Equipment *from page 38*

To adjust for spraying, open the control valve and close the boom valve. Then adjust the relief valve to open at a pressure 10 to 15 psi above spraying pressure. Open the boom control valve and make sure flow is uniform from all nozzles. Then adjust the control valve until the gauge reads desired spraying pressure.

Other less common pumps include the gear, flexible impeller, sliding vane impeller, diaphragm, and internal idle gear. Gear pumps work best at low pressures spraying pesticides that do not contain abrasive materials. The flexible impeller will handle mildly abrasive materials as well as a number of other chemicals which will not scratch the housing or cause the impeller to deteriorate.

Selecting the right pump is very important. "The type, volume, and physical nature of a pump determines whether you can add to a spraying system," says Bob Oberg, engineer at Broyhill. "Municipalities and many private operators at golf courses and lawn care companies will buy a good quality pump to begin with because it gives them a wider range of abilities." Oberg says his company sells a lot of large piston pumps where operators can use them for low pressure boom spraying and high pressure hand gun spraying. "Many turf spray operators will have a pumping system which can adapt to a variety of jobs more than agricultural sprayers, and are easily able to add a boom or handgun if they didn't already have one."

It should be noted that for spraying tall trees, it is more effective to increase the nozzle size than pump pressure. The greater the nozzle capacity and the narrower its spray pattern, the higher it will reach. Spraying Systems' Ed Gray says that at 40 psi, his company's sprayer can shoot 38 feet. You would have to increase the pressure to 800 psi to shoot 65 feet. Unless you treat many tall trees, it would not be economical to buy a high capacity pump. An interchangeable orifice tip is the most practical way to extend your spray reach, according to Gray.

Regulatory devices

A pressure regulator with by-pass line is needed to control the pressure, and thereby the delivery rate, of the liquid in a spray system. Since the actual discharge rate of any system is determined by the pressure at the nozzles, a pressure gauge should be mounted as near to the boom as possible.

A pressure gauge should have a total range twice the maximum expected reading. It is important that the gauge reads accurately and dependably. When calibrating, it is recommended to measure the discharge rate at a specific pressure on the gauge. If corrosive chemicals or a piston pump are used on a sprayer, install a gauge protector to prevent damage.

Screens in the main line, and before each nozzle, are needed to prevent foreign matter from entering the spray system and blocking the flow or changing the spray pattern. Screens should not be finer than 50 mesh if wettable powders are used. Boom controls are also needed to regulate which boom sections are operating at any given time.

Continues on page 42

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A relief valve is designed as a safety device to release liquid from a pressure system or line when the pressure exceeds a set level. By setting it to open at a desired spraying pressure, it is continuously bypassing any excess chemical back to the tank. It must be large enough to handle the entire pump capacity when the boom is shut off.

On spraying systems which operate at pressures over 200 psi, an unloader valve should be used in place of a relief valve. This unloads the pressure from the pump when the boom is shut off.

Boom control valves will direct the flow of chemical to a portion of the boom, the entire boom, or shut off the flow completely. Two types of flow controls are available: a manual control, which is mounted in the spraying hoses so it is accessible by the operator, and an electronic control. Nozzles mounted on sprayers should contain check valves which open at about 5 to 7 psi. These help prevent nozzle drip around edges.

Among other factors to consider for a spray system, along with the basic anatomy and the skill to adapt it to various purposes, are adjusting spraying volume, calculating the amount of pesticide needed, and mixing the chemical in the tank. Meggitt and Dekker offer the following tips:

Adjusting spraying volume

There are three basic methods for adjusting the volume of liquid sprayed:

1. Change the nozzle tips: This is the best method for making major changes (greater than approx. 25 percent) in the delivery rate of the sprayer. A smaller orifice in the nozzle tip means less spray delivered, and a larger orifice increases the delivery rate. Always select the nozzles for the job you want done.

2. Change the pressure: This is the least desirable method because pressure change will alter the nozzle pattern and droplet size. Reducing the pressure too much greatly reduces the spray angle and increases droplet size so plant coverage may be inadequate. Increasing the pressure increases production of small droplets and may contribute to an unacceptable drift problem. Also, a relatively large change in pressure is required for smaller changes in volume.

3. Change the speed of travel: This method is practical for smaller changes (less than about 25 percent) in delivery rate. The rate of delivery is inversely proportional to the speed; i.e., slower speed means more spray delivered, and a faster speed means less spray delivered per unit area. Slower speeds usually do not adversely affect a pesticide's performance, but too much speed increase may cause too wide a droplet distribution for acceptable chemical performance.

