ERNEST TIMM: I'm sorry I don't know.

VOICE: Did you notice any effect of the static electricity that you obtain when you blew that air over the soil so fast?

ERNEST TIMM: No. It is no problem at all.

J. RAVENSTEIN: Is this machine available in the United States? Can you tell me the name of the dealer; I've been looking for this fellow for five years.

ERNEST TIMM: See me, I have some literature in back of the room.

HUGH STEAVENSON: It looks from one of the slides as though the soil was being blown away from the roots pretty badly. How do you get the soil back?

ERNEST TIMM: You have cultivating teeth right behind it.

HUGH STEAVENSON: Your teeth bring it right back?

ERNEST TIMM: Yes, you bring it right back so that if you want to blow next time, they are ready. Most people blow and leave it level. Next time they cultivate up the ridge, and the next time they blow it level again.

HUGH STEAVENSON: How about wet soil or damp soil?

ERNEST TIMM: The last time I was out, it rained 3 days solid and I had an appointment on Monday. And driving up that day I was quite worried if the thing would work. We had no trouble at all. In fact, that's when this slide was taken, after three days solid rain. And the thing is if you do get into heavier soil you can't go as fast, but you can still do it. You can do it even in heavy clay in the spring.

VOICE: How far does it move the soil laterally?

ERNEST TIMM: Well, you get a shield which the soil blows against. It will not blow into the next row. The soil blows against the shield and the cultivating teeth are right behind.

VOICE: Doesn't it create a problem for the operator when working in dry soil?

ERNEST TIMM: Well, he uses a bathtub at night.

HANS HESS: Our next speaker will be Mr. Hoy C. Grigsby who will tell us of his work with captan and the rooting of pine cuttings.

CAPTAN AIDS ROOTING OF LOBLOLLY PINE CUTTINGS

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Since 1942, when researchers began selecting the southern pines for specific traits, there has been increased interest in propagating them from cuttings. But in spite of an early concern with rooting techniques, accomplishments have been quite modest.

In 1961, I reported obtaining up to 52 percent rooting of loblolly pine (*Pinus taeda* L.) cuttings with indolebutyric acid

(IBA) treatment under intermittent mist, but could not regularly repeat this success in subsequent research (3).

In 1962, the Boskoop Trail Grounds in Holland reported good results with ornamental conifers from a combination of IBA and Captan (1). A little later Van Doesburg (2) doubled the rooting of conifers by adding Captan to IBA. Wells (5) at the thirteenth annual meeting of the Plant Propagators' Society, stated that the combined treatment decidedly improved the quality and quantity of rhododendron cuttings. Vanderbilt (4) tested the rooting response of the rhododendron hybrid cultivar Chionoides to 16 compounds, principally fungicides containing no hormornes. He reported that 88 percent of the cuttings treated with Captan and with Sevin were well rooted. None of the other treatments were as effective.

In mid-December of 1963, I installed a loblolly pine study in which one treatment was obtained by combining equal amounts of 10 percent Captan and 1.6 percent IBA. It produced 24 percent rooting, or two and one-half times more than the Hormodin No. 3 treatment which, until then, had been the most successful stimulant. This accomplishment would not be considered a success by most propagators, but it was encouraging nevertheless because loblolly pine is hard to root and the cuttings had been taken later than the time considered optimum.

In November 1964, I began a follow-up study in which ten treatments with stimulants, principally Captan and IBA applied in various strengths and by several methods, were used on cuttings from 6-year-old loblolly pine trees. Some cuttings received a wounding pre-treatment before being dipped into the powder mixtures or the liquid concentrations.

The design was a split-plot randomized block with two bottom temperatures, 72° and 78° F. It was replicated five times. Night air temperature was maintained at 72° F. Day temperatures ran higher, especially on sunshiny spring days, when the average was 82° F. The rooting medium was half coarse sand and half perlite of horticultural grade. Mist was provided by Supreme A-6 Humidomist nozzles, one for each seven square feet of bench space, operating 30 seconds of each minute during daylight.

After 190 days in the bench, the Captan - IBA treatments were superior to those with IBA alone. The best, 25 percent Captan and 0.8 percent IBA, produced 40 percent rooting. This was three times better than the Hormodin No. 3 treatment. Quick-dip applications of IBA at 200, 500, and 1,750 ppm; naphthaleneacetic acid at 500 ppm; and 30-minute hot soaks of 105° F. before IBA treatment; all produced little rooting. Wounding with three equally spaced slits in the basal inch of the cutting before treatment with IBA did not significally increase rooting.

