

A TOTAL HEALTH CARE PROGRAM FOR TREES AND SHRUBS

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The maintenance of health and the resistance to infections or infestations is a basic life process. It is a top priority of any living thing, be it a human being, an earthworm or a plant. The things we do as growers or caretakers of plants will be successful if they result in the plant being better able to function and, basically, take care of itself. Provide good growing conditions and then stand back and let the plant do its thing! This is what a total health care program for trees and shrubs is all about.

The importance of maintaining plant health by controlling or manipulating (balancing) environments is basic to achieving sustained health of plants. We can balance and control the environment with routine plant maintenance practices. We do not need to use pesticides at every turn of events! The result of all this balancing is healthy trees and shrubs and healthy environments!

THE PLANT HEALTH BALANCE

What is a healthy plant? Good health involves the balance we spoke of above. All of the environmental elements that are influencing the plant must be within reasonable ranges - both by themselves and in relation to each other. The result is a plant that can balance its internal processes to satisfy its needs. It then becomes a plant in continuing good health.

Processes such as flowering, growth, leaf expansion, leaf retention, etc., will cease or adjust themselves radically if need be to maintain the health of the entire plant. Trees and shrubs may stop growing but will continue to be perfectly healthy, if conditions demand this sort of internal adjustment. Good plant health managers realize that their healthy plants may not always grow.

The basic environmental elements that promote plant health are simple: a crumbly soil, a proper balance of nutrients, sufficient balance of the soil acidity, enough root and crown space, ample water, moderate temperatures, good light, pure air, and freedom from pests and diseases. When one or more of these elements is out of range the health balance of the plant is at risk.

Most trees and shrubs have remarkable abilities to balance their internal processes and maintain their health in environments that commonly exist in landscapes or nurseries. They must, for they cannot move to escape an inhospitable environment that causes stress, like humans and most other animals can.

PLANT IMBALANCE AND ENVIRONMENTAL AWARENESS

Stresses cause the most serious health imbalance problems. In many cases, stress is not defined precisely when dealing with health. But this does not make it less important as a concept. Remember that the environment contains elements that occur in ranges or degrees. Either too much or too little of things such as light, temperature, water, etc., can cause stress. Such imbalanced environments cause imbalanced plant processes. Imbalanced plant processes cause poor plant health.

Good environmental awareness can help you recognize stress causing situations more easily. When confronted with an unhealthy plant, your first job should be to identify chronic environmental imbalances, even though you already might have noted the presence of a particular acute environmental problem, such as an infectious disease or insect pest.

Put yourself in the place of the plant. You might want to investigate the soil or water situation, light or temperature extremes, or the soil aeration and compaction conditions. Remember that environmental imbalances are apt to occur in combinations. They may be additive in their effect. For instance, soil dryness may not become stressful until temperatures climb. If dryness and high temperatures persist, spider mites may begin to develop. The result of such situations often have been called plant disease complexes or stress complexes within plants.

ACUTE vs. CHRONIC STRESS

Environmental elements that cause stresses can be of different types. Acute conditions occur suddenly and cause damage soon after they occur. Improper sprays, toxic chemicals poured onto soils, injuries during shipment, transit, installation, or day to day exposure to extremes of cold and heat are examples of acute conditions that cause acute health problems on plants used indoors. Plants become unhealthy very quickly as a result of these problems. Chronic conditions, on the other hand, include nutritional imbalances, soil compaction, soil moisture problems, too low a light intensity for an interiorscape plant, or improper pH of the soil, leading to nutrient unavailability. Chronic conditions take time to work on a plant.

Dealing with chronic conditions sometimes is easier than with acute conditions. There is some time to reverse the imbalance if you have learned to recognize signs of chronic problems soon after the condition has been initiated. An acute problem, on the other hand, gives you little time to correct it. About all you can do is learn from the experience and make sure it is not repeated in the future.

