

Short Communication

***Puccinia pelargonii-zonalis* (Uredinales: Pucciniaceae),
an addition to the rust flora of Canada**

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***Puccinia pelargonii-zonalis* is reported for the first time in Canada. It has occurred on cultivated geraniums (*Pelargonium* × *hortorum*) in both greenhouses and gardens in three provinces.**

Key Words—geranium; *Pelargonium* × *hortorum*; *Puccinia pelargonii-zonalis*; rust.

Because of its hardiness and disease resistance, the horticultural geranium (*Pelargonium* × *hortorum* L. H. Bailey) is one of the most popular greenhouse and bedding plants worldwide. However, within the past few decades *Puccinia pelargonii-zonalis* Doidge, a rust fungus on geranium, has become a serious pathogen, particularly in north temperate greenhouses (Dennis, 1993). First recorded from South Africa (Doidge, 1926), the centre of origin for *Pelargonium*, it has since been found in other countries of Africa (e.g. Bisby and Weihe, 1953; Riley, 1956; Natrass, 1961; Gjaerum, 1985), Australia and New Zealand (Cunningham, 1931), India (Singh and Rao, 1990), Hawaii (McCain and Trujillo, 1967), Mexico and Central America (Hennen and McCain, 1993), Argentina (Lindquist, 1970), and throughout Europe (see Dennis, 1993).

In the continental United States, *Puccinia pelargonii-zonalis* was first reported in 1967 from New York and California (Dimock et al., 1968) and has since been found in Florida and Georgia (Wehlburg, 1970), Pennsylvania (Nichols and Forer, 1972), Minnesota (Stienstra et al., 1973), North Carolina (Grand, 1985) and Arizona (Yohem et al., 1985). Within Canada, the greenhouse industry has been placed under a quarantine regarding the importation of diseased geraniums from the United States (MacLachlan, 1976). None of the published reports have listed *P. pelargonii-zonalis* as occurring in Canada (Brown, 1956; Connors, 1967; Ginns, 1986). However, in June of 1995 the author purchased potted geraniums from a local nursery in Guelph, Ontario and found one plant infected with *P. pelargonii-zonalis* (DAOM 221074). The rust from the original diseased plant subsequently spread to infect all geranium plants in the author's garden prompting the writing of this present report.

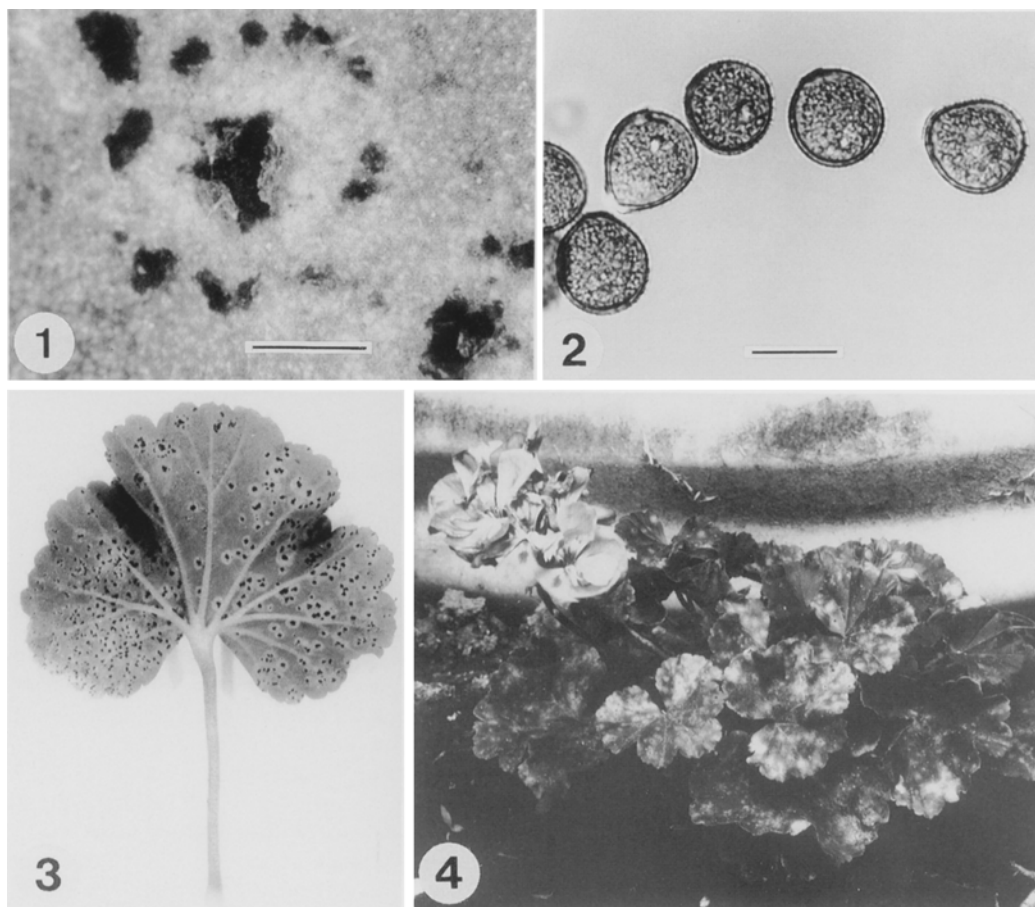
Examination of specimens in the National Mycological Herbarium, Ottawa (DAOM) confirmed the rust in British Columbia, Manitoba and Ontario where plant quaran-