Livability and rooting of cuttings were increased by the higher concentration of Captan and the higher bottom temperature (Table 1).

Table 1. Effect of two concentrations of Captan (each in combination with 0.8 percent IBA) and two bottom temperatures on the livability and rooting of loblolly pine cuttings

Bottom temperature	Percent living		Percent rooted	
	10 percent Captan	25 percent Captan	10 percent Captan	25 percent Captan
72° F.	39	63	10	23
78° F.	79	98	29	40

At the end of the study (190 days) the living cuttings for the treatments without Captan ran from 2 to 50 percent and the rooted cuttings for these treatments ran from 0 to 13 percent.

The combined treatments produced more roots per cutting, and the roots were stronger and better distributed around the base of the cutting. (Figure 1).

The cuttings were drenched with a mercury-base fungicide every 10 days. This treatment aided in keeping down slime molds and had no apparent deleterious effect.

In summary, the combined Captan - IBA treatments were clearly superior to all others in their ability to stimulate rooting and produce quality roots. The highly significant differences

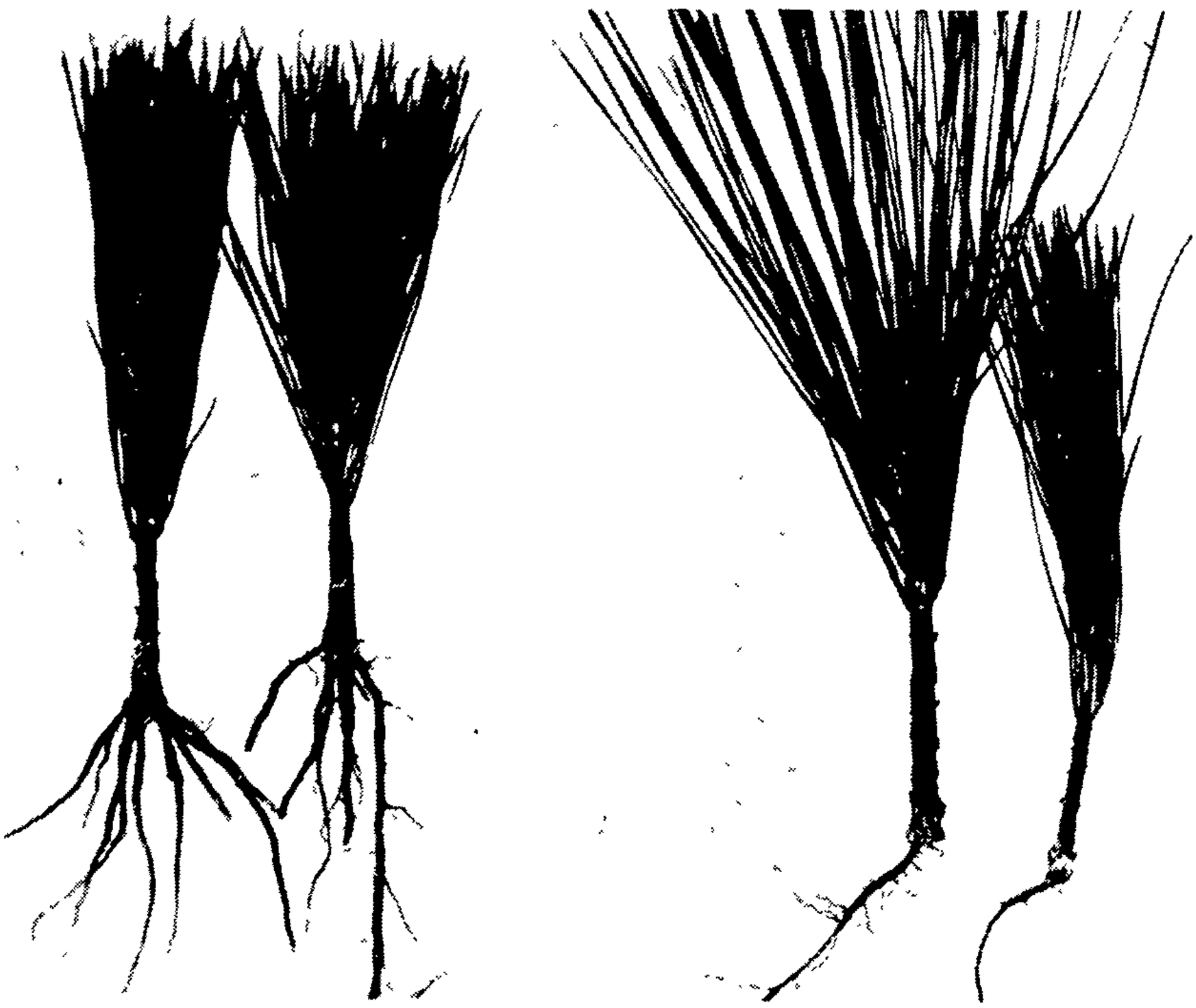

Figure 1. Six-year-old loblolly pine cuttings after 104 days in the propagation bench. The two on the left were treated with 25 percent Captan and 0.8 percent IBA. Those on the right were treated with 0.8 percent IBA alone.

