Poinsettia Mosaic Virus in British Columbia

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ABSTRACT

Chiko, A. W. 1983. Poinsettia mosaic virus in British Columbia. Plant Disease 67:427-428.

Most plants of two poinsettia cultivars grown from cuttings at Saanichton Research and Plant Quarantine Station in 1980 developed varying degrees of leaf and bract distortion, mosaic, or both symptoms. Diagnostic tests showed that both cultivars were infected with poinsettia mosaic virus (PMV), which has not been reported previously in Canada. In a survey of commercially grown poinsettias conducted in British Columbia in 1981, PMV was detected in eight of nine poinsettia cultivars sampled and in 94% of 65 samples tested. Results of this survey, combined with work previously reported from the United States, suggest that this virus probably is prevalent in commercial stocks of poinsettia throughout North America.

Poinsettia mosaic virus (PMV), initially described by Fulton and Fulton (2), has been detected commonly in commercially grown poinsettias (*Euphorbia pulcherrima* Willd.) in the United States (2) and West Germany (4). The virus has also been reported in England (1). Foliage of infected poinsettias may show mosaic or mottle and may also be distorted (2). In Canada, PMV was detected apparently for the first time in poinsettias grown at Saanichton in 1980. This paper reports identification of the virus and results of a survey to estimate its incidence in commercial stocks of poinsettia in British Columbia.

MATERIALS AND METHODS

E. cyathophora J. Murr., grown from seed purchased from a commercial source under the misnomer *E. heterophylla* (2), was used as a test plant for PMV. Inoculum was rubbed on corundum-dusted leaves of test plants at the three- to five-leaf stage and final readings for symptoms were made 4–5 wk later. Test plants were maintained in a greenhouse without supplemental light at temperatures varying from 16 to 29 C.

Two cultivars of poinsettia grown at Saanichton Research and Plant Quarantine Station from cuttings imported from the United States were initially tested for PMV by infectivity assay in December 1980. Samples, each consisting of a small apical leaf or bract, were collected systematically from 14 and 26% of the plants of Annette Hegg Brilliant and Annette Hegg Dark Red, respectively. Each sample was ground in a sterile mortar with 2 ml 0.03 M, pH 8.0, potassium phosphate buffer (PB) and the extract was used to manually inoculate a group of five test plants.

Leaf-dip preparations were negatively stained with 2% sodium phosphotungstate, pH 6.8, and examined with a Philips 300 electron microscope. In vitro properties of one isolate of PMV were determined, using systemically infected leaves of *E. cyathophora* as a virus source 22 days after inoculation. Undiluted crude extract was used to determine the thermal inactivation point (TIP) and longevity of the virus, whereas the dilution end point (DEP) was determined with extract diluted with PB. For these property determinations, each treated extract was applied manually to a group of 10 test plants. Agar gel double-diffusion tests were performed in a medium consisting of 1% Noble agar, 0.85% saline, and 0.02% sodium azide. Undiluted extract from young leaves of selected test plants was tested against PMV antiserum (supplied by R.W. Fulton, University of Wisconsin) diluted 1/5 with 0.85% saline.

In December 1981, poinsettia samples were obtained from 17 commercial growers on Vancouver Island and the lower mainland of British Columbia. This sampling represented about half of the poinsettia growers in this province (B. Mauza, *personal communication*). When sampled, all poinsettias were bracteate but only a small proportion were in bloom. Each sample consisted of a small leaf or bract from each of three plants per cultivar maintained by each grower. In cases where a grower obtained a cultivar from more than one source, a sample was obtained from each source. Each sample was ground with 6 ml PB and the extract was used to manually inoculate a group of 12 test plants. The time from collecting samples to inoculating test plants varied from a few hours to 4 days. During this interval, samples were kept in a cooler equipped with an ice pack.