tine inspectors have found it on *Pelargonium* mainly from greenhouses. The earliest collection (DAOM 144587) was from Vancouver, British Columbia in 1973 on plants originally imported from California.

Specimens examined: CANADA: BRITISH COLUMBIA: Vancouver, 16. iv.1973, coll. D. Kirkham & R. Palmer, det. J. A. Parmelee, DAOM 144587; Victoria, 6.iii.1980, coll. unknown, det. D. M. Laidlaw, DAOM 175347; MANITOBA: Winnipeg, 5. x.1982, coll. M. Desjardins, det. J. A. Parmelee, DAOM 184717; ONTARIO: Carleton Co.: Ottawa, 22. vii.1990, coll. J. A. Parmelee, det. J. A. Parmelee, DAOM 212849; 11. x.1990, coll. J. A. Parmelee, det. J. A. Parmelee, DAOM 212850; Niagara Co.: St. Catharines, 18. iv.1979, coll. G. B. Warner, det. D. M. Laidlaw, DAOM 171951; Wellington Co.: Guelph, 2. vii.1995, coll. L. J. Hutchison, det. L. J. Hutchison, DAOM 221074; York Co.: Richmond Hill, 1.v.1981, coll. unknown, det. D. M. Laidlaw, DAOM 181987; Toronto, 9. i.1985, coll. E. J. Mathers, det. G. P. White, DAOM 191471.

The Canadian specimens had uredinia on petioles and on necrotic spots on the undersides of leaves. Uredinia are dark brown and are 0.2–1.5 mm in diam, often surrounded by concentric rings of smaller secondary uredinia creating a "target" effect, 3–6 mm across (Fig. 1). Urediniospores are globose to subglobose to broadly ovate, and finely echinulate, 22–32 × 19–25 μm (Fig. 2). Telia and teliospores were not seen on the Canadian specimens examined. The alternate host bearing the spermatial and aecial states is still unknown (Sivanesan, 1970). Upon infection, light coloured necrotic spots appeared on both the upper and lower surface of infected leaves with uredinia forming mostly on the undersides (Fig. 3). Over time, infected leaves often became entirely necrotic and dropped off, with the general appearance of plants being stunted and non-vigorous (Fig. 4).

The rust appears to have entered Canada on diseased plants imported from the United States and has



Figs. 1–4. *Puccinia pelargonii-zonalis* on *Pelargonium* × *hortorum*.

1. Uredinium surrounded by concentric ring of smaller secondary uredinia (scale = 1 mm). 2. Urediniospores (DAOM 221074) (scale = 20 μm). 3. Underside of infected leaf of *Pelargonium* × *hortorum* showing uredinia. 4. Infected *Pelargonium* × *hortorum* with conspicuous necrotic spots, in author's garden several wk after purchase.

now become established in commercial greenhouses in southern Ontario. Under outdoor conditions in southern Ontario, *P. pelargonii-zonalis* can spread quickly in gardens as was witnessed by the author. It is not known whether the rust can survive Canadian winters.

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Literature cited

- Bisby, G. R. and Wiehe, P. O. 1953. The rusts of Nyasaland. *Mycol. Paper* **54**: 1–12.
- Brown, A. M. 1956. A check list of plant rusts in Canada. Canada Department of Agriculture, Ottawa. Publication 976.
- Connors, I. L. 1967. An annotated index of plant diseases in Canada and fungi recorded on plants in Alaska, Canada and Greenland. Canada Department of Agriculture, Ottawa. Publication 1251.
- Cunningham, G. H. 1931. The rust fungi of New Zealand together with the biology, cytology and therapeutics of the Uredinales. John McIndoe, Dunedin, New Zealand.
- Dennis, R. W. G. 1993. *Pelargonium* rust in England. *The Mycologist* **7**: 150–151.
- Dimock, A. W., McCoy, R. E. and Knauss, J. E. 1968. *Pelargonium* rust: a new geranium disease in New York state. *N. Y. State Flower Growers Inc. Bull.* **268**: 1–3.
- Doidge, E. M. 1926. A preliminary study of the South African rust fungi. *Bothalia* **2**: 1–228.
- Ginns, J. H. 1986. Compendium of plant disease and decay fungi in