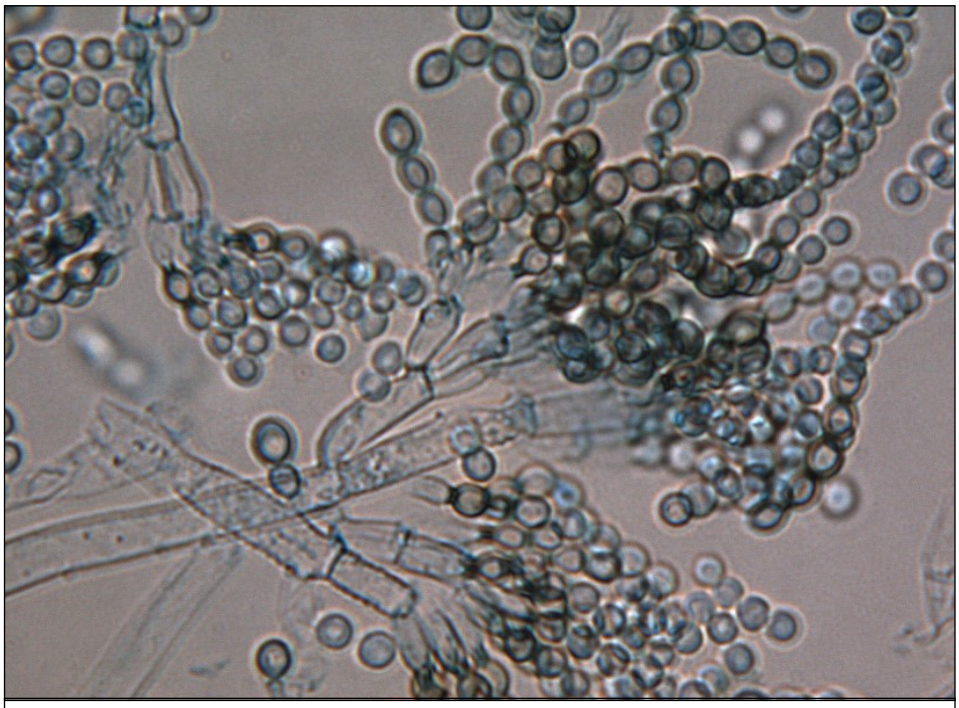
Fungi Can Be Good Guys

Gardeners have come to think of fungi as one of the predominant impediments to successful gardening. From rusts to anthracnose to fruit rot and root rot, it seems like members of the Fungi Kingdom are determined to destroy our plants and bring us constant disappointment. But before we put a black hat on all fungi, consider all the benefits that fungi provide. The age of antibiotics began when Alexander Fleming discovered that *Penicillium notatum* produced an antibacterial substance that could be isolated and purified – penicillin. *Penicillium* also gives us Bleu cheese and its many variants. Not to mention all of the fungi breaking down the dead organic matter that accumulates constantly. There are even fungi that we can use to help control the insects that like our garden plants as much as we do.



Microscopic view of *Penicillium notatum* fungus.

Entomopathogenic fungi (EPF) are fungi that feed on insects. These fungi can act as a parasite of insects and kills or seriously disables them; however, they are generally facultative parasites. The fungal spores attach to the insect cuticle and when conditions are favorable, they germinate. They produce hydrolytic enzymes that allow them to bore through the insect cuticle and enter the hemocoel (insect body cavity). The fungus proliferates inside the insect body eventually killing the insect either by toxins or by destroying the internal organs. The fungus also produces thousands of spores so will continue to invade and kill susceptible insects.

A Colorado potato beetle infected with EPF.

Entomopathogenic fungi is not a new discovery but one that has received much more interest and research in recent years. This is due in large part to the emphasis on reducing the use of chemical pesticides and implementing IPM (Integrated Pest Management) procedures. Many of the chemical insecticides once easily accessible are being restricted or eliminated completely. This has happened to a greater degree in European countries and much of the current research is coming from scientists in these countries.

There are several fungal genera that are being studied for use as biological insect control agents. These

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include *Beauveria, Metarhizium, Hirsutella, Isaria* and *Cordyceps*. These are all naturally occurring organisms that have been observed to be EPFs. The common approach to developing fungi as bioinsecticides is to collect multiple isolates and screen them for hypervirulence and host range. The best isolates are grown in large quantities and tested in the lab and in the field. If results are good, they are EPA registered and produced commercially.

There are several products available in the U.S. that use various strains of *Beauveria bassiana* as the active ingredient. Different strains show different host ranges. Some brand names are: balEnce, Mycotrol, BioCeres and BotaniGard. It is very important to read and follow the label directions exactly when using these biopesticides. Remember, you are working with living organisms so proper storage, mixing, conditions and application procedure are extremely important for effectiveness. These can sometimes be mixed with other insecticides but never with fungicides – fungicides will kill your insecticide.

Photo from USDA.gov

A high-magnification image of the spores and spore-bearing cells of the same fungus, Beauveria bassiana, taken from a Diabrotica beetle in Oregon.

Entomopathogenic fungi being used to control whiteflies.

These are all contact insecticides and generally considered safe for mammals and beneficial insects but follow all label precautions. These are fungal spores and may elicit an allergic response in some individuals.

Though we often battle with disease-causing fungi in the garden, we should stop and remember all the good things that fungi do for us and begin to think of some of them as allies. The use of fungi as biocontrol agents is still in the nascent stage (first U.S. product was 1995) but there is great potential.

~Dr. Joe Willis