In some cases, it may be desirable to change all three variables. For example, you may wish to increase the spraying speed without changing the number of droplets or droplet size. Therefore, you could increase the nozzle size to partially compensate for the required increase in volume, and then increase pressure to reduce the droplet size from the larger nozzle and to increase the volume to the final target rate.

A sprayer cannot safely be calibrated from calculations, because of variations in speedometers, pressure gauges, hose sizes, nozzle wear, etc. The calculations will be near the desired rates, but a final calibration test is essential.

Calculation of the amount of pesticide needed

Many different approaches work to calculate the amount of pesticide needed. Which formula is not important as long the correct rate is obtained. The following are formulas for dry and liquid formulations that suit many problems:

1. Dry formulations: (wettable powders, granules, soluble powders, dusts, baits) Remember that commerical pesticides rarely are 100 percent pure active ingredient. Therefore, more weight of commercial pesticide is needed than active ingredient.

$$\text{pesticide weight/unit area} = \frac{\text{weight active ingredient/unit area desired}}{\text{percent active ingredient in product (expressed as a decimal)}}$$

2. Liquid formulations: (emulsifiable concentrates, flowable solutions) A ratio frequently is used to calculate amount of liquid formulation needed with one side of the ratio being the concentration of active ingredient per unit volume (pint, quart, gallon).

$$\frac{\text{weight of active ingredient}}{\text{volume containing the weight of active ingredient}} = \frac{\text{weight active ingredient/unit area desired}}{\text{volume of product/unit area}}$$

Guidelines for tank mixing

These guidelines are not a substitute for following label directions, but generally are the best procedure when more specific guidelines are not provided.

1. The sprayer tank must be clean. Oil, grease, old chemical residues, and other organic substances can be a primary cause of incompatibility.

2. Fill the tank at least one-half full to two-thirds full with water or the liquid fertilizer. Turn on the agitator immediately.

3. Premixing the pesticide with water or liquid fertilizer can substantially reduce compatibility problems. Premixing can be made in buckets.

4. The compatibility agent sometimes can be added to the premix or last to avoid foaming. Follow instructions provided with it.

5. Add the pesticide slowly to the sprayer tank. A wetting basket of cloth or 20 to 25 mesh screen over the tank filling port will assure slow addition to the tank, along with screening out lumps and foreign material.

6. Add the different pesticide formulations in the following sequence:

A. Soluble powders—must be completely dissolved in the tank before adding other pesticides. Pre-dissolving in water or in liquid fertilizer is desirable.

B. Wettable powders—make a slurry in water or the liquid fertilizer and add slowly to the sprayer tank.

Continues on page 44

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Equipment *from page 42*

This will avoid the possibilities of invert emulsions.

D. Emulsifiable concentrates—generally can be added slowly and directly to the sprayer tank. If compatibility or an invert emulsion occurs, premix in water or liquid fertilizer and add slowly to the sprayer tank.

E. Soluble liquids—usually can be added slowly and directly to the sprayer tank, or premixing in water or liquid fertilizer may be required.

7. Finish adding the remaining water or liquid fertilizer. Maintain good agitation at all times, although too vigorous agitation may cause foaming or incompatibility problems. If agitation should stop for any reason, be sure that the contents are fully agitated again before starting to spray.

8. If an incompatible mixture forms in the sprayer tank, add a compatibility agent to attempt dispersal.

9. Use the spray mixture as quickly as possible. Clean the sprayer thoroughly when finished. Most pesticides are formulated with organic solvents that may damage organic sprayer components such as hoses and gaskets. Some pesticides are corrosive and may damage the pump, tank, or other metal parts if allowed to remain too long in a tank. The label will contain special instructions if a certain sprayer part is especially susceptible to damage from the pesticide formulation.

These guidelines along with a working knowledge of a sprayer's anatomy should help an applicator analyze his own equipment needs and diagnose problems, to a certain extent, when they affect his equipment. Manufacturers are also very willing to help with choosing and adapting the proper spraying equipment for your needs. As Hypro's ad manager, Al Henjum, says, you may very likely change applications and not always know what equipment changes are also necessary. "The key," he says, "is to have the whole system in balance." **WTT**

We'd like to thank manufacturers of spraying equipment for their cooperation in this article. A special thanks goes to William Meggitt and Jack Dekker of Michigan State University whose manual is an excellent and comprehensive text on the subject of spraying equipment. If you'd like a copy of their lab manual for Weed Science contact Michigan State University Press, E. Lansing, MI 48824.

