Poinsettia Culture and Root Rot Control

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The relation of environmental factors to development of the poinsettia root rots was recently discussed by Bateman (1). On the basis of his work he concluded that controlled environment (temperature, soil pH, and soil moisture) could be a supplement to the "complete sterilization program" now recommended (2). It was stipulated, however, that before this could become a grower recommendation further work would have to be done under conditions which would more closely approximate those the grower is likely to obtain in terms of controlled environment. Such an experiment was conducted in 1960, in which the findings of poinsettia root rot studies at Cornell were evaluated with respect to their adaptability and/or feasibility in a recommended cultural program.

It should be noted that Shanks and Link, at Maryland, made an extensive study of cultural factors and the incidence of certain soil-borne diseases of poinsettia (6). The influences of soil pH, temperature, and fungicides were considered. Much of the groundwork for their studies had been obtained from the work of Keller and Shanks (3).

Studies at Cornell conducted under controlled environment indicated that root rots of poinsettia were minimized when a soil temperature of 65°F was maintained, along with low pH (below pH 5.5) and low soil moisture (about 45% moisture holding capacity). Low soil temperature was considered to be the primary factor giving control of *Rhizoctonia* and low moisture resulted in the control of *Pythium*. A low soil pH reduced damage caused by *Thielaviopsis* and *Pythium*.

An air temperature of 65°F has been strongly recommended by Larson and Langhans (4), so the temperature considered desirable for root rot control by the pathologists when used in combination with low moisture and low soil pH corresponds with the temperature recommended by the floriculturists as being desirable for plant growth, rapid flowering, and good bract development. Growers have given little attention to soil pH with regard to poinsettia culture, while the pathologists have noted a marked decrease in root rot incidence at a low pH (below 5.5). A slight controversy does arise between the pathologists and the floriculturists with respect to soil moisture levels. Low moisture levels have been advocated by the pathologists because damage due to *Pythium* would be decreased. The floriculturists have hesitated to recommend low moisture

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levels because of the possibilities of leaf drop and bract abscission (5).

The purpose of the cooperative investigation reported herein was to determine if the previously mentioned environmental conditions would result in minimum disease development under simulated commercial conditions and still result in high-quality, salable plants.

Methods

Cuttings of the variety Barbara Ecke Supreme were taken on August 30, 1960 and placed in 3″ pots under intermittent mist. The rooted cuttings were placed in 5″ pots on September 30. Supplementary lights were given from 10-2 at night from September 20 to October 10. Nine hour days were then started on October 10.

When the rooted cuttings were placed in the 5″ pots they were put in the following soil treatments: sterile soil, non-sterile soil, and non-sterile infested (*Thielaviopsis, Rhizoctonia* and *Pythium*) soil. Two soil pH levels (5.0 and 7.0) were used. The plants were divided into 2 groups, and half were watered every day and the other half were watered every 3 days. All treatments were studied at 50° and 70°F.

Results

None of the plants grown at 50°F flowered for Christmas regardless of treatment. The mortality rate was extremely high for plants grown at 50° in non-sterile and infested soils regardless of soil pH. Recontamination of the sterile soil treatment was only slight, but a little root rot developed in this treatment at the low temperature. Plants moved from 70° to 50° on December 1 were severely damaged by the root rot pathogens.

The time of flowering was not appreciably affected by the various environmental treatments at 70°. All the plants were in flower by December 16, except plants grown in infested soil at a pH of 7 flowered about 6 days later than plants in other treatments.

A comparison of frequency of watering and soil treatment on increase in plant height, increase in number of leaves, bract diameters, date of flower, root rot reading, and root weight can be seen in Figures 1 and 2 (on pages 4 & 5). All plants shown in Figure 1 were grown at pH 5. Plants grown in a soil of pH 7 are shown in Figure 2.

Average bract diameter was the same in sterile, non-sterile, and infested soil at a pH of 5. Bract diameters of plants grown at pH 7 in the sterile soil treatment were the same as those obtained at a pH of 5. Considerable reduction of bract diameter occurred, however, when plants were grown at pH 7 in non-sterile or infested soil.

