**PLANT HEALTH MANAGEMENT**

**Plant health management is the science and practice of understanding and overcoming the succession of biotic and abiotic factors that limit plants from achieving their full genetic potential as crops, ornamentals, timber trees, or other uses. Management of a plant disease means reduction in the amount of damage caused.**

General Principles of Managing a Disease

General management considerations: the practical reason for studying crop diseases is to develop economical measures for control. Controls must be based on knowledge of the specific disease, pathogen life cycles, the time and the method of infection, the plant parts affected, the method of causal agent dissemination, and certain other agronomic and economic considerations.

Certain guiding principles must be kept in mind; these include:

1. The cost of the measure must be less than the expected return.
2. The measure must not be too complicated and dangerous to use.
3. The measure must not aggravate other pest problems in the operation, and when possible, should complement other production practices.
4. If the control measure opposes other good farming practices, a compromise may be necessary.

In managing plant diseases, total plant populations are more important than individual plants; since damage or loss of a few scattered plants is insignificant, controls are directed at saving most of the population. The success of a management tactic may be judged in several ways, including extent of reduction in number of diseased plants and by an increase in size and vigor of a crop; ultimately, control must be reflected in an increase in yield, quality, and income.

Traditional Principles of Plant Disease Control

1. ***Avoidance****—prevent disease by selecting a time of the year or a site where there is no inoculum or where the environment is not favorable for infection.*
2. ***Exclusion****—prevent the introduction of inoculum.*
3. ***Eradication****—eliminate, destroy, or inactivate the inoculum.*
4. ***Protection****—prevent infection by means of a toxicant or some other barrier to infection.*
5. ***Resistance****—utilize cultivars that are resistant to or tolerant of infection.*
6. ***Therapy****—cure plants that are already infected.*

The six fundamental principles of disease management are exclusion, eradication, protection, resistance, therapy, and avoidance of insect vectors and weed hosts.

**1. Exclusion means preventing the entrance and establishment of pathogens in uninfested crops in a particular area.**

It means using certified seed or plants, sorting bulbs before planting, discarding any that are doubtful, possibly treating seeds, tubers or corms before they are planted, and most especially, refusing obviously diseased specimens from dealers. For example, tare soil returned to trucks at sugarbeet dump stations should never be returned to production fields because of contamination by nematode and rhizomania diseases from other infested fields.

In order to prevent the import and spread of plant pathogens into the country or individual states, certain federal and state laws regulate the conditions under which certain crops may be grown and distributed between states and countries. Such regulatory control is applied by means of quarantines, inspections of plants in the field or warehouse, and occasionally by voluntary or compulsory eradication of certain host plants. Plant quarantines are carried out by experienced inspectors, stationed in all points of entry into the country, to stop persons or produce likely to introduce new pathogens. Similar quarantine regulations govern the interstate, and even the intrastate, sale of nursery stock, tubers, bulbs, seeds, and other propagative organs, especially of certain crops, such as potatoes and fruit trees.

**2. Eradication involves the elimination of a pathogen once it has become established on a plant or in a field.**

  It can be accomplished by removal of diseased plants, or parts, as in roguing to control virus diseases or cutting off a cankered tree limb; by cultivating to keep down weed hosts and deep ploughing or spading to bury diseased plant debris; by rotation of susceptible with nonsusceptible crops to starve out the pathogen; and by disinfection, usually by chemicals, sometimes by heat treatment. Spraying or dusting foliage with sulfur after mildew mycelium is present is eradication, and so is treating the soil with chloropicrin to kill nematodes and fungi. Soil treatment with various nematicides (Telone II, Temik 15G, Counter 15 and 20G) is useful to control sugar beet nematodes.

Many disease can be managed by applying a three-year conservation tillage rotation system called ecofallow. Ecofallow is defined as crop rotation system of controlling weeds and conserving soil moisture with minimum disturbance of crop residue. In this system, corn or sorghum is seeded directly into winter wheat stubble in a winter wheat-grain sorghum/corn-fallow rotation. The uniqueness of this system is that one crop is planted directly into the residue of a different crop rather than into the residue of the same crop. This crop rotation-fallow system effectively breaks disease cycles, such as tan spot, which involve pathogens that survive in crop residue.

**3. Protection is the use of some protective barrier between the susceptible part of the suspect or host and the pathogen.**

In most cases this is a protective spray or dust applied to the plant in advance of the arrival of the fungus spores; sometimes it means killing insects or other inoculating agents; sometimes it means the erection of a windbreak or other mechanical barrier.

Fungicidal sprays that act as protectants .The principle of protective fungicides is to disrupt the natural sequence of infection. These fungicides act on the leaf surface to kill the newly germinated spores. Flowable sulfur is used as a protectant fungicide to control powdery mildew of sugar beet.

**4. Disease-resistant and tolerant varieties are the cheapest, easiest, and most efficient way to reduce disease losses.**

 Varieties should be selected that possess resistance or tolerance to one or more disease organisms. For some diseases, such as the soil borne vascular wilts and the viruses, the use of resistant varieties is the only means of ensuring control. The use of varieties of plants resistant to particular diseases has proved to be very effective, i.e., stem rust of wheat, rust of dry bean, and Rhizoctonia root rot of sugar beet.

**5. Therapy is used on individual plants and can't be used on a large scale.**

 It is achieved by inoculating or treating the plant with something that will inactivate the pathogen. Chemotherapy is the use of chemicals to inactivate the pathogen, whereas heat is sometimes used to inactivate or inhibit virus development in infected plant tissues so that newly developing tissue may be obtained which is free of pathogen. Thermotherapy involves the exposure of diseased plants or parts of them to hot water or high air temperatures for different periods of time. Loose smut of wheat is controlled by treating the seeds with hot water, but modern resistant varieties are a simpler method of control. Hot water treatment has been used to kill nematodes in bulbs, corms, tubers, and fleshy roots while they are in a dormant condition. Dormant chrysanthemum stools can be rid of foliar nematodes by submerging in water at 112°F (44°C) for 30 minutes.

**6. Control of insect vectors and weed hosts: certain insects, especially aphids, beetles and leafhoppers, are known to transmit viruses and mycoplasmas from infected plants to healthy plants.**

  Many insects, weeds, aphids, beetles and leafhoppers acts as a carrier of viruses and mycoplasm from a infected plants to a healthy plants. They acts as a vector. Elimination of these vectors can act as a barrier and check the transmission of many viral and mycoplasm disease from infected plant to a healthy plants.

Perennial weeds, including pokeweed, milkweed, Johnson grass, and horse nettle, serve as overwintering reservoirs of some viruses. Curly top in sugarbeet is a leafhopper-transmissible viral disease, and weeds play a significant role in its spread. Some of the important weeds involved in the spread of curly top disease are certain species of Chenopodium, Russian thistle, Amaranthus, deadly nightshade, shepherd's pursed, and knotweed.