Treatment of Gladiolus Cormels

hot-water bath treatment of planting stock shows promise as means of controlling serious corm-borne fungus diseases

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Diseases of gladioli—especially those carried on the planting stock—are the limiting factor in commercial production of gladioli in California.

Apart from foliage diseases—now partly under control—crippling losses are caused by soil- and corm-borne diseases. Almost any lot of gladiolus corms—bulbs—carries enough of these diseases to contaminate disease-free soil, which, in turn, infects a proportion of any healthy gladioli planted in it. However, most serious fungus and bacterial diseases of gladiolus attack only gladiolus and perhaps a few closely related plant species. The risk of infection from outside sources is slight.

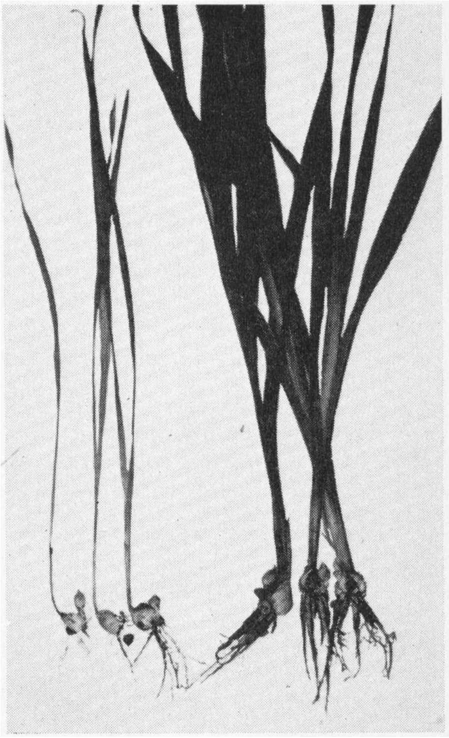
A hot-water treatment of gladiolus cormels—small tubers produced annually by the parent corm—was tested as a method for obtaining fungus-disease-free planting stock. Cormels were used rather than corms because of their heat resistance, small size, and because they are readily available in large numbers.

Planting stock was grown—as parent corms must be—in warm soil and harvested before cold weather. Until treatment, the cormels must be kept at room temperature—never in cold storage—so for these studies the corms were dug with cormels attached, and stored at 95°F and 80%–85% relative humidity. When the old corm and roots could be broken off easily—often after about one week of warm-temperature curing in pretreatment storage—the corms were cleaned, the cormels separated, and both were returned to 95°F storage.

Cormel Treatment

Cormels are at the right stage for treatment about two months after digging and thereafter for a period of at least two months.

In these experiments, treatment was started by soaking the cormels in water at air temperature for two days. Then they were removed and immersed in a 1:200 dilution of commercial 37% formaldehyde. After about four hours in the solution, they were placed in containers—which allowed thorough water penetration and complete immersion—and held for 30 minutes in water heated to 135°F. The hot water in the bath must be well circulated and of a large enough volume to restrict temperature drift to 1°F above or below 135°F. After the hot water bath, the cormels were cooled immediately with clean cold water from a hose and dried quickly.



Two representative groups of gladiolus plants, the larger one grown from hot-water treated cormels, the smaller one from untreated cormels.

Drying the cormels after treatment is essential because they must not be stored until thoroughly dry. In warm dry climates this may be done by spreading the cormels thinly under a draft of warm air indoors or outside in the sun.

When dry and before storage, the cormels should be dusted with a fungicide—such as Spergon—as a precautionary measure.

Treated cormels should be stored in mesh-bottomed trays on racks; or if in sacks, the sacks should be only partly filled, loosely tied, and suspended, or placed on racks with good air circulation below.

Clean benches, floors, and equipment are essential to prevent contamination of treated cormels. One of the standard fungicidal soaks, sprays, or fumigants should be used around the working area and on the storage trays. Formaldehyde, 1:50, commercial sodium hypochlorite solution 1:20; or methyl bromide gas at one pound per 100 cubic feet under a plastic sheet have all been used.

Rapid and even germination may be encouraged by storage at 40°F for a period of six weeks or more before planting time.

Treated cormels should be planted in soil not previously used for gladiolus or related crops. Otherwise, the soil should be treated with an effective fungicide such as methyl bromide, chloropicrin, or steam. Any diseased plants that appear—and also those growing beside them in the row—should be destroyed.

Percentage germination and vigor of most treated lots of cormels have been increased by the hot-water treatment provided they are planted during the spring. In instances where preplanting germination trials have indicated decreased viability after treatment, growers have obtained an even and vigorous stand by increasing the planting rate.

Grower Experience

In 1953, a grower bought two thirds of a bushel of Spotlight gladiolus cormels with a high disease content. Spotlight is very susceptible to Fusarium disease. After the hot-water treatment, the cormels were planted in old citrus land in a climate very favorable for the development of Fusarium wilt. Less than 0.5% diseased plants appeared.

From the two-thirds bushel of treated cormels the grower obtained 19,300 corms in sizes No. 1 to No. 4. Two bushels of No. 5 and No. 6 corms and cormels were kept for further treatment. All corms of sizes No. 1 to No. 4 were large enough for flowering.