Plant height was greatest in sterile soil watered daily, and the pH seemed to have little effect. The plants grown in sterile soil but only watered every 3 days were 6 to 7 inches shorter.

At the conclusion of the experiment the root systems of all plants were inspected for root rot, and fresh root weights were recorded. Root rot at 70° caused heavy damage only at pH 7 in the infested soil. Greater control was achieved with the acid versus the neutral soil. All root rot data indicated that low soil moisture was not as influential in controlling root rot at 70° as it was at 50°. Soil

moisture did have considerable influence on root weight at 70°. Root systems in soils watered every 3 days weighed only about half as much as those which were grown in soil where water was applied daily, at pH 5.0. The differences were negligible at pH 7.

Conclusions

According to the results of this study a grower could expect the greatest disease control at 70° in sterile, acid soils where water was applied every 3 days. The heights of plants grown under such conditions were more satisfactory than those obtained when the plants were watered daily. However, there may be a distinct possibility for leaf drop or bract abscission at low moisture levels.

It should be stressed that the authors do not suggest a cultural program of acid, dry soils as a substitute for the recommendations of "complete sterilization program," although these tests indicated that one can grow salable poinsettia plants in spite of root rot pathogens by proper environmental control. Not all growers are able to effectively sterilize their soil, benches, pots and other equipment at the present time, and they could reduce their root rot problems by maintaining a pH of 5, using a well-drained soil, and keeping the plants at 65-70°. For the grower who is able to effectively sterilize his soil and equipment, this cultural program could be an added form of insurance. Recontamination does occur in the greenhouse, and an acid, well-drained soil, and maintenance of the above indicated temperature range will reduce losses to a substantial extent.

