

Feeding types of filamentous Ascomycota fungi with a special note regarding the orders Hypocreales and *Trichoderma*

The history of fungi initially being considered plants contributes to the considerable confusion regarding the use of botanical, zoological, and microbiological terms when describing fungal biology, such as terms for the assignment of their feeding types.

The Kingdom of Fungi comprises mainly sessile heterotrophic organisms that rely on absorptive nutrition [1]. It is now confirmed that they share a last common ancestor with animals, which existed at least one billion years ago [2] or even earlier [3].

To avoid confusion related to terminology, we specify the meaning of the technical ecological terms used in this article (Table A). We follow the scheme of Getz (2012) [4], which is based on the distinction between (i) **eating live or dead biomass** and (ii) **consumers of animals, plants, or fungi**. In this article, it is also essential to distinguish between **generalists** (capable of feeding on any of listed resources) and **specialists** (feeding on a particular food source). Moreover, following the suggestion of Getz (2012), we attribute filamentous Ascomycota fungi to **miners** because he describes them as “relatively sessile in locally exploiting a resource mass larger than themselves” compared to **gatherers**, which are “relatively mobile in searching out and consuming or sequestering packets of resources.” Because the terms indicating feeding types of gatherers are based on the Latin “*vorus*” (to swallow), in this article we avoid using such terms as carnivorous, fungivorous, and herbivorous. However, we should note that the above-mentioned terms are frequently applied to fungi [5-8].

We use the term **parasite** to refer to any organism that feeds on a live biomass of any type. Mechanisms of interactions, interactions types, and benefits and losses for individual partners are not considered here. Consequently, frequently used terms referring to pathogenicity (entomopathogen, plant pathogen, etc.) are not used. Feeding on dead biomass is described using terms based on the Greek word “*phagos*” (to eat), while the terms based on the Greek word “*trophe*” (food, nourishment) are used to describe the act of feeding on live or dead biomass.

We also note that the term “**environmental opportunist**,” which has been recently attributed to some *Trichoderma* species [9], does not specifically mean nutritional versatility. It also includes the ability to rapidly grow and resist environmental stresses. Consequently, the term “**generalist**” is used for nutritional versatility on dead or live biomass, while “parasite” and “polyphags” describe each of the latter two types of biomass, respectively.

Table A. Terms describing feeding types of filamentous Ascomycota fungi

State	Resource*	Term indicating nutrition type	Comments	References for <i>Trichoderma</i>
Live	Parasite			
Live	Insects sensu lato	Entomoparasite	Here a colloquial meaning of insects is used: insect may apply to any small arthropod similar to an insect including spiders, centipedes, millipedes, etc	Moths [10], aphids [11], bed bugs [12], corn borer [13]
Live	Fungi	Mycoparasite	May also include necrotrophic parasites of fungi	Broad spectrum [9, 14-19]
Live	Plants	Phytoparasite	The term may also include plant pathogenic organisms, croppers and also endophytes as symptomless parasites of plants. Note: In this article, we do not use the meaning of this term sensu Merriam Webster Medical Dictionary https://www.merriam-webster.com/medical/phytoparasite [Oct. 2017]: "a parasitic plant".	Mainly endophyte [20-25], rarely plant pathogen [26]
Live	Plants and/or fungi and/or animals	Parasite	Feeding on live biomass of any type, biotrophy	Immunocompromised and immunocompetent humans [27, 28], nematodes [29-31]
Dead	Greek: <i>phagos</i> = eat			
Dead	Insects sensu lato	Sarcophage, necrophage	May include necrotrophic parasitism	Moths [32], aphids [33], bed bugs [34], corn borer [35]
Dead	Fungi	Mycophage	Also includes necrotrophic mycoparasites	[9]
Dead	Plants	Phytophage, Saprophytophage	In this article mainly organisms feeding on non-wooden biomass were studied; xylophagous fungi capable to degrade lignin were not considered.	Dead wood and herbaceous biomass [9, 36-38]
Dead	Plants and/or fungi and/or animals	Polyphage	Saprotrophic nutrition	[9]
Live/Dead	Fungi	Mycotrophy	All kinds of feeding on fungi and fungal biomass	
Live/Dead	Animal, fungi and plants	Nutritional versatility, Generalism	If at least two types of resources may be equally well consumed	

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