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MODERATOR LAGERSTEDT: Thank you, Don. Next, Barrie Coate will discuss some aspects of sanitation in the nursery. Barrie:

THE IMPORTANCE OF CLEANLINESS IN THE PROPAGATION HOUSE

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Many important propagation procedures become so routine that we often relax our attention to them. I'm speaking of the day-to-day details of cleanliness in the propagation program. Disease organisms can and do travel all the way from the cutting bench, through the greenhouse into 1 and 5 gallon stock, as the diseased crop is transferred to larger containers. It is very difficult to convince some nurserymen that meticulous disease control in the propagation department is worth the man-hours it requires. However, consider the value of 25 5-gallon saleable plants lost to disease in a month as compared with one man-hour per day spent on cleaning propagating tables, floors, and equipment per month.

25 5-gallon plants @ $3.00 ea.	— $75.00
25 hrs @ $2.50 per hr.	— $62.50

Even if only 25 5's per month are lost to disease, and this can be prevented, money would be saved. Another point in favor of good sanitation practices is the fact that chemical control over disease, once the disease is present, is poor at best.

Once *Rhizoctonia solani* or *Phytophthora sp.* are established enough for detection of the symptoms, at best we can only hope to prevent its spread to the remainder of the crop or to other crops. It is virtually impossible to eliminate these diseases once they begin to affect a crop.

Many nurserymen are "living with" infected stock maintained under "low stress" conditions. When this diseased stock is shipped to higher stress conditions (retail nurseries, high temperature areas, poor water areas) it often declines or dies, leaving the purchaser with a poor memory of the supplier and no repeat orders.

One question we should ask ourselves periodically is, "when did I last empty and disinfect my greenhouse?" The answer should be — "not more than 6 months ago."

Probably the easiest, least costly, and most rewarding single sanitation effort one can make is as follows: a 2% formaldahyde drench applied through a large sprayer. This will

take only an hour for a 50′ x 100′ house, including preparation and cleanup; if done twice a year this will provide a sanitary environment for cuttings.

The next most basic, and inexpensive step is to paint all interior greenhouse surfaces from table height down with copper naphthenate, including the gravel in the benches. Any disease organisms landing on this green copper surface will be killed. In other words — "green is clean", in a propagating house.

Here is a list of procedures which have produced good results for me.

General

1. Flats dipped in copper naphthenate often enough to keep them green.
2. Greenhouse sprayed twice a year with a 2% formaldehyde solution and allowed to stand, tightly closed, for three days.
3. Cutting flats and seed flats filled with planting medium sterilized with either methyl bromide, or steam, in small enough batches to prevent recontamination before each batch is used up.

Cutting propagation

1. Cutting material taken only from healthy, vigorous plants and only from areas off the ground.
2. Cutting material washed outside propagation house to remove all dust.
3. Headhouse benches as well as the immediate area of the benches, washed every morning with LF-10[1] before cutting material is handled.
4. All workers hands and all tools rinsed in LF-10[1].
5. Cutting material placed in a sink in propagation house, from which rough cuttings are made onto a previously sterilized propagation table.
6. Cuttings dipped in Morsodren or SD-345[2]. Personnel should use rubber gloves or large salad forks for removal.
7. Cuttings stuck in previously fumigated flats.
8. Full flats carried to copper-naphthenate benches and watered-in with a Morsodren mix from watering can.

Seed propagation

1. Seed sown in previously-fumigated moist seed flats.
2. Flats placed in cold frames, previously sprayed with copper naphthenate.
3. Seen watered-in with a Morsodren mix.
4. Fumigated burlap placed over flats and watered with Morsodren mix.

In conclusion, it is far more efficient and less costly to prevent disease than to attempt to cure it.

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[1]LF-10 is a hospital disinfectant manufactured by Lehm & Fink Products, Toledo, Ohio 43612.
[2]SD-345 is a soil fungicide, a product of Shell Development Co. and available from Moyer Chemical Co., 1310 Bayshore, San Jose, California.

MODERATOR LAGERSTEDT: We will now entertain questions for any of the three previous speakers.

DALE KESTER: I would like to ask Don Copes two questions. First, do all Douglas-fir grafts fail?