(0.01 level) in the efficiency of the two Captan levels indicate that concentrations higher than 25 percent may produce even better results. Differences (0.05 level) between the two bottom temperatures suggest that the optimum temperatures may be above 78° F. Night air temperatures probably should not run lower than 75° F. (3).

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BRUCE BRIGGS: Was any attempt made in the research to eliminate the captan applied to the cuttings, but rather applying it as a drench to the rooting medium?

HOY GRIGSBY: That's one of my treatments this year; I tried it for the first time.

CASE HOOGENDOORN: Have you tried to root other varieties of pine besides this particular variety like *P. cembra* or *P. mugo*.

HOY GRIGSBY: No, I have not, Case. I have tried short leafed pine which is another one of the southern pines and it roots a little better than loblolly.

JOHN THOMPSON: Have you tried phygon with the captan?

HOY GRIGSBY: No, I have not.

BOB DEWILDE: Do you associate your increase rooting response to control of pathogens or to some biological activity in captan?

HOY GRIGSBY: Frankly, I do not know. I hope that some of these treatments that I've put in this year will give an answer to this. This is the first time I applied captan alone. There is a possibility that it does possibly react with the IBA or has some stimulatory effect.

DICK FILLMORE: I would like to ask the reason for putting the nozzle on the high trees. I am sure it must be a very important one.

HOY GRIGSBY: Really I just threw that in as a matter of interest. It has nothing to do with the vegetative propagation. That's in my controlled breeding work and it takes three years to get seedlings from pine if you count the year in the nursery and you don't like insects to interrupt the work.

VOICE: Was your percentage captan based on 100% active ingredients or based upon a percentage of 50% or whatever they use?

HOY GRIGSBY: It's the commercial captan. It is based on

whatever is given on the package and if we want 25% captan in the final mix, we start out with 50%.

DICK STADTHERR: What size trees are you using? Are these big trees or small trees from which you are propagating?

HOY GRIGSBY: I have tried all ages. We have not had good results in any of these as you have seen here, but the older trees do root more poorly as you would expect and in working out these techniques we're working with six year old trees.

HANS HESS: The next subject this morning is on the effects of medium, pH, and root inducing chemicals upon the rooting of *Gardenia jasminoides*. It will be given by Dr. Booker T. Whatley.

THE EFFECTS OF MEDIA, pH, AND ROOT INDUCING CHEMICALS ON ROOTING OF GARDENIA JASMINOIDES

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A limited amount of published information on the propagation of *Gardenia jasminoides* is available. Southern growers propagate gardenia cuttings in open nursery or in cold frames. The cuttings. six or seven inches long, are made in late winter or early spring. The cuttings are stuck in sandy soil which covers two-thirds their length (1, 5).

Watkins (5) in Florida has reported that high humidity,, constant temperature and moisture are necessary for speedy rooting. The media used have been clean, sharp builder's sand, peat or sphagnum moss. Gardenias being susceptible to root-knot and other diseases, sterilized or fresh media are required. Root inducing chemicals are not essential, but larger root systems are formed in shorter periods on cuttings that have been dusted with one of the root-inducing agents.

Hartmann and Kester (2) reported that leafy terminal cuttings may be rooted in the greenhouse under glass from fall to spring. A mixture of one-half sand and one-half peat moss was a good rooting medium. These authors further stated that gardenias were difficult to transplant and should be moved only when small.

Laurie *et al* (4), in Ohio, reported that tip cuttings four to six inches long taken between December and March and treated with a growth substance hastens rooting, which may be expected in four to six weeks.

Materials and Methods

A 2 x 3 x 5 factorial experimental design with three replications and ten cuttings plots was employed to study the effects of media pH and root-inducing chemicals on rooting of *Gardenia jasminoides* cuttings during a 45-day period.

[1]The authors express their appreciation to Dr Barton R Farthing, Professor and Head, Department of Experimental Statistics, Louisiana State University, for his advice and assistance regarding the statistical analysis