

8.1 The Roles of Fungi in Ecosystems



Figure 1: *Aspergillus Flavus*, a species of fungus.

Fungi are saprophytic organisms that decompose organics for a living. Moldy food, moldy clothes, poisonous mushrooms... Although fungi bring a lot of troubles to people's daily life, they are actually making very important contributions to the world we live in. Recent scientific research has revealed the significant roles that fungi play in ecosystems, which we are going to learn in this chapter.

8.1.1 Carbon Cycle and Wood Decomposition Process

Fungi are one of the primary decomposers of ground litters and woody fibers. Without the decomposers, the *organic carbon* in dead plants can not be turned into *inorganic carbon* and get recycled in the carbon cycle of ecosystems. Therefore, the existence of fungi influences the stability of ecosystems directly.

A recent study by scientist shows that, different species of fungi have great diversity in their traits, such as *hyphal extension rate* and moisture tolerance. Generally, the fungi with high extension rate and competitiveness tend to be less adaptable to different environmental conditions, and the those with wider *moisture/ temperature niche widths* usually grow slower. In the wild, there are usually multiple fungi species taking part in a wood decomposition process. Fig. 2 is the simulation of the decomposition process of a wood plate. Each circular dot on the pictures refers to a point of wood being decomposed. From the simulation, we can clearly see that different species of fungus extend and decompose the wood at different speeds. What's more, the boundaries of two adjacent dots are not as smooth as an arc, which indicates that there are some interactions between different types of fungi as they meet each other.

8.1.2 Interactions between Fungal Species and Adaptation to Different Environmental Conditions

The interaction patterns of fungi are related to many aspects, including hyphal extension rates, competitiveness, tolerance to environmental factors (humidity, temperature...), as well as the changes of environmental conditions. According to the results of computer simulations, there are four main types of interactions among fungi. Below are the types of interactions and corresponding features:

- *Overwhelming winning-losing*: One type of fungi grows overwhelmingly better than the other one. The weaker type of fungi will be driven out nearly at once. Usually only happens in experimental conditions with constant temperature and humidity.
- *Quickly determined winning-losing*: Similar to the overwhelming winning-losing type. The difference is, the weaker fungus can stay existing for a short time and occupy a small area of wood.
- *Deuce at first*: There is no obvious trend of winning-losing at first. However, one species will be gradually driven out after some time.
- *Long-run competition*: There is obvious deadlock (even seesaw

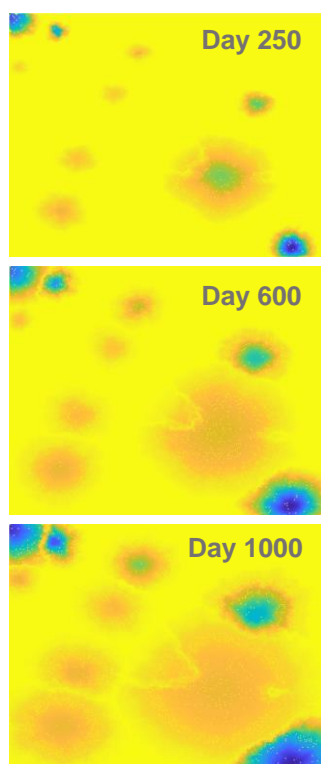


Figure 2: Simulation of the decomposition process of a woody plate by fungi (chromatic diagram). Deeper color means deeper degree of decomposition.