

location, or plants like *Ilex cornuta* whose root systems are extremely susceptible to damage from temperatures in the 20's F. It may also be helpful in preventing premature bud swelling on flowering shrubs due to unseasonable warm temperatures. It is important to consider carefully your own geographic location. If you have tried this system and found that plants do not go dormant, try covering later and uncovering earlier.

APPLYING FUNGICIDES TO ORNAMENTALS THROUGH OVERHEAD IRRIGATION

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Fungigation, the injection of fungicides into the irrigation system, has been used to apply soil drench treatments for root-rot diseases for several years. It has recently been effective against foliar diseases as reported by Lambe (1). Several forms of fungicides — emulsifiable concentrates, such as Subdue 2E; flowables, such as Daconil 2787; and wettable powders, such as Benlate and Dithane M-45, have been applied through the irrigation system with little problem.

Our application technique is simple, since we irrigate from ponds. A hole is drilled and threaded into the suction pipe close to the centrifugal pump. A ½-in short pipe nipple and valve are installed, being careful to avoid any air leakage through the valve or pipe fittings, which can cause a loss of pump prime. A pipe may connect the valve permanently to a holding tank, or a hose may be attached and simply submerged into a bucket of fungicide solution, as shown in Figure 1.

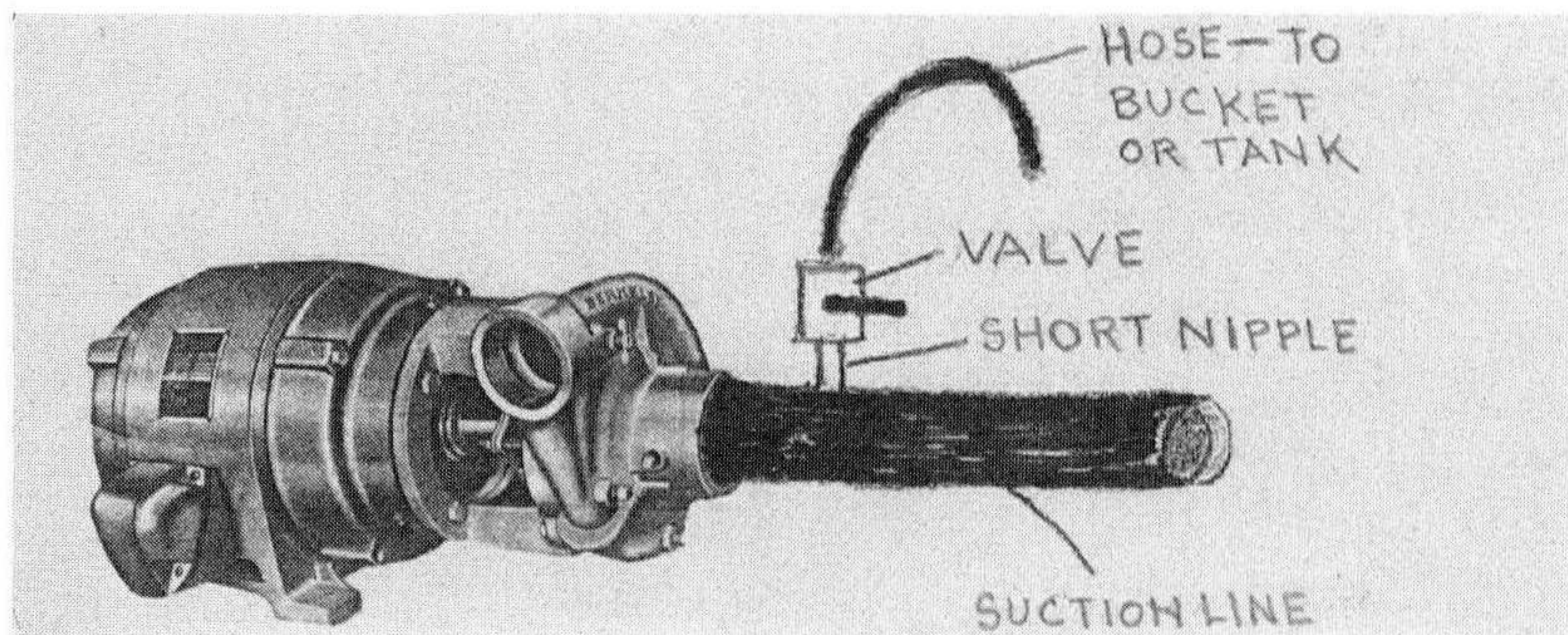


Figure 1. System used for injecting pesticides into overhead irrigation system.

