

Cascading mosses transform into green curtains

Mosses are plants that are both ancient and tiny. Most people know little about them and confuse them with algae (chlorella). Actually, mosses (Division Bryophyta), is the oldest plant division still in existence today. They are a rather special division of plants. The earliest known moss fossil is 40 billion years old.

Unlike other terrestrial plants, mosses are non-vascular plants with simple structure. Most mosses are small in size and often go unnoticed. Mosses reproduce through spores instead of bearing seeded fruits like flowering plants.

Over 90 types of mosses found in Singapore

Mosses are distributed over vast reaches of the world. Traces of mosses can be found almost everywhere except in oceans, be it in the tundra of the Himalayas or the deserted Gobi. Mosses contribute the second largest number of plant species, after flowering plants, with 15,000 species in existence. Studies show that there are over 90 types of mosses in Singapore which can be classified into 54 species. These mosses are distributed throughout the island and can be found in places like tree trunks by the roadside, sewage pipes, drains, walls, and soil and rocks in forests.

In general, there are relatively fewer species of mosses in cities and villages. These mosses also tend to be smaller, averaging 2mm in length, which makes it difficult for them to attract the attention of passers-by. However, there is a diverse variety of mosses, some of which can reach 30 to 50mm in length, growing in rainforests and on tall mountains. Since they grown in mats, they form pleasantly green carpets on the forest floor. Some mosses grow on tree trunks and cascade down to form yellow-green curtains which are even more attractive.

For medical use and for you to admire

Mosses, especially moss forests in tropic rainforests and tall mountains, play an extremely important role in the ecological environment. Mosses are great stores of water, as well as excellent protectors of the soil. They are also an important link in the food chain and the natural cycles of inorganic substances.

Furthermore, mosses have many unique biological compounds that are absent in other plants. However, due to the lack of research, little has been done to apply these special moss compounds to practical use, which is a real pity. If Singapore wants to develop the biomedical industry, R&D and other characteristic biological research in special moss compounds is fertile ground.

Important environmental indicator

Mosses are especially sensitive to changes in the environment, particularly with regards to humidity and air pollutants. As such, many countries, such as Northern Europe and Japan use mosses as important environmental indicators. These countries carry out surveys of the distribution of various species of mosses and run chemical analyses of the dust cover found on mosses to arrive at indications of the degree of air pollution.

According to latest research by NUS, there are only slightly more than 10 species of mosses in the Jurong industrial area, while over 50 species can be found in the forests of Bukit Timah and MacRitchie. The vast difference is probably largely a result of air pollution and lower humidity in the industrial areas in the West. If the population of mosses in Bukit Timah and MacRitchie were to be compared with the species found in the tropical rainforests of Johor, right across the Straits, it would pale in diversity.

Some large mosses such as Hypopterygium, Pogonatum and Meterium, which commonly found in Johorean forests, have already disappeared from Singapore. This suggests that the past two decades of urbanization has reduced humidity and raised temperatures in our forests.

Another study by the NUS Cryptogram Lab shows that the types of local mosses has fallen by as much as 35 to 40 per cent in the past decade, which warrants more active conservation of these plants for the future.

Mystery of survival

The survival and continuation of the mosses is also an interesting and important topic in Biology. In the plant kingdom, mosses were the first plants to transit from being marine to terrestrial. They overcame difficulties facing terrestrial life, including strong UV rays and the lack of water, to diverge into 15,000 species. Its adaptability to the mystery of survival and the environment are well worth the research.

Mosses commonly found in Singapore

Mosses commonly found in Singapore include the following. Some of them have unique phenotype, which makes them easy to identify.

1. Leucobryum: Grows on soil or rocks. 2 known local species, larger in size, pale green. Microphylls (leaves) have a unique structure which allows them to store large amounts of water. Leucobryum are often used for grafting in bonsai cultivation and gardening.

2. Fissidens: Normally grows on soil, 16 known species, flat with two rows of leaflets arranged on the same plane, which makes this moss extremely easy to identify. Because they can grow quickly into mats, they are extremely effective in preventing soil erosion. Many insects also lay and hatch eggs in areas covered by fissidens.

3. Hyophila: Normally grows on rocks, especially cement walls. It loves calcium. There is only one known species in Singapore though it is the most common moss. Microphylls appear oval, with bluntly rounded tips.

4. Pallavicinia: Grows on soil or rocks, two known species. Microphylls not distinct. Plant appears lined and has an obvious leaf vein.

5. Heteroscyphus: Grows on soil, two known species, flat with microphylls approximating squares or rectangles arranged neatly on the same plane. Far edge of the leaves has obvious teeth-like groove. Different species have different number of teeth, normally ranging from 2 to 6.

7. Leucophanes: Grows on trees, only one known local species. Similar to Leucobryum, its body also appears light green with hints of white. Unlike Leucobryum, Leucophanes have an obvious leaf vein in the middle of the leaves.

Collaboration in exchange and research

NUS Cryptogram Lab currently conducts intensive research in the diversity and distribution of Asian mosses. This includes DNA fingerprinting chlorophyll and cell nuclei of mosses to investigate the relatedness between species and families of mosses.

Because the lab has a large collection of moss specimens and library of literature from Asia (including Southeast Asia), experts and scholars from 3 to 4 different countries visit every year for academic exchange and collaborative research.

Also, the lab helps train young moss researchers from other Southeast Asian countries. This makes Singapore one of the centres of research in the diversity of and conservation of mosses in Asia.

(Author Assoc Prof Benito Tan is a Filipino Chinese and local biologist.)

Ecology talk

How much do you know about mosses?

After reading this special feature, do you want see mosses “up close” and understand them better?

This coming Friday, Assoc Prof Benito Tan from the National University of Singapore will hold a public lecture in English. He will introduce various moss rainforests, mosses and data on mosses in depth to members of the public. Brilliant shots of various types of mosses will also be showcased.

Date: 6 February 2004

Time: 4pm

Venue: Singapore Botanical Gardens Tourist Centre Gardens Briefing Room

Admission is free, all are welcome.