A second grower bought the No. 1 to No. 4 size corms from the first grower and some untreated Spotlight corms from another source. The 19,300 corms yielded a 95% cut of 1,528 dozen flowers and 10 bushels of cormels. The untreated bulbs yielded a 25% cut of 402 dozen flowers. The grower reported an 80% recovery of 15,440 corms from the treated stock. The bulk of the 20% loss was caused by damage and nonrecovery of all corms by a mechanical digger. No corms were salvaged from the untreated stock. The re-

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GLADIOLUS

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covered corms were grown again in 1955 and produced an excellent flower crop.

The yield of cormels and small corms—sizes No. 5 and No. 6—from the original two-thirds bushel was two bushels. These were hot-water treated and replanted the following year by the first grower. During the second year, the 10 bushels of cormels obtained by the second grower represented a ratio of 15:1 of the original two-thirds bushel stock. On this basis, multiplication of clean stocks from small lots of treated cormels would appear easy and rapid.

Advantages

There are numerous advantages of the hot-water treatment of gladiolus cormels. Bigger corms and a much higher yield of cormels are produced and most corms produced the first year are of blooming size.

Clean corms yield a higher flower cut and flowers are produced from smaller size corms when they are disease free. Furthermore, the same planting stock may be used for a number of seasons.

The hot-water treatment enables the growing of several varieties which demand a high price, but which have been unprofitable since planting stocks have become infested with disease. Also, treatment preserves rare varieties or new crosses and makes possible a more rapid increase.

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WALNUT KERNELS

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upon the length of time nuts have been so separated. If the moisture content of the kernels is above 25%, they will freeze at 28°F plus or minus 1°F. Mathematical curves showing the freezing point and degree of undercooling of hulled nuts of different moisture contents are shown in the graph in column 1, page 7. The graph in columns 2 and 3 on the same page shows a portion of a recorder chart of laboratory frozen walnuts. As the moisture content is reduced, the freezing point is lowered. Experimentally, no freezing could be produced at 10°F when the moisture content fell below 12%.

The undercooling curve reflects a phenomenon that may or may not occur to the same degree in nature. In this case, conditions favorable to radiation assume a role of consequence. A low dew point and dry ground may retard freezing and cause undercooling. Dew deposit or any other condition that promotes formation of ice crystals on the shell assists freezing without undercooling when the temperature of the kernel falls below its freezing point. The undercooling is of practical importance to the grower, for undercooling without freezing does not damage the kernel.

The degree to which a walnut may undercool is not predictable. As much as 10°F of undercooling was recorded in laboratory experiments. However, the majority of undercooling minima fell in the 0°F–4°F range. All data on walnuts frozen under field conditions fell in the latter range. The duration of undercooling is also unpredictable. Experimental values range from zero to 15 minutes, but conditions in an orchard might be somewhat different. The thermocouple is a foreign body in a kernel and, as such, it acts as a focal point where freezing may be initiated. The duration of undercooling may be greater under field conditions than under experimental conditions if no ice crystals form on the nut surface.

Influence of the Hull

When an early frost occurs, a substantial part of the crop may be on the trees with hulls intact to a varying extent. The moisture content of an intact hull or one just beginning to split is about 86%. This high moisture content favors freezing of the nut. Experimental freezing of intact hulls shows that the freezing point is the same as that for kernels of high moisture content, that is, 28°F plus or minus 1°F. The hull also may or may not pass through the undercooling stage before freezing, but whatever happens to the hull will affect the nut. If the temperature of the hull after undercooling rises above the freezing point, the nut will not freeze. But the kernel will freeze in the same instant if the hull freezes. Attempts to induce independent freezing of the hull and of the nut by creating a moisture-proof barrier between the hull and the shell failed.

The condition of the hull may serve as an indicator as to whether or not frost damage has occurred. A frozen hull breaks down quite rapidly. The hull of experimentally frozen walnuts became dark and mushy in 24 hours, staining the shell.

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ALMONDS

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copper chelate in 100 gallons of water produced an average kernel weight of 1.07 grams and no kernel shrivel. The copper content of the hull was 2.7 ppm—parts per million—and the copper content of the kernel was 7.3 ppm. The average kernel weight from trees not treated was 0.75 gram with 42% shrivel; the copper content of the hull was 1.4 ppm and 6.8 ppm in the kernel.

Experimental Treatments

Copper materials were applied both to the soil and to the leaves. Twenty pounds of copper sulfate applied in a trench around the base of a tree produced a marked response in the amount of new shoot growth and an improvement in leaf color. Applications of one pound of copper sulfate mixed with the soil at planting time, however, did not produce a response during the first year. Three pounds of copper sulfate applied to the soil around an extremely dwarfed older tree also produced a decided improvement in the condition of the tree.

During April 1955, spray applications of one pound of copper chelate per 100 gallons of water were made to a number of trees in the area. These sprays produced a marked response in the amount of shoot growth, an improvement in leaf color, and an increase in the copper content of the leaves. Marked response was also produced in the color and copper content of the leaves of Marianna plum grafts which had been placed on some of the trees.

The treatments were experimental applications designed to show whether or not copper deficiency was present. Experiments are underway to determine dosages which will serve to correct the deficiency and which will not be injurious to the trees in this orchard.

Varying Conditions

Response to any particular treatment does not always occur. Variations in soil type, growing conditions, species of tree, and perhaps rootstock are influential in the amount of response to various treatments.

At the present time it appears that, in California, the distribution of copper-deficient trees—of all species—is restricted to comparatively quite small areas in different districts.

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