**Biological control**

Microorganisms like fungi naturally present in natural habitats, have been parasitizing plants over millions of years to non-cultivated and cultivated plants. Also they have been interacting with their pathogenic counterparts and have been governing the infection in plants to a minimum level. But this behaviour of controlling one organism by other called biological control.

According to Baker and Cook (1974) biological control is the reduction of inoculums density or disease producing activities of a pathogen or parasite in its active or dormant state, by one or more organisms, accomplished naturally or through manipulation of the environment, host or by mass introduction of one or more anatagonists.

**Natural biological control**

Soils may be classified as conducive and suppressive in respect to development of soil-borne diseases. There are many soil-borne diseases, e.g., root rot disease of many fruit and forest trees vascular wilts, damping off, and take-all of wheat that appear in severe form in certain soils, such soils are called conducive soils. But the same diseases develop much less and cause much milder effect on their host in other soils, such soils are referred to as suppressive soils. The inhospitability of suppressive soils to certain pathogens is such that either the pathogen can not established themselves, or they become established but fail to cause disease, or they become established and initiate disease but diminish in severity with monoculturing of the crop.

Various kinds of antagonistic microorganisms do occur in suppressive solis, the most common pathogen and disease suppression appears caused by fungi (e.g. *Trichoderma*, *Sporidesmium*, *Penicillium*) or by bacteria belonging to genera *Pseudomonous*, *Bacillus* and *Streptomyces*. Such antagonists, through direct parasitizing of the pathogen, through competition for nutrients, or through the toxic/inhibitory chemicals they produce, do not allow the pathogen to reach high enough population to cause severe disease. Thus suppressive soil is an umbrella wherein fungistasis, competitiveness for survival, and variety of interactions between pathogen and host exist.

**Mycoherbicides**

Though viruses, bacteria as well as fungi has been used as herbicides, fungi could be found more suitable for the purpose. Fungal pathogen are attractive biocontrol for weed control in view of their host specificity and ease in production and inoculation in the field where, once established, they will spread on their own. In classical strategy fungi parasitic on a particular weed plant is introduced into a new area in which the pathogen is not known to attack the weed. Mostly rust fungi have been used. These include *puccinia chondrillina* to control rush skeletonweed in Australia, and west U.S., and Phragmidium violaceum to control Eurepaen blackberry in Chile. Recently, however, a new strategy mycoherbicide or inundative strategy, has been developed. In this method the weed plant is repeatedly inoculated with inoculums doses of the pathogenic fungus. Several products of different fungi have been developed and are in use on commercial scale in different parts of world.

Table Biological control agents being developed for commercial use

|  |  |  |
| --- | --- | --- |
| Microorganisms | Target organisms | Crops |
| *Bacillus thuringiensis* | Heliothis and other Lepidopteran and Coleopteran paest | Cotton, chickpea, maize, tomato, groundnut etc. |
| *Trichograma parasitoid* | Sugarcane internode borer, bollworms of cotton, stem borer (sorghum) | Sugarcane, cotton, sorghum |
| *Trichoderma* | Macrophomina phaseolina; seed treatment | Groundnut, chickpea, sunflower etc. |
| *Colletotrichum gloeosporioides* | Northern jointvetch |  |
| *Phytophthora palmivora* | Milkweed vine |  |
| *Colletotrichum gloeosporioides* | dodders |  |
| *Colletotrichum coccodes* | Velvet leaf |  |
| *Colletotrichum gloeosporioides* | Round leaved mallow |  |
| *Alternaria cassiae* | Sicklepod |  |

**Myconematicides**

Various studies have been made with fungal nematicides. Classcal nematode-trapping fungi belonging to the genera, *Arthrobotrys, Dactylaria, Dactylella and Monacrosporium* have been studied in trials to control nematode genera Meloidogyne, Heterodera and Rotylenchulus, attacking mostly vegetable crops. These nematodes cause cyst and root knot diseases in these plants. There have been some limitations in the use of classical nematophagous (trap-forming) fungi for the control of these nematodes. It is difficult to manage fungi so that periods of nematode migration and trap formation coincide. Another group of fungi, the soil fungi have been found more ideal nematicides. These are **opportunistic fungi** such as *Vertivillium chlamydosporium, Dactylella oviparasitica* and *Paecilomyces lilacinus* that also attack eggs and young females of cyst and root-knot nematodes. Of these *P. lilacinus* has attracted much attention as it is almost ubiquitous in tropical and subtropical soils.