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ENVIRONMENTALLY FRIENDLY METHODS FOR MANAGEMENT OF PLANT DISEASES

Steps for Disease Prevention and Management:

Regardless of the plant host or particular type of disease that you encounter in your landscape or garden, the strategies for prevention and management of these diseases are fundamentally the same. The concept of being "environmentally friendly" is inherent in this integrated, three part approach to managing diseases that includes diagnosis, assessment of disease severity, and management strategies.

A. DIAGNOSIS-

The first step in effective disease management is to determine the *cause* of the problem. Is the plant infected with a fungus? Are the symptoms associated with the site, the weather, or your cultural care? It is very important to accurately identify or diagnose the cause of the problem since this determines whether there is a need to manage the disease and it also helps to determine the most effective management strategy.

B. ASSESSMENT OF DISEASE SEVERITY-

This step follows the first step with more detailed information with regard to the severity of the problem. It provides information on:

1. **Nature of pest problem-** this addresses the type of disease; for example, is a root problem or a foliar problem, is it systemic in the plant or localized;
2. **Level of disease-** this addresses the loss threshold; for example, how many plants are affected, how many different species are involved, and how many years have the plants had symptoms.

C. MANAGEMENT STRATEGIES-

A common misconception to disease management is that chemical sprays, dusts, and soil drenches are the only effective means of reducing the effects of plant disease. However, chemical control is only one component of a multifaceted approach that includes: culture, sanitation, resistance, biological, and chemical components. The goal here is not to completely eliminate diseases but to manage them by keeping the disease at *acceptable levels*. In most cases, **prevention** is the best strategy for disease management.

1. Culture:

This includes cultural methods that modify the plant's growing conditions;

a. Maintain plant vigor- maintain optimum plant vigor by proper site selection, proper watering, and by fertilizing as necessary, based on a soil test; avoid mechanical injuries and soil compaction; prune and transplant at appropriate times; allow for adequate spacing between plants to improve air circulation and drying, improve tilth and pH of the soil;

b. Rotate crops- this involves the practice of NOT planting members of the same plant family in the same location or part of a garden; in many cases, the rotation period is 3-4 years, although 10 years is necessary in some situations; because of these long rotations, this practice isn't usually effective for most home gardens;

c. Interplant (Companion planting)- this involves the practice of placing plants in the garden bed according to the ways in which they interact or affect one another;

d. Mulch- this involves the use of mulches to minimize the spread of disease; mulches also help with soil temperature moderation, soil moisture retention, and weed control;

e. Control weeds- this involves the practice of minimizing problems by eliminating weeds as reservoir hosts of plant pathogens and by eliminating competition for available nutrients and soil moisture.

a. Sanitation:

This includes methods that maintain plant health and minimize spread of disease;

a. **Select and plant healthy plants-** use vigorous, healthy, pathogen-free seeds, bulbs, cuttings or transplants; carefully inspect plants (esp. root system) prior to planting;
b. **Remove or prune infected plants or plant parts-** remove infected plants; prune, rake, and remove affected plant parts such as fallen leaves;
c. **Groom plants-** regularly remove plant debris or senescing or spent flowers during the growing season;
d. **Use clean equipment-** use clean tools and equipment such as pruning shears, flats, pots, and spades; these can be disinfested with compounds such as 10% household bleach (1 part bleach : 9 parts water), 70% alcohol, or one of the commercially available compounds such as Physan 20®;
e. **Scout and keep records-** take scheduled walks through the garden on a regular basis during the growing season; keep records of when and where diseases occur; this can help to identify "hot spots" in order to anticipate disease outbreaks in following years.

3. Resistance:

This involves the use of resistant/tolerant cultivars; plants with genetic resistance to specific diseases; lists of cultivars with specific types of resistance are available.

Examples include cultivars of elm resistant to Dutch Elm Disease (e.g., New Harmony, Valley Forge); cultivars of beebalm resistant to powdery mildew (e.g., Blue Stocking, Marshall's Delight); cultivars of crabapple resistant to scab (e.g., Donald Wyman, Red Baron); and cultivars of tomato resistant to Verticillium and Fusarium wilts (e.g., Better Boy, Celebrity).

4. Biological:

This involves the use of living organisms for control of other living organisms that are plant pathogens (good guys *vs.* bad guys); these products can have different modes of action; biological controls are also called biological pesticides or biopesticides, since they have EPA numbers;

- **Competition-** the organism occupies all or most of sites along the root or leaf and

selectively excludes the pathogen from infecting;

- **Parasitism-** the organism feeds on the pathogen;
- **Antagonism (Antibiosis)-** the organism secrets toxins that inhibit the pathogen;
- **Induced Resistance-** the organism activates defense mechanisms in the plant;
- **Enhanced Growth-** the organism stimulates growth even in the absence of the pathogen.

Examples include *Trichoderma harzianum Rifai* strain *KRL-A62* (RootShield and PlantShield) and *Bacillus subtilis QST 713 strain* (Rhapsody).

5. Chemical:

This involves the use of pesticides for control of specific diseases on specific hosts; proper selection and timing of the pesticide applications are critical for control;

Categories of Pesticides:

- **"Biorational" pesticides:** these pesticides are defined as products that are considered to be environmentally friendly because they have minimal harmful effects on non-target organisms and the environment; they are frequently more "user friendly" than traditional pesticides;
  - Examples include neem oil, insecticidal soap, horticultural oil, and potassium bicarbonate.
- **Biological pesticides:** these pesticides are living agents that are also called biological control agents, as previously described.
- **"Chemical" pesticides:** these are considered "traditional" pesticides with traditional modes of action;
  - Examples include copper and sulfur compounds.