

## Plant disease management

### Role of biotic agents

#### *Instead of physical and chemical means biotic control offers effective strategy against plant diseases.*

India loses approximately Rs. 500 crores worth of agricultural produce every year, 26% of which is due to plant diseases only. Hence it is important that plant diseases are controlled. A number of methods are used singly or in combination, for control of plant diseases. Use of chemicals, is presently, the main approach. Apart from high costs, the continuous use of some chemicals make the pathogens resistant to these chemicals. Moreover the residues may get accumulated in toxic amounts and there may also be annihilation of nontarget and useful organisms.

Physical means including sterilisation of soil/plant parts by hot air or water are being used in some cases. Such methods aim at manipulating the environment so as to reduce the damage. High costs and impracticality in adoption are among the handicaps for the success of these methods.

The use of biotic agents for the suppression or destruction of disease incitants or in protecting the plants against such attacks is a recent approach. Many of the problems encountered during the use of chemicals are overcome with this strategy. Biological control of plant pathogens is multifaceted and its full potential is yet to be realised.

It can provide ways to increase crop production with only marginal increase in inputs and at the same time, ensuring environmental safety. Among several such agents, one is the vesicular arbuscular (VA) mycorrhiza or VAM.

The word mycorrhiza is a combination of 2 Latin words, myco and rhiza meaning fungus and root, respectively. In VA-mycorrhizae, fungi live in plant roots in a symbiotic association. They are called vesicular-arbuscular since they form vesicles (terminal hyphal swellings, considered to be storage organs) and arbuscules (intra-cellular

structures, considered to be involved in exchange of nutrients) in the plant roots.

Better growth of mycorrhizal plants compared to that of nonmycorrhizal ones, has led to considerable research and use of these fungi as yet another tool for possible suppression of plant diseases. Inoculation of plants with VA-mycorrhizal fungi is now considered as a new method which can reduce the intensity of disease to a considerable extent or to enhance the general resistance of plants to pathogens.

The beneficial VA mycorrhizal fungi are allowed to come in contact with the plants at nursery stage or at the time of transplantation. Like *Rhizobium* and *Azotobacter* inoculants, seed dressing with spores of VA-mycorrhizal fungi is already being done in USA where notable achievements have been obtained with *Glomus deserticola* on directly sown crops like soyabean.

The mechanism of providing the plants with protection from diseases by VA-mycorrhizal fungi is not yet exactly known. Interactions between VAM-plant pathogens — host are complex and may involve: 1. Competition of actual sites of infection in root. 2. Changes in nutrition of the host plant. 3. Increase of tolerance of the host plant to infection when mycorrhizal fungi compensate for the damage to its roots caused by the disease. Many reports are available on their use. In tobacco and tomato, inoculation of VA mycorrhizal fungus, *Glomus* sp. has been found to reduce the number of larvae of root knot nematodes. In cotton, the intensity of attack of *Thielaviopsis basicola*, a root rot-fungus was found to be less in VA mycorrhizal plants.

However, one has to exercise certain amount of caution. Selection of wrong fungal-plant association and soils with high phosphorus content can also result in increased severity of disease as found in *Phytophthora* rot of soyabean.

The present day approach is to look for suitable host — VA mycorrhizal fungus combinations. Then, the attempt is to create encouraging conditions for VA-mycorrhizal fungi to establish on plant roots. VA mycorrhizal fungi cannot be grown in artificial medium and hence these must be grown on roots of suitable nurse plants like sorghum, maize, guinea grass etc. Once the fungus is established, the roots are minced and the minced bits along with soil are mixed in soil where the main crop is to be grown.

In perennial crops, the effectiveness of VA-mycorrhizal fungi will be much more. There is evidence that inoculation is needed only once in life-time of a perennial crop. Thus the beneficial fungus once added and allowed to establish, gives the plant enough ability to withstand the root pathogens which are serious in plantation crops.

Thus we see that the soil-mycorrhizae — plant complex, when managed properly could offer opportunity to transform nutritionally poor soils to be productive and relatively safe for plants from disease point of view.

Though many root diseases are being controlled by physical and chemical means, VA-mycorrhizal could offer an alternative, cheap, effective and safe mode of biotic control.

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