SANITATION: A DELIBERATE, ESSENTIAL EXERCISE IN PLANT DISEASE CONTROL

EUGENE H. MOODY, SR.

Extension Plant Pathologist
University of Georgia
Athens, Georgia 30602

Growth difficulties of ornamental plants produced within a commercial nursery are usually due to poor management practices. Results of such practices are reductions in plant quality and increases in disease losses. Among these less than desirable conditions for plant production is the lack of a well-conceived disease control program that includes sanitation — a deliberate, essential function for disease control. All comments will be directed toward this end.

A sound sanitation program must be an integral part of all production practices. This becomes apparent when requirements for plant disease development are understood, i.e. (1) the presence of a pathogen; (2) the presence of a particular, susceptible host; and (3) a proper environment. A pathogen is either a fungus, bacteria, virus, mycoplasma-like organism, or nematodes. Any one of these particular disease-causing entities causes a particular disease on a particular plant under certain conditions. The host plant, the one you grow to make money is, of course, present within your facility; the pathogen is either present or soon will be if poor sanitary practices exist. Of equal importance in the disease development scheme is a precise environment, which varies with a particular disease. Some disease-inducing factors common to many foliage and flower diseases are, unfortunately, the same as those which are necessary for plant growth. Temperature extremes, high humidity, high moisture, improper nutrient regimes, improper pH, and limiting light levels, either singly or in combinations, are very important environmental conditions necessary for disease development. For instance, some diseases require free moisture on the foliage during dark periods; this is a disease requirement which can be avoided by keeping the foliage dry during dark hours.

If improper management practices such as poor irrigation practices, improper plant locations, planting or sticking too deeply, use of a poorly drained medium, or poor fertilization methods occur within a nursery production system, poor plant vigor and quality are likely. If sanitation practices are limited under such conditions, disease becomes more prevalent and severe due to the poor health of the plant.

The objective of this presentation is to delve into the particulars of a sanitation program designed for propagation. Success of such a program is dependent upon a firm philosophy that prevails perpetually. Economically successful growers are utilizing a "holistic" philosophy towards plant production — plant health from start to finish — whether they are aware of it or not.

Disease Prevention: All disease control approaches are based on one basic criterion — prevention. Plant disease prevention is essentially a quasi-synonym for proper sanitation practices. Simply, the sanitation philosophy is the "clean kitchen", or a "keep 'em out, not get 'em out", approach.

Implementation of a sound sanitation program just does not happen as we have seen that a disease *just* does not happen. Often some disease-causing organisms make their way into a nursery production cycle because certain safeguards are lacking. In order to avoid the introduction of these organisms into the nursery production cycle, potential sources *must* first be defined by the producer. The most common sources are as follows:

(1) contaminated soil or potting mix splashed onto clean areas by drops of water from irrigation or rain;

(2) pathogens deposited on cuttings when placed in contaminated water or hormone solutions;

(3) hoses dropped carelessly to the ground where pathogens get into the nozzle-end and are expelled into pots or on benches at the next watering;

(4) pathogen-infested soil and organic material not removed from used flats, pots, benches, or other containers prior to disinfection;

(5) contaminated soil carried on tools, covers, or worker's hands;

(6) sterile potting mix placed on contaminated greenhouse floors, benches or flats caused by foot traffic;

(7) flats or plants placed on the ground, and

(8) planting infected seed, cuttings or seedlings.

Because there are so many sources of contamination, emphasis must be placed on practices which keep the pathogens out (exclusion) of the production cycle.

The attitude towards disease control in many nurseries is to (1) "dump a chemical on it", or (2) correct only one specific problem at a time. However, these problems *must* be solved by making changes or adjustments in the entire production cycle. The usual piecemeal approach is not applicable if success is to be achieved.

The efforts of sanitation are probably one of the most important functions in propagation, but the process must be viewed together with other different functions. Think of production as consisting of links in a chain; one broken link can result in losses due to plant disease.

A Simple Sanitation Program For Propagation: As previously described, plant disease development in the nursery is seldom an isolated incidence. Below are some simple, but yet important functions, that can be utilized to minimize disease problems.

A. *Establish Pathogen-Free Stock Plants:* Certain safeguards must be implemented to insure the stock plants remain healthy. Consider the following:

1. Stock plants or mother blocks should be isolated from propagation areas. Avoid weedy and known disease areas.
2. Establish regular spray schedules to control foliage, stem or flower diseases on stock plants. Drench with appropriate soil fungicides as added insurance.
3. Isolate newly introduced plants to determine health status prior to introduction into the existing nursery or greenhouse.

B. *Collection of Cuttings:*

1. Collect cuttings from tops of apparently healthy plants. These are usually free of soil-borne organisms. Some nurseries even grow certain plants on trellises.
2. Avoid root divisions unless absolutely necessary.
3. Break shoots rather than cut with knives or pruning shears. If the latter are used, disinfect frequently with alcohol dips using 70% to 95% grain, rubbing, or wood alcohol. There are other disinfectants available from which you may select, including commercial chlorine bleach at a 9:1 ratio, iodine solutions, phenolic sprays.
4. Place cuttings only into containers or on surfaces that were previously disinfected. Again, chlorine bleach can be used as the disinfectant.
5. Avoid dipping cuttings into aqueous solutions if possible. If this must be done, change solutions and disinfect containers frequently.
6. Prior to sticking, some growers dip or soak cuttings in fungicide dusts or aqueous suspensions. One material frequently used is 10% captan dust or a suspension of 1 lb. captan 80% WP/100 gals. water.

C. *Flats and Pots*

1. All new containers in the propagation area should be so stated to avoid contamination. Contamination in foam-type rooting blocks seems to be bacterial.
2. Containers that are reused should be treated thusly:
   (a) Remove old media adhering to surfaces and disinfect with chlorine, iodine, or another disinfectant. For wooden flats brush or spray a 2% copper naphthenate solution. Wait 2 or 3 weeks before using newly-treated wooden flats.
   (b) *DO NOT* nest or stack containers before disinfection. Thorough coverage of container surfaces will not be achieved.

D. *Propagating Media:*

1. *Never* reuse potting or propagating media, period!
2. Sterilize or pasteurize media if new soil is used. Methyl bromide or heat (dry or moist) are excellent preplant treatments. However, a waiting period before use is required. At present we do not have dry materials for incorporating in the medium, but in the future we probably will. So far, slow-release formulations have not been satisfactory.
3. If mixing your own potting medium, use only disinfected surfaces or properly located concrete slabs.
4. Store properly; avoid foot traffic.
5. If automatic pot fillers are used, be sure all surfaces are clean.

E. *Propagation Area:* Raised benches are superior to ground beds in that they are less prone to contamination, easier to clean and easier to keep clean.

1. All plant debris and potting soil should be removed from structures.
2. Benches should be disinfected with sodium hypochlorite, chlorine bleach, iodine, or other solutions. Treat wooden benches between crops with 2% copper naphthenate to preserve and disinfect them. A two-week waiting period is necessary before plants can be introduced into this area. Although fumigation is a possibility, it can easily miss critical spots and pests. In addition, there is a high risk of phytotoxicity.
3. Avoid unnecessary handling of plants and traffic in houses once they are clean.
4. Be sure all hoses are clean.

5. If root diseases had been a problem with a previous crop, consider disinfecting all irrigation water lines. An iodine solution injected into the system at the rate of 3 oz./gal. of water has proven to be successful for several nurseries.

6. *Do Not Use Untreated Pond Water in Propagation!*

Poorly graded areas surrounding ground beds are easily contaminated by normal water runoff. Ground beds are difficult to keep clean. Pathogens in water droplets are splattered about during irrigation or rain and are easily carried into ground beds from contaminated areas. Even raising the bed the height of a brick helps greatly. Follow these procedures if ground beds are used in propagation:

(1) Thoroughly prepare the soil. Improve drainage. Incorporate fertilizer as needed.

(2) Treat with a wide-spectrum fumigant. See your state extension service for specific information. Always fumigate between crops.

(3) Treat walkways as well as the bed area.

(4) Use boards or cinder blocks to build up bed perimeters to avoid flooding.

F. *Sanitation Practices After Sticking:*

1. Space cuttings to allow for good ventilation.

2. Any plant debris should be removed regularly. Carpenter aprons can be used by personnel to collect debris in pockets during their daily activities. *Covered* garbage cans should be placed at each end of the propagation area.

3. Apply fungicides on a regular basis. One successful schedule is as follows. (Always read the label of the pesticide before use):
   (a) *First week*: Spray captan at the rate of 1.5 lbs/100 gals. water.
   (b) *Second week*: Spray mancozeb (80% WP) plus benomyl (50% WP) at the rate of 1 lb. and ½ lb. per 100 gals. water, respectively.
   (c) *Third week*: Spray chlorothalonil flowable at the rate of 1 pint per 100 gals. water.
   (d) Repeat the above sequences.

4. For added insurance some growers drench with soil fungicide at 4-inch intervals. This is a good idea. Note that drenching is done after cuttings are stuck and in place while soaking is done at the time cuttings are

made. The base, or the entire cutting is put in the solution. In both cases proper worker protection should be provided.

5. Do not be plant molesters.
6. When spot treating dry areas in propagation, use low water pressure for irrigating with hoses.
7. Hose nozzles should be kept away from ground contact at all times.
8. Avoid excessive misting. Adjust misting to compensate for rainy, humid days. Misting at night is unnecessary; allow sufficient time in late afternoon for foliage to dry before nightfall.
9. Remove dropped leaves or cuttings that appear to be dead or declining.
10. Get a proper diagnosis of any growth difficulty so that correct remedies can be applied.
11. The number of people entering propagation areas *should be limited.*

Examine all Plants Regularly: A good grower frequently observes moisture, leaves, and root condition. Diseases detected early are more easily controlled. Diseased plants should be removed from the growing area as soon as possible. The disposal area for such debris should be located well away from the growing areas, storage areas, potting area and water source.

Even under the best management conditions, we sometimes still fail to consider plant needs adequately. You should always know how the plant grows and its optimum growth requirements.

In conclusion, there are so many things that predispose plants to diseases that a grower must use sound management practices that include a precise sanitation program. A grower must constantly develop knowledge about the plants grown. There is no substitute for this knowledge.

REFERENCES

Baker, Kenneth F. 1957. The U. C. System for Producing Healthy Container-grown Plants. *California Agricultural Exp. Sta. and Ext. Service Manual 23.* 333p.

Moody, Eugene H. Sr. and Gerald E. Smith. 1983. Sanitation: Plant health from start to finish. p 84-100. *In* R. K. Jones and R. C. Lambe, eds. *Diseases of woody ornamental plants and their control in nurseries.* Agricultural Publications, North Carolina State University, Raleigh, NC 27650. 130p.