Before injecting the fungicide, the pump is started and sprinkler heads are inspected for proper rotation and any blocked orifices. For smaller areas below pump capacity, the output butterfly or flow restriction valve is adjusted to prevent a back flow of fungicide to the pond. Chlorine and fertilizer injections are suspended during fungigation to prevent chemical interactions.

The measured chemical is stirred into the holding tank previously filled with water and the valve on the suction pipe is partially opened to begin drawing the solution into the pump. The flow rate is controlled over a 5 min interval to allow several rotations of each sprinkler head. The rate of rotation of sprinklers varies from 6 to 12 revolutions during this interval. The fungicide solution is constantly stirred and additional water is added to rinse all material into the pump. Care must be taken not to allow air to be drawn into the pump before closing the valve.

After all the fungicide has entered the system, samples must be taken in the field to determine when the pipes are clear of chemical. A beaker or glass jar is used to collect water samples from a specific sprinkler head. A milky solution, often with foam, indicates the presence of fungicide. With our system 6 to 10 min, depending on distance from the pump, is required to clear the lines. The change from milky to clear samples is surprisingly rapid.

Drench fungigation rates, based on the label rate per 400/ft², are calculated to include roadways and perimeter areas covered by the sprinkler heads. The water samples to determine the completion of fungigation are taken from the sprinkler farthest from the pump. Because watering is recommended to wash off foliage and transport the fungicide into the soil solution, pump shut-down is not critical.

Foliar fungigation rates, based on one to 2 times the label rate per acre, are also calculated to include roadways and perimeter areas. Samples are taken from a sprinkler near the midpoint in the section and the pump is shut down promptly to prevent excessive washoff of fungicide residue.

Fungigation is an important disease control procedure compatible with modern nursery practices. Today's standards of compact quality plants, dense container populations, larger liners, and overwintering practices severely reduce air movement around plant foliage. Container-grown plants receive more frequent overhead irrigation, which increases periods of wet foliage favorable for disease development. Condensation and limited air movement in overwintering houses also produce conditions favorable for fungi and bacteria.

Fungicide sprays applied monthly by a concentrate air-blast sprayer are extended beyond their effective residual period. Biweekly sprays are needed to control *Entomosporium* leaf spot on Fraser photinia (*Photinia* × *fraseri*), and anthracnose scab caused by *Colletotrichum* spp. on *Euonymus japonica* 'Silver King', *E. japonica* 'Gold Spot', and 'Gracilis' [syn. *E. fortunei* var. *radicans* 'Argenteo-variegata']. Other seasonal diseases requiring additional fungicide treatments are *Rhizoctonia solani*, web blight, on *Ilex crenata* 'Helleri' and gumpo azalea (*Rhododendron* 'Gumpo'); and *Botrytis cinerea*, gray mold, on *Gardenia jasminoides* 'Mystery', and various azaleas.

Spray application by hand gun in tightly-packed overwintering houses is time consuming and semi-effective in controlling various foliar diseases. A biweekly fungigation has demonstrated improved disease control.

In summary, fungigation is an excellent labor-saving method to apply soil drenches. We have reduced disease problems in overwintering houses with biweekly applications. Large areas may be covered quickly when weather conditions are unfavorable to spray applications over long intervals. Fungicide residues may be effectively supplemented between scheduled sprays. Phytotoxicity of some fungicides to susceptible plants also appears to have been reduced in fungigation. It is also possible to make foliar applications. However, it is difficult to get even distribution over large areas due to differences in the distance from the source. This method can be used on concentrated small blocks of plants.

LITERATURE CITED

1. Lambe, R.C. 1984. A Comparison of foliar disease prevention on selected woody ornamentals with chlorothalonil applied either fungigation or ground spray. *SNA Research Conference*, Vol. 29.

POSTEMERGENCE HERBICIDES — WHAT WORKS?

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Weed control from preemergence herbicides is often unacceptable for numerous reasons including improper timing and rate of application, weather conditions, or excessive