Low pH Joins Sanitation Measures in Fight on Poinsettia Root Rot

For years growers in many states have had trouble with Poinsettia diseases, principally in the Summer and early Fall when cuttings and young plants frequently die in large numbers. The stem of the plant is often attacked by the Rhizoctonia fungus at the soil line. Root rots caused by one of several species of Pythium are also common.

More recently, however, growers have experienced trouble with a Thielaviopsis root rot which appears late in the season just before the plants are ready for sale. The disease is characterized by dwarf plants, misshapen leaves and flower bracts, excessive leaf drop, and badly rotted roots. The rot is confined to the roots and the below-ground portion of the stem. The roots turn brown-black and decay, and very often there are black, rough, longitudinal cracks along the below-ground stem sections. The plant dwarfing and other symptoms reflect the amount of rot that has occurred. A small amount may cause stunting whereas severe rot usually results in complete defoliation.

Widespread

The disease is not new and seems to have been increasing for many years. Tilford[1] noticed it in Ohio in 1941 and indicated a possible relationship of Thielaviopsis basicola with poinsettia stock plants. Dimock[2] in 1951 established T. basicola and Pythium as the chief causes of Poinsettia root rot as a result of his experiments. The suggested controls included sterilization of soils, benches, pots, and tools and proper sanitation in every phase of production. Thielaviopsis is world-wide in distribution and has caused root rot on Tobacco for years. Extensive research has been conducted to determine its nature and control. Research workers have found that with Tobacco, high temperature and acid soil (below pH 5.0) are effective control measures. In some areas the use of acid soil has been about the only means available to control the disease. Apparently the use of acid soil as a means of controlling the disease on Poinsettia had not been tried prior to the present time.

An experiment was set up to test the relative importance of several different fungi, the effects of combinations of fungi, and the effects of watering level on the disease. The varieties Barbara Ecke Supreme and Ruth Ecke were used in this experiment. The fungi tested were a Thielaviopsis isolate from Poinsettia stock plants in Maryland and three fungi isolated from Poinsettias which were supplied by Dr. A. W. Dimock at Cornell University; a Rhizoctonia and two Pythiums.

The plants in each treatment were divided into three groups to receive different amounts of water. The ones considered to be watered normally were watered 16 times in 35 days. The plants receiving low water were watered nine times and the high water plants were watered 29 times in 35 days.

Proof

Inoculation with Thielaviopsis reduced the weight of the tops of the plant to one-half that of the check plants while the other fungi used by themselves caused little or no damage. One Pythium caused a reduction in weight with the variety Ruth Ecke but not with Barbara Ecke Supreme. The combination of Rhizoctonia and Pythium likewise caused no injury to the plants but any combination of fungi containing Thielaviopsis caused extreme injury. This showed that Thielaviopsis causes the most serious damage.

The symptoms appeared earlier in the pans where Thielaviopsis was in combination with either Rhizoctonia or Pythium, or both. Heavy watering greatly increased the amount of Thielaviopsis rot in the experiment. While the growth of healthy plants was much better with the heavy watering. Fungi combinations are typical of most greenhouse soils. The other fungi tend to increase the damage already started by Thielaviopsis. When growers see the first symptoms of root rot, leaf curl and light yellow bottom leaves, they often water heavily. This can be more damaging than beneficial, for it definitely hastens root rot.

More

Another experiment was designed to test strains of the fungus, varieties of poinsettias and Tobacco, soil acidity, and temperature in their effects on the severity of the disease. Besides being planted in steam sterilized soil, plants were planted in soil inoculated with two isolates of Thielaviopsis from Poinsettias and two from Tobacco.

The soil mixture of equal parts of acid peat moss and loam was treated with either lime or sulfuric acid and sulfur to have soils with pH values of 4.8, 6.3 or 7.3 After potting the plants were placed

in greenhouse sections where the night temperatures were 50 deg. F., 60 deg. F. and 70 deg. F.

The eleven varieties used were:

1. Albert Ecke
2. Barbara Ecke Supreme
3. Ecke White
4. Improved Albert Ecke
5. Improved Indianapolis Red
6. Indianapolis Red
7. Oak Leaf
8. Mrs. Paul Ecke
9. Pink
10. Ruth Ecke
11. St. Louis

In addition Tobacco seedlings were grown in each of the treatments since two of the strains of fungi were known to be injurious to Tobacco.

The results of this experiment indicate that there are definite Thielaviopsis strains. The isolates from Poinsettia damaged Poinsettias but not Tobacco, whereas the isolates from Tobacco damaged Tobacco, but not Poinsettias. These results are important because they show that the common Tobacco field strains of Thielaviopsis in the East may not be harmful to Poinsettias. Thus, field soil used in greenhouse work is probably not a source of the fungus introduction unless growers have carelessly dumped old Poinsettia soil where it could have contaminated field areas.

The 70 deg. F. temperature delayed root rot development until the Poinsettias were near maturity, after which there was considerable loss of roots and leaves. At this temperature the bract color was not as good as at either 50 or 60 deg. F. When started on September 25, which is before the flower buds form, the high temperature may cause blindness or a delay in flowering combined with excessively long stems. At 50 deg. F. the rot was most severe and symptoms appeared soon after the experiment was started. This temperature not only favored the disease, but it also repressed Poinsettia growth.

