes produce spores in a complex trilobed structure called as synangium. In this image you can see this globular structure here? These are called as; single one is called as synangium and when we are referring to more than one, they are called as synangia. So, what is this synangium? Synangium is a trilobed structure. It is 2 to 3 millimeters in diameter. It is borne at the axils of the forked bracts. You can see the forked bracts here. Each synangium consists of three chambers or locules. If you take a section through the synangium, you will be able to see three locules or three chambers. So, you can see here, when you take a longitudinal section through the synangium, this is how it will appear and when you take a transverse section through

the synangium this is how it will appear. As I just told you, there are three locules or three chambers in which lot of spores are produced.

Now, let us look at the wall of the synangium. Wall of the synangium is made up of three to four layers of cells. The outer layer forms the epidermis. What is depicted in green here is the epidermal layer. The inner layer separates the three locules. You can see here; these inner layers of the wall are separating the entire area into 3 chambers or three locules. Each locule is filled with a large number of homosporous spores, that is, the spores are all of one type. That is why, they are called as homosporous. When the synangium matures and when it has to dehisce, when it has to liberate the spores, the synangium splits up through three slits to release these spores. So, you can see here, in the epidermal region areas where the epidermis is little thin. Those are the slit regions. So, when the synangia will mature, they will split up from here, here and here.

So, the spores are released from the synangium. Now, let us look at what happens when they germinate. Germination of spores. It takes about three to four months after liberation from the synangium for the spores to germinate. For germination, they will absorb water and when they absorb water, they swell up and when they swell up, the outer wall of the spore will split open. So that is the point where the germination begins. Slowly it will germinate and it will develop into a prothallus. It is initially single celled which will undergo mitosis to produce many cells and it will form a structure which is called as the prothallus. This is the gametophytic phase. Prothallus is the gametophyte of the plant. During the development, the prothallus gets colonized by mycorrhizal fungus. The prothallus of *Psilotum* has mycorrhizal association. The point when the germination and the development of the prothallus happens, that is the time when the mycorrhizal fungus will come and colonize the prothallus.

These are the set of references and the weblinks that I have referred to during the preparation of this module.

Thank you.