Literature Cited

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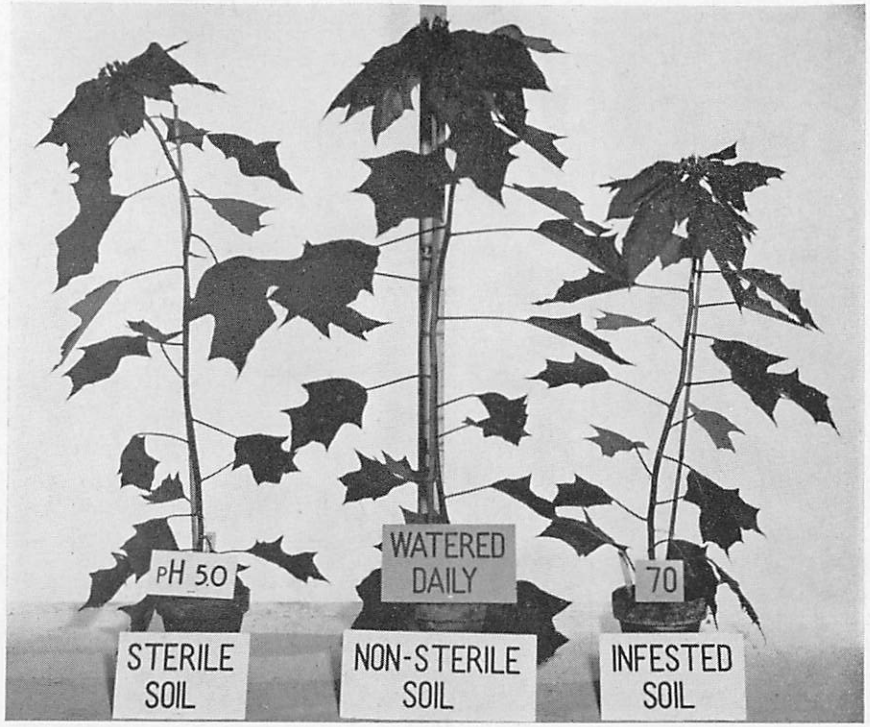
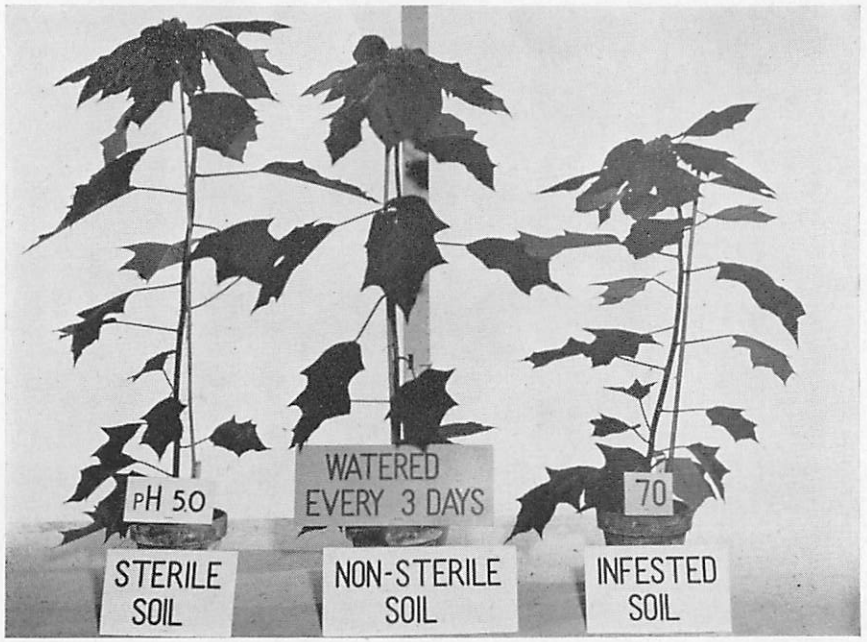
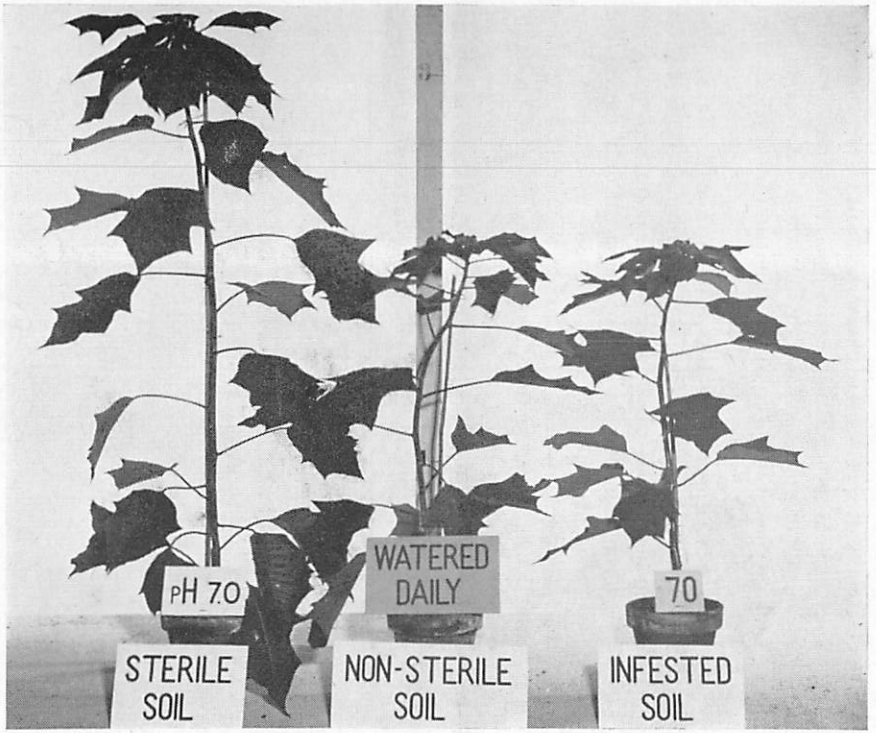