Acidity

Excellent control of the root rot was obtained in acid soil. There was complete loss of roots and leaves in most varieties at the 6.3 and 7.3 pH levels, whereas there was none at pH 4.8. From an observational standpoint the Poinsettias in acid soil grew as well as others in soil of a higher pH even though there was a slight reduction in weight. The soil pH must be below 5.0 for control to be effective. Varieties which seemed to have some resistance to the disease were Indianapolis Red, Improved Indianapolis Red, and Albert Ecke. Those which lost leaves most readily after inoculation were St. Louis, Pink, Ruth Ecke, Oak Leaf, and Barbara Ecke Supreme.

Pinched plants of Ruth Ecke and Barbara Ecke Supreme were panned in soil taken from around the roots of stock plants. These plants showed typical root rot symptoms and when recorded had a weight of 542 grams compared with 708 grams for healthy plants.

A limited test was made with several fungicidal drenches on Barbara Ecke Supreme cuttings panned in old stock plant soil, four plants per 6 inch pan and four pans per treatment. A fungicide drench was applied to the pot at one week and three weeks after panning. The drench was made by using one ounce in 2 gallons of water of Arasan, captan, ferbam, and Semesan. Fresh weights after two months showed that captan had a beneficial effect. There was no defoliation in this treatment whereas there was complete defoliation in the check and partial defoliation in the Semesan treatment. However, these are the results of only one experiment made under only one geographical condition. It is suggested that captan may have use as a stop-gap measure to keep down root rot damage, but it is not a substitute for sound cultural practices, soil sterilization, and other controls for this disease.

As was the case when Thielaviopsis was found on stock plants some years ago, the disease apparently does not effect the production of cuttings. The stock plants in this experiment produced a large number of excellent quality cuttings. Fortunately, the fungus lives in the roots only and is not carried in the cuttings, but there is the possibility that spores may be carried on the cuttings if water has splashed from the soil up to the stems and leaves of the plant. The stock plants must be kept isolated from the young plants at all times, It would be best if they could be grown in a house that will not be used for the young plants.

The authors have observed that the Thielaviopsis fungus attacks other flower crops. As a result, the area where stock plants have been grown must eventually be sterilized or treated in some way. Steam sterilization of beds and benches must be done thoroughly. If steam is not available, the benches should be cleaned and scrubbed down with formaldehyde, captan, or ferbam. The ground underneath the bench can be treated by sprinkling copper sulfate crystals over the area. Some of the plants which have been observed to be attacked by Thielaviopsis are Cineraria, Cyclamen, Gerbera and Scindapsus.

Means

In addition to the complete sterilization of all soil, pots, benches, tools, etc., there are two principal means of reducing loss from the disease. Growing the plants at warmer temperatures has been used by a number of growers, and where reasonable sanitation practices are employed this method should permit the finishing of the crop in a fair condition. It has been our experience, however, that this control is gained only at the expense of plant quality. While untried as yet on a commercial scale, the use of an acid soil in the rather extensive tests here reported has given complete control of the disease. Growers who have experienced troubles with Thielaviopsis should at least try this method on a small scale.

To avoid root rot by the use of acid soil will require some planning ahead of time. Prepare a soil mixture well in advance using acid peat moss as the source of organic matter. Have the soil tested for pH and get a recommendation for the amount of sulfur required to bring acidity to a pH of 4.8. Several months may be necessary for the acidifying action of sulphur to be complete at which time the pH should again be checked. This mixture should then be steam sterilized before use.

"Do's and Dont's"

If you are growing Poinsettias and have experienced trouble with root rot late in the season:

DO--Sterilize all soil, pots, benches, tools, etc., used in growing and handling of cuttings and young plants.

Spray stock plants or dip cuttings in ferbam or captan before sticking in sand.

Keep stock plants isolated from the young plants and finally sterilize the beds where the stock plants have been kept.

Pan plants in soil which has been prepared ahead of time to have a pH of 4.8 to 5.0.

Keep plants well fertilized and unchecked in growth at all times.

Keep plants growing at optimum temperature of at least 60 deg. F.

DON'T--Put stock plants in the propagating house or on benches where young plants are to be placed without using extra care in sterilizing the benches and treating the walks.

Don't lime soil for Poinsettias.

Don't cool off plants to hold or harden them. Don't over-water.

Don't start using high temperature as a control before the buds are formed.

Literature Cited

1. Tilford, Paul E. 1941. Leaf Curl of Poinsettia. Ohio Florist Association Bulletin 145:7-8.
2. Dimock, A. W. 1951. Poinsettia Trouble a Result of Root Rot. New York State Flower-Growers Bulletin 69:4-8.

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Additional Notes on Poinsettia Root Rot

From Ohio Florists Association Bulletin 297-- Paul Alexander found Rhizoctonia the major cause of root rot under conditions prevailing in Ohio in 1953. In his trials with 16 fungicides for treatment of poinsettia soils, he noted that Mathieson 275, Orthocide 406 and Dithane Z78 appeared to give protection from the root rot equal to, or better than fermate. These fungicides were used at the following rates for active materials--

1.5 pounds of Mathieson 275
1 pound of Dithane or Orthocide (active)

The fungicide was spread evenly over 100 sq. ft. of soil, 3 inches deep and mixed thoroughly before potting the cuttings.

Since the causal organisms of poinsettia root rot are weak parasites, they must have some help. The propagation house is one of the best places for them to receive this help. Crowding the cuttings, wet foliage and stems 24 hours a day, bruising the stems while sticking the cuttings all help to aid these disease organisms to get a start.

Bottom heat during cool nights would be one of the best preventatives for it will drive off excess moisture and hasten rooting. Remember that 60° F is pretty cold for poinsettias but not hard on the rot organisms.

Your editor,

W. D. Holley