6.4.2 Lichens

Lichens are a mutualistic association of photoautotrophic algae and heterotrophic fungi. The algal partner (**phycobiont** *or* **photobiont**) is typically unicellular or multicellular green algae or cyanobacteria. About 90% of all known lichens have a green alga as a symbiont. The most common photobionts are the green algae *Trebouxia, Pseudotrebouxia,* and *Trentepohlia,* and the cyanobacterium *Nostoc.* The fungal partner (**mycobiont**) may be a member of ascomycetes (mostly) or member of basidiomycetes (in a few cases). About 98% of the lichen-forming fungal species belong to the ascomycetes.

In a lichen, the mycobiont makes up most of the thallus and plays the major role in determining the form of the lichen. There are two general types of lichen thalli. In one, the cells of the photobiont are more or less evenly distributed throughout the thallus; in the other, the cells of the photobiont form a distinct layer within the thallus. There are three major morphological types of thalli: foliose, crustose and fruticose.

Foliose lichens are leaflike in both appearance and structure. They adhere to their substrate loosely.

Crustose lichens are *crust-like.* They are tightly attached to or embedded in their substrate. Crustose lichens make about 75% of all lichens on earth.

Fruticose lichens have no distinct top and bottom and are often round in cross-section.

In a lichen which represent a mutualistic relationship, the photobiont provide carbon compounds; the cyanobacteria also fix nitrogen and provide organic nitrogen. The mycobiont provides their photosynthetic partners with a suitable environment for growth. The physical arrangement of hyphae allows gas exchange, protects the photosynthetic partner, and retains water and minerals.