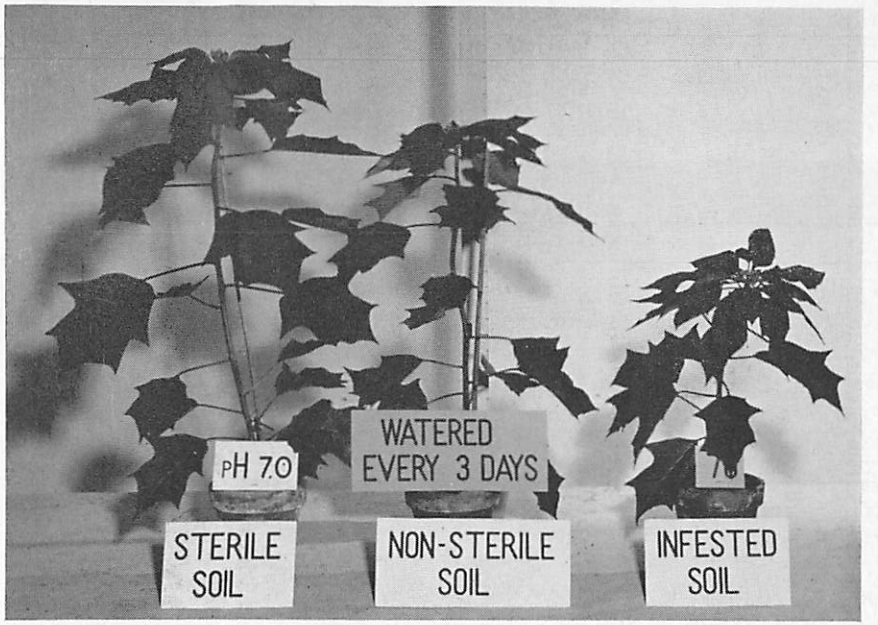


	Watered daily			*Watered every 3 days*		
	Sterile Soil	Non-sterile Soil	Infested Soil	Sterile Soil	Non-sterile Soil	Infested Soil
Increase in ht. (in.) (1)	31	32	26	23	26	21
Increase in # lvs.	20	21	21	15	18	17
Bract dia. (in.)	15	15	16	15	15	14
Date of fl. (2)	12/10	12/10	12/10	12/10	12/10	12/12
Rot reading (3)	0.1	1.1	1.6	0.5	1.1	1.7
Root weight (grams)	32	35	23	16	18	15

Figure 1. Influence of soil moisture levels and soil treatment on increase in plant height, increase in number of leaves, date of flowering, rot reading, and root weight. The cuttings, of the variety Barbara Ecke Supreme, were propagated August 30, and 9 hour daylengths were started October 10. All plants were grown at a pH of 5.

(1) Heights and numbers of leaves were recorded on October 1, 1960, and the final data were taken on January 9, 1961.
(2) Date of flowering was determined to be the date when half of the plants in a treatment had the first stamens showing.
(3) 0=no root rot, 5=all roots rotted.





	Watered daily			*Watered every 3 days*		
	Sterile Soil	Non-sterile Soil	Infested Soil	Sterile Soil	Non-sterile Soil	Infested Soil
Increase in ht. (in.) (1)	26	15	11	18	14	9
Increase in # lvs.	7	7	6	4	5	5
Bract dia. (in.)	14	12	12	14	12	11
Date of fl. (2)	12/11	12/12	12/13	12/10	12/14	12/16
Rot reading (3)	0.1	3.7	4.3	0.3	2.0	2.6
Root weight (grams)	9	8	5	10	7	4

Figure 2. The influence of soil moisture levels and soil treatment on increase in plant height, increase in number of leaves, date of flowering, rot reading, and root weight. The cuttings, of the variety Barbara Ecke Supreme, were propagated August 30, and 9 hour daylengths were started on October 10. All plants were grown at a pH of 7.

(1) Heights and numbers of leaves were recorded on October 1, 1960, and the final data were taken on January 9, 1961.
(2) Date of flowering was determined to be the date when half of the plants in a treatment had the first stamens showing.
(3) 0=no root rot, 5=all roots rotted.