RESULTS AND DISCUSSION

Symptoms similar to those described by Fulton and Fulton (2) were initially observed in two cultivars of poinsettia at Saanichton in October 1980. The following month, each plant of these cultivars (bracteate, prebloom stage) was examined individually for symptoms. Of 166 and 19 plants of Annette Hegg Brilliant and Annette Hegg Dark Red, respectively, two plants of each cultivar were symptomless, whereas the remainder showed mosaic, leaf and bract distortion, or both symptoms. Mosaic symptoms were generally mild, and although bracts on a few plants were almost all severely distorted, distortion was generally confined to only a few leaves or bracts per plant. By December, when initial infectivity assays were made, mosaic had diminished in intensity and was apparent on only a few plants. Initial infectivity assays for PMV were positive for 19 of 23 Annette Hegg Brilliant plants and for five of five Annette Hegg Dark Red plants. The identity of the virus from both cultivars was repeatedly verified serologically, using extracts from selected diseased test plants. Some poinsettias that initially tested negative for PMV by infectivity assay were discarded and thus could not be retested. Additional infectivity and serological assays, however, ultimately showed that each of the symptomless poinsettias was infected with PMV. Because both poinsettia cultivars were grown from cuttings, these results strongly suggested that all plants of each cultivar were infected with PMV.

Isometric viruslike particles 23–24 nm in diameter were observed in leaf-dip preparations from both cultivars of poinsettia and from infected but not from healthy *E. cyathophora*. For one virus isolate originally obtained from Annette Hegg Brilliant, the DEP was 10^{-3}–10^{-4}, the TIP was 60–65 C, and longevity at room temperature was 8–10 days. These values agree closely with those reported previously for PMV (2).

In 1981, PMV was detected in eight of nine cultivars tested and in 94% of 65 poinsettia samples obtained from commercial growers in British Columbia (Table 1). PMV was recently found to be common in Annette Hegg plants in England (1). Insufficient sampling or use of a relatively insensitive infectivity assay may account for the failure to detect the virus in this cultivar in British Columbia.

The number of *E. cyathophora* test plants infected with PMV per survey sample varied from one to nine of 12

Contribution 258, Saanichton Research and Plant Quarantine Station.

Accepted for publication 8 November 1982.

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Table 1. Detection of poinsettia mosaic virus (PMV) in commercial stocks of poinsettias in British Columbia in 1981

Cultivar[a]	No. samples tested	No. samples infected[b]	Percent samples infected
AH Dark Red	23	21	91
AH White	15	15	100
AH Pink	12	12	100
AH Hot Pink	4	4	100
AH Marble	4	3	75
AH Supreme	3	3	100
AH Diva	2	2	100
AH Lady	1	1	100
AH	1	0	0
Total	65	61	94

[a]AH = Annette Hegg.
[b]Virus from each infected sample was transmitted to *Euphorbia cyathophora* and subsequently identified serologically as PMV.

inoculated and the average rate of infection was about 40%. Low efficiency of mechanical transmission of this virus from poinsettia to *E. cyathophora* has been reported previously (2,3). Because PMV was detected so commonly in commercial stocks of poinsettia in British Columbia, using a relatively insensitive assay host, it is conceivable that the virus was of universal occurrence in these stocks.

Growers surveyed in British Columbia obtained their poinsettia cuttings either locally, from the province of Ontario, or from the United States. This, combined with the reported common occurrence of PMV in the United States (2), suggests that the virus probably is prevalent in commercial stocks of poinsettia throughout North America.

The possible effect of PMV on the production of poinsettias in British Columbia cannot be evaluated critically because most survey samples were collected without attention to symptom expression. Of the 65 samples received, 45% showed mosaic or mottle, which was usually mild, and 17% showed some distortion. Based on this and observations of infected poinsettias grown at Saanichton, the effects of the virus on commercially grown poinsettias in British Columbia would generally appear to be slight. Severe mosaic symptoms, however, which might affect marketability, were noted in one lot of infected poinsettias in a commercial greenhouse near Saanichton. According to the grower, these poinsettias had been kept for an extended period of time at cooler temperatures than another lot of the same cultivar that showed considerably milder symptoms. Low temperatures have been reported to favor symptom expression in poinsettias infected with PMV (3).

Pfannenstiel et al (5) recently developed a method for obtaining PMV-free poinsettias from infected stocks by using heat therapy. Because no vectors of PMV are known (2) and mechanical transmission of the virus under commercial growing conditions seems unlikely (5), there would appear to be few if any obstacles to the commercial production of virus-free poinsettias.

ACKNOWLEDGMENTS

I thank R. W. Fulton for providing PMV antiserum, B. Valentine, Vancouver Research Station, for assistance with electron microscopy, B. Mauza, B. C. Ministry of Agriculture and Food, for collecting most poinsettia samples, and S. E. Godkin for providing able technical assistance.

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