

= Myco @-@ heterotrophy =

Myco @-@ heterotrophy (Greek : ????? mykós , " fungus " , ????? heteros

= " another " , " different " and ????? trophe =

" nutrition ") is a symbiotic relationship between certain kinds of plants and fungi , in which the plant gets all or part of its food from parasitism upon fungi rather than from photosynthesis . A myco @-@ heterotroph is the parasitic plant partner in this relationship . Myco @-@ heterotrophy is considered a kind of cheating relationship and myco @-@ heterotrophs are sometimes informally referred to as " mycorrhizal cheaters " . This relationship is sometimes referred to as mycotrophy , though this term is also used for plants that engage in mutualistic mycorrhizal relationships .

= = Relationship between myco @-@ heterotrophs and host fungi = =

Full (or obligate) myco @-@ heterotrophy exists when a non @-@ photosynthetic plant (a plant largely lacking in chlorophyll or otherwise lacking a functional photosystem) gets all of its food from the fungi that it parasitizes . Partial (or facultative) myco @-@ heterotrophy exists when a plant is capable of photosynthesis , but parasitizes fungi as a supplementary food supply . There are also plants , such as some orchid species , that are non @-@ photosynthetic and obligately myco @-@ heterotrophic for part of their life cycle , and photosynthetic and facultatively myco @-@ heterotrophic or non @-@ myco @-@ heterotrophic for the rest of their life cycle . Not all non @-@ photosynthetic or " achlorophyllous " plants are myco @-@ heterotrophic ? some non @-@ photosynthetic plants like dodder directly parasitize the vascular tissue of other plants .

In the past , non @-@ photosynthetic plants were mistakenly thought to get food by breaking down organic matter in a manner similar to saprotrophic fungi . Such plants were therefore called " saprophytes " . It is now known that no plant is physiologically capable of direct breakdown of organic matter and that in order to get food , non @-@ photosynthetic plants must engage in parasitism , either through myco @-@ heterotrophy or direct parasitism of other plants .

The interface between the plant and fungal partners in this association is between the roots of the plant and the mycelium of the fungus . Myco @-@ heterotrophy therefore closely resembles mycorrhiza (and indeed is thought to have evolved from mycorrhiza) , except that in myco @-@ heterotrophy , the flow of carbon is from the fungus to the plant , rather than vice versa .

Most myco @-@ heterotrophs can therefore be seen as ultimately being epiparasites , since they take energy from fungi that in turn get their energy from vascular plants . Indeed , much myco @-@ heterotrophy takes place in the context of common mycorrhizal networks , in which plants use mycorrhizal fungi to exchange carbon and nutrients with other plants . In these systems , myco @-@ heterotrophs play the role of " mycorrhizal cheaters " , taking carbon from the common network , with no known reward .

In congruence with older reports , it has been recently shown that some myco @-@ heterotrophic orchids can be supported by saprotrophic fungi , exploiting litter- or wood @-@ decaying fungi . In addition , several green plants (evolutionarily close to myco @-@ heterotrophic species) have been shown to engage in partial myco @-@ heterotrophy , that is , they are able to take carbon from mycorrhizal fungi , in addition to their photosynthetic intake .

= = Species diversity of myco @-@ heterotrophs and host fungi = =

Myco @-@ heterotrophs are found among a number of plant groups . All monotropes and non @-@ photosynthetic orchids are full myco @-@ heterotrophs , as is the non @-@ photosynthetic liverwort *Cryptothallus* . Partial myco @-@ heterotrophy is common in the Gentian family , with a few genera such as *Voyria* being fully myco @-@ heterotrophic ; in photosynthetic orchids ; and in a number of other plant groups . Some ferns and clubmosses have myco @-@ heterotrophic gametophyte stages . The fungi that are parasitized by myco @-@ heterotrophs are typically fungi with large energy reserves to draw on , usually mycorrhizal fungi , though there is some evidence that they may also parasitize parasitic fungi that form extensive mycelial networks , such as

Armillaria . Examples of fungi parasitized by myco @-@ heterotrophic plants can be found among the ectomycorrhizal , arbuscular mycorrhizal , and orchid mycorrhizal fungi . The great diversity in unrelated plant families with myco @-@ heterotrophic members , as well as the diversity of fungi targeted by myco @-@ heterotrophs , suggests multiple parallel evolution of myco @-@ heterotrophs from mycorrhizal ancestors .