DON COPES: No, with a group of 947 grafts, 35% of them died from incompatibility. This is fairly normal; we have an average of compatibility with random clones of 60 to 65 percent.

DALE KESTER: You have some that you can select?

DON COPES: Yes, even from our most incompatible combinations, some of those scions put on random stocks will be compatible.

DALE KESTER: The stocks are different, but the clonal tops are the same — is this right?

DON COPES: Yes, we don't have clonal lines for understocks yet but we are working on it. From our testing we determine which stocks are compatible with certain clones; for the severely incompatible clones we root the understocks. This is very easy to do with two, three and four-year-old Douglas fir.

DALE KESTER: Another question. In our almond-plum graft combinations, the most sensitive test we have to indicate incompatibility is early defoliation of the trees in the fall. Do you see anything in Douglas fir grafts comparable to this?

DON COPES: No, this delay in bud-burst is the very first thing we can pick up. The amount of needle drop we have in Douglas fir during the first winter is very small, probably less than 1 or 2%, depending on the year. Oregon has quite a bit of precipitation in the winter and I think that the scions could be totally dead and still not drop their needles until June.

RALPH MOORE: I was interested in the drilling technique described by Dr. Lagerstedt to stop "bleeding" in walnuts. All you need though, is some knife slashes below the graft; on large trees we use an axe and cut several slashes to alleviate this "bleeding" from the graft union and it works fine. It is very simple.

HARRY LAGERSTEDT: Yes, I know this has been done with a knife slash; we feel, though, that it may not go deep enough. Such cuts may only go into the primary phloem whereas the main root pressure is involved with xylem tissue. So going all the way through as by drilling a hole, the trunk bleeds from both sides; this procedure seems to work better for us.

CURTIS ALLEY: On grape vines, we use a pruning saw and make a cut below the graft after they are growing. Also, if the grape vines are in leaf if you leave a nurse branch below the graft then they will not bleed at all.

HARRY LAGERSTEDT: This bleeding is not a problem throughout the season. It will happen for perhaps two or three weeks and can be related to certain temperatures situations. With a lot of ground moisture and cool, muggy, days

and with the plants starting active growth, bleeding can be a problem.

VICE-PRESIDENT BRIGGS: For the second half of this afternoon session, Dr. Dale Kester of the University of California at Davis, will be our moderator. Dale:

MODERATOR KESTER: This afternoon we have some very interesting topics. The first talk will be given by a speaker that you heard this morning — Wes Hackett. His topic now is on bulblet formation under aseptic conditions. Wes:

ASEPTIC MULTIPLICATION OF LILY BULBLETS FROM BULB SCALES

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It has been known for many years that individual lily bulb scales when separated from the mother bulb will form adventitious bulblets at their base when placed in favorable environmental conditions. Three to five bulblets will usually develop from each scale depending on the species and cultivar. This propagation technique is called "scaling" and is useful for rapid build up of stocks of a new cultivar or to establish pathogen-free planting stocks.

The objectives of the experiments reported in this paper were to find methods of producing bulblets under aseptic conditions and to increase the efficiency of bulblet production from scales. Accomplishment of these objectives would increase the commercial feasibility of multiplying and maintaining pathogen-free stocks and also increase the rate at which planting stocks of new cultivars could be built up.

In performing these experiments, bulb scales of *Lilium longiflorum* 'Croft' about 1.5 cm wide and 3.0 cm long were used. 'Croft' is a cultivar used as a flowering potted plan tfor Easter. Early experiments showed that scales can be sterilized by washing them for 10 minutes in a 1:10 dilution of commercial bleach (Clorox or Purex) followed by thorough rinsing in sterile (autoclaved) water. After sterilization the scales were asceptically cut into a proximal and da distal section each 1.0 cm^2, as shown in Figure 1, and kept separate for experimental purposes. These scale sections were implanted aseptically in glass vials (See Fig. 2) on a culture medium consisting of inorganic salts, vitamins, sucrose and agar (3). The vials with implanted scale sections were placed at 70°F under fluorescent lights with an intensity of 400 ft. c. (Bulblet formation will occur just as well at 100 ft. c. light intensity and in the dark).

In one experiment, the plant growth regulators, indoleacetic acid (IAA) and kinetin were incorporated into the me-