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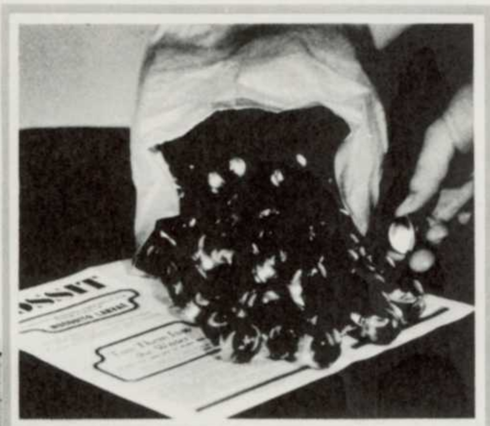

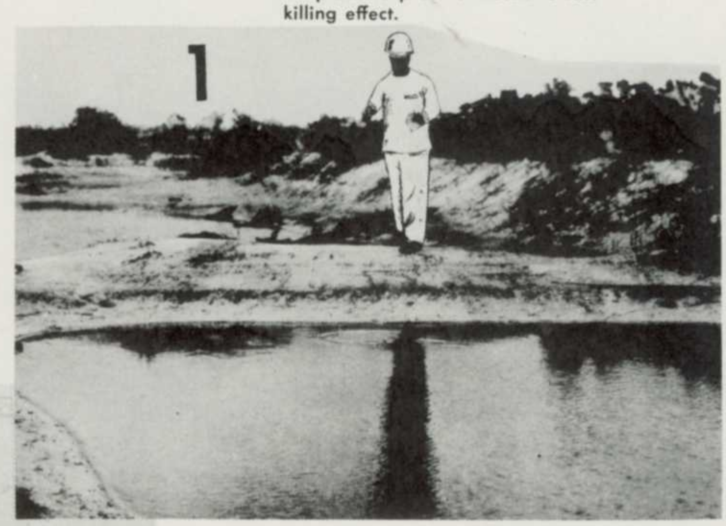

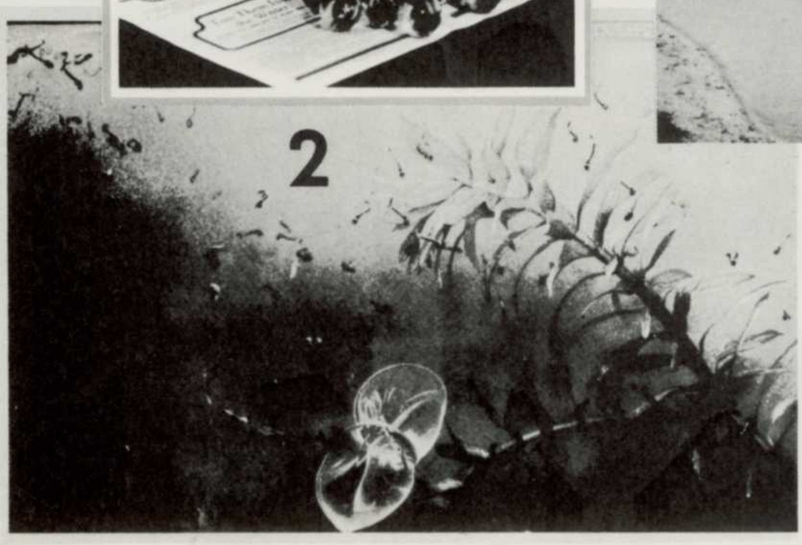

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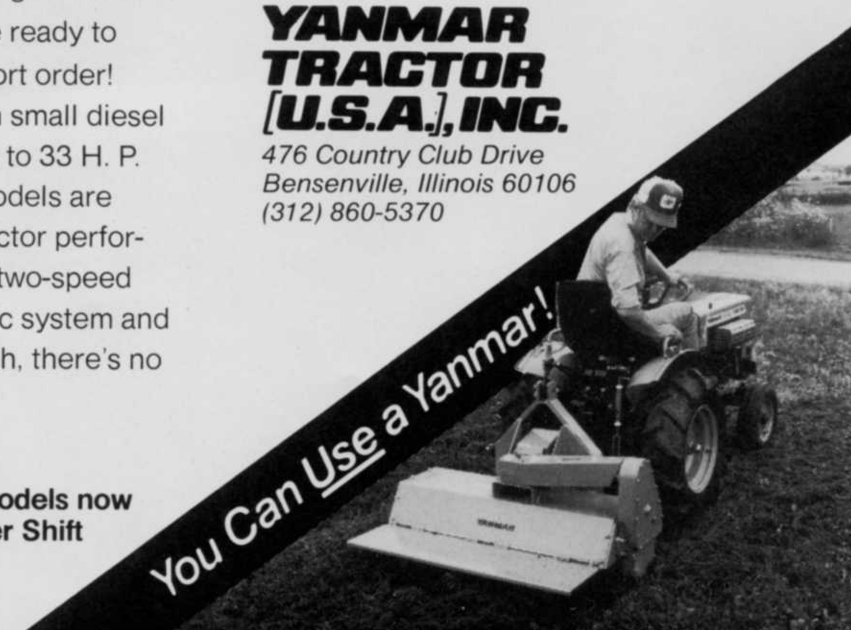