UNDERSTANDING PLANT DECLINE

Chronic conditions that work on a plant over a period of time eventually will cause sick plants. The time it takes for the plant to get sick is called a period of plant decline. There are all degrees of plant health, from magnificently healthy to pathetically diseased. The longer the plant has to endure a stress promoting condition, the more it slips along the continuum from health to diseased. The key to plant health management is to recognize early when decline is beginning and take quick measures to reverse it.

"Disease" is the term used by the general public to refer to plants that are showing obvious symptoms or signs of imbalanced internal processes. Sometimes symptoms can occur from acute conditions such as pesticide burns. Symptoms that are suddenly caused by acute conditions often have been called injuries by many in the past. Now some authors are beginning to use the term disease even for this type of plant problem.

If a chronic condition is allowed to work on a plant for some time, the plant eventually will show symptoms. If a pest or pathogen is not involved, these situations often are called "disorders." We prefer to use the term "noninfectious disease" to describe these sorts of poor plant health situations.

NONINFECTIOUS AND INFECTIOUS PROBLEMS

Pathogenic organisms and pests commonly attack and infect a plant that has been stressed and may already show symptoms of a noninfectious disease condition. When the pathogen or pest is involved, the health imbalance and stress of the presence of the pathogen or pest is added to that resulting from the previously existing environmental conditions. In such cases, remember that at least two types of health imbalances are existing in the plant simultaneously. A fungus may be acutely stressing the roots. A lack of water, high soluble sales, or some other problem may be stressing the root tissue as well. That is why the fungus was able to overcome the resistance mechanisms of the tissue and infect it.

CONDITIONS NECESSARY FOR A PLANT DISEASE TO OCCUR

Infectious diseases vary greatly in prevalence and severity from year to year and from one area to another. At least three conditions are necessary for disease to develop. These are:

1. The air and soil environment (principally the amount and frequency of rains or heavy dews, relative humidity, air and soil temperatures, and plant nutrients) must be favorable;
2. The host plant must be susceptible; and
3. A virulent, disease-producing agent or pathogen must be present.

All three basic ingredients, commonly called the "disease triangle" must be present for an infectious disease to develop.

ENVIRONMENTAL FACTORS AND DISEASE DEVELOPMENT

Some important environmental factors that commonly affect the development, prevalence and severity infections of plant disease include temperature, relative humidity, soil moisture, soil reaction (pH), soil type, and soil fertility.

Management of the chronic environmental conditions can do a lot toward the management of infectious as well as noninfectious problems. Chronic environmental conditions are often the reason the infectious agent has been able to develop in the first place. Many root rots on field, landscape or greenhouse crops serve as examples of this sort of thing.

There are some disease organisms or pests that are so infectious that they will attack even vigorously growing and reasonably healthy plants. Black spot of rose or fire blight on crabapple are good examples of those sorts of problems.

Specific plant health management tactics fit easily into the holistic plant health management concept outlined above. They fall into three integrated areas: selection tactics, cultural or care tactics, and pesticide use tactics.

CONTROL OR PREVENTION OF PLANT DISEASES

Plant Selection

Plant selection has always been the most difficult plant health management tactic to use successfully. New plants or cultivars constantly are becoming available. These commonly are developed because of a unique leaf color or form, not because they are easier to keep healthy! When considering the future healthfulness of a plant, you should consider its known susceptibilities to particular pests and diseases, and its known tolerance or ability to handle environmental imbalances. For instance, a new crabapple cultivar that is susceptible to fire blight would not be a wise choice.

On the other hand, a cultivar with blight resistance but questionable tolerance of dry sites, would be an equally bad choice.

Resistance of trees and shrubs is often reported on a particular cultivar, but may fail when tried out by many landscapers. The reason for this is that there exists two types of genetic resistance to pathogenic infection and development in plant material. The most reliable form of resistance is vertical resistance. Vertical resistance is where the genetic property operates through the action of one or more major, dominant genes that are always active. The other kind of resistance is called horizontal resistance. Horizontal resistance operates via many minor genes that operate in various combinations depending on the weather and cultural conditions. It is this kind of resistance that comes into play when we speak of increasing the vigor of a plant to increase its resistance. This is the most common kind of genetic resistance found in trees and shrubs. It is useful to us, but does not always work!

Cultural Activities

Cultural tactics to modify environments may be the most important way for landscapers to manage plant health. The most common reason for poor tree and shrub health in the urban environment is a bad relationship between root, soil, water, nutrients and aeration. Poor root health and chronic stress on the entire plant is the result.

Roots on plants may decline and die from a variety of causes. Unfavorable environments that result in either waterlogged or droughty conditions are common causes of poor root health on landscape plants. There are also fungi in the soils that have the ability to infect roots of plants. The unhealthy roots may be only the small "feeder" rootlets, rendering the entire plant generally sickly and unproductive. Sick roots may be present only on part of a plant's root system, resulting in a one-sided appearance of symptoms on leaves and stems of the plant. Plants may slowly decline and die or the whole plant may collapse suddenly as a result of root problems.

Good environmental awareness, as discussed earlier, will help you to recognize the need to initiate or alter a cultural practice to keep plants healthy. Environments do not remain static. Things change with the season or as plants age. A recognition of these changes and a realization of your need to change your cultural practices is the key to good plant health management.

The prevention of root disorders is an important example of integrated health management of trees and shrubs. Most root disorders can be prevented by providing for good soil drainage. Most plants are attacked by pathogenic root rotting fungi when water stands around the base of the plants for many hours. This is particularly true during the late spring and summer months, when the organisms are most active and the roots of trees and shrubs may be entering a period of stress from heat.

Surface drainage problems can be easily prevented with planning. Soil surfaces should always slope away from buildings. Low areas sometimes cause problems because they cannot easily be graded to provide for adequate surface drainage. In such cases natural drainage channels or underground drains may need to be constructed.

Good internal drainage, which is the movement of water through the soil, will influence rooting depths and resulting plant vigor. Many landscapes have internally saturated drainage conditions because of clay and rock layers. Sandy soils are generally well drained, but can be subject to dryness. Frequent light waterings may be required because of their low water-holding capacities.

Internal drainage should be good on deep soils with sloping surfaces. Layers that restrict downward water movement, however, may cause poor internal drainage, even on slopes. This generally appears as a down-slope damp or soggy condition showing at the ground surface. Obviously, rooting conditions and plant vigor are adversely affected in such areas. Additionally, a slope may have good surface and internal drainage but often the base of the slope will remain wet for a long time. Placing a drain across the slope near its base or just above a damp spot on a slope will collect water from above and improve the drainage.

Shallow underground water or water tables are sometimes found in urban soil. If this standing water is below rooting depth there is no problem. If it is shallow, underground drains may be installed to remove excess water. Expert advice should be obtained before these drains are installed.

Surface soil underlain by a compacted layer of dense clay subsoil, or solid rock often causes internal drainage problems. A saturated soil area or perched water table will develop above the compacted layer or other barrier to water percolation. This zone is favorable for damaging root rot organisms unless it is deeper than the root system. If the soil below the compacted layer is found to be noncompacted, then the condition might be improved. This is done by removing the compacted layer through shoveling or backhoeing and returning the soil to the hole. Drainage holes can sometimes be drilled through compacted layers to relieve or remove the perched water table.

The planting hole should be at least twice the size of the root ball if potted plants are being used. The hole should be large enough to accommodate the roots without crowding. The sides of the hole should be rough and jagged. Check drainage conditions by filling the hole with water. If water drains in 24 to 28 hours it can be assumed that there is enough drainage. If water stands in the hole, corrective measures should be taken (see above), or only water-tolerant plants should be used.

The other important concept regarding health care via cultural practices is to do all you can to maintain the stability of an environment. Plants will react and adjust to changing environments. However, they react slowly. They do not react well to unstable environments that change back and forth rapidly.

If a tree or shrub is already suffering from poor root health, there are several cultural practices that can be employed. Most of them are designed to stabilize the root environment. Here are some treatments which may help:

1. Stop or decrease summer watering. A number of plants used in landscaping require little or no summer watering. Always allow the soil around plants to dry out a few inches below the surface before watering again.
2. Do not fertilize plants during hot, dry weather periods.
3. Vertically mulch or core aerate to improve and stabilize the drainage and aeration of landscape soils. Vertical mulching will also improve water infiltration during dry periods, and promote the formation of fine feeder roots. Drill one or two inch wide, 18" deep holes in the soil 12-20" centers under affected trees near the drip line of the branches (where fine feeder roots are located). Fill holes with a mixture of equal parts of peat and a coarse aggregate such as pumice or calcined (baked) clay particles.

Cankers on trees and shrubs are best prevented by attention to stress management. A canker is an infection of the bark and outer vascular tissue of a tree. The exact time of infection and the seasonal activity of the pathogens involved is poorly known, thus, environmental stability and stress management takes on importance as primary control tactics.

Control of bacterial diseases such as fireblight on crabapple is usually preventive as well. Keep trees irrigated and uncrowded, if possible. Promptly prune out diseased plant parts. Be sure to sterilize your pruner in alcohol (70%) between cuts. Avoid mechanical damage to plants.

Verticillium is a fungus that causes wilting of a large number of woody ornamentals such as hard maples, redbud and Russian olive. The fungus invades injured roots, grows into the stem and plugs the vascular system of the plant. Plant wilting fungi cannot be controlled effectively with chemicals. Control plant wilting fungi via sanitation, growing resistant plant types and maintenance of vigor.

Using Pesticides

Last in integrated plant health management tactics are those involving pesticides. Remember that pesticides only are effective when pests or infectious diseases are truly part of the cause of the problem. In many cases, pests and diseases follow environmentally induced chronic stress as secondary acute stresses. The pesticide will help but is not the total answer. Also, remember that pesticides are only effective if several rules are followed. First, the correct material must be selected. This depends on correct diagnosis and identification of the pathogen or pest. Second, the chemical must be applied at the right time in the life cycle of the pathogen and frequently enough to protect plant material adequately. Third, pesticides must be applied properly over plant surfaces. The three rules depend on you making correct decisions based on correct knowledge. Too many people simply "spray and pray."

Most of the diseases of trees and shrubs that will be benefitted by fungicide sprays are leafspots, leaf blights, twig blights or tip blights. There are many different pesticides or fungicides used for diseases of leaves, stems and flowers on trees and shrubs.

Powdery mildews can be controlled by a variety of products including Karathene, Cleary's 3336, Domain, Triforine, Sulfur, Rubigan, Banner or Bayleton. For rust diseases, we generally turn to the use of Dithane M-45, Manzate 200, Banner, Daconil 2787 or Bayleton. Other leaf protectant type fungicides such as Dithane M-45, Manzate 200, Cleary's 3336, Domain, Daconil 2787, or Zyban (Duosan).

Many landscapers fail to achieve proper spray control of a disease on leaves, flowers and stems because they do not apply the products properly. "Wet down" or high volume sprays continue to be the most effective method to get good performance from a chemical. It is important to get complete coverage of all plant surfaces that can be infected. Most importantly, this includes the undersurfaces of leaves. A good sweeping motion with hydraulic applicators that produce reasonably fine droplets with good momentum will achieve proper plant coverage.

CONCLUSIONS

Proper diagnosis followed by proper consideration of the many integrated ways in which pathogens attacking trees and shrubs can be managed is important to understanding how to successfully control and prevent such diseases.

Landscapers that will think in terms of the general goal they wish to accomplish and seek out the common denominators of these sorts of diseases will not have trouble implementing good disease control and prevention practices into every day operating procedures. It is important to understand that a programmed approach is necessary. Keep good records and continue to train your employees properly so that they can carry out such programs successfully.