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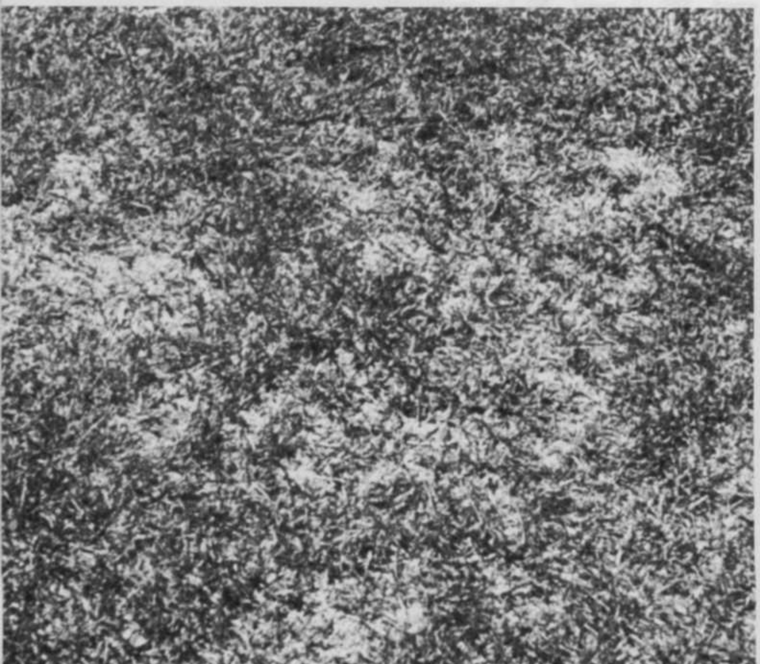
SYMPOSIUM ON LEAF SPOT MANAGEMENT

HELMINTHOSPORIUM DISEASES FEATURED AT CONFERENCE

By R.C. Shearman, Turf Specialist, and **J.E. Watkins,** Extension Plant Pathologist, University of Nebraska, Lincoln

Symptoms are in two phases, leaf spot in cool seasons (above) and melting out in warmer weather (below).



Helminthosporium leaf, crown, and root diseases are among the most common and serious diseases of all cool season turfgrass species. This disease complex is caused by several species of *Helminthosporium* fungi, including *H. vagans, H. sorokinianum, H. giganteum* (zonate eyespot), and *H. dictysides* (*Helminthosporium* blight). Generally, *Helminthosporium vagans* causes the most serious damage to cool season turfs such as Kentucky bluegrass, but *H. sorokinianum* (summer leaf spot) can also cause severe problems.

Leaf spot severity is determined principally by the turfgrass species or cultivar grown, length of favorable conditions for disease infection and development, and cultural practices utilized. Leaf spot symptoms are generally considered to be expressed by one of two phases. During cool, moist periods (i.e. spring and fall) the leaf spot stage is most evident. While, later when warmer weather conditions prevail, symptoms are expressed by general thinning or melting-out of the turf. The melting-out phase can appear as large irregularly-shaped patches that look like turf suffering from heat, drought stress or both. It should be pointed out that correct identification of the disease problem is extremely important. Usually leaf spot symptoms, crown and root discoloration, are associated with the melting-out phase. If these symptoms are not present, then the turf manager should carefully examine the site for other potential pests that may cause similar effects on the turf such as billbug, sod webworm, or white grubs.

In January, 1980, a Symposium on "*Helminthosporium* leaf spot" was held in conjunction with the 18th Nebraska Turfgrass Conference. The following papers give a contemporary view of the leaf spot problem in turf by discussing disease development and symptom expression, disease management, and development of resistant cultivars. These papers offer the reader an insight into aspects that enhance and discourage leaf spot development; factors that influence the typical disease symptom expression; cultural practices that enhance or suppress disease infestation; and the difficulties involved in selecting and breeding leaf spot resistant cultivars. Turf managers should realize that resistant cultivars are not readily accessible, but that their development takes a considerable expenditure of time and money.

The reader should also be aware that many aspects discussed in the following papers, regarding leaf spot, are also relevant to other turfgrass disease problems in terms of their development, management and manipulation through cultivar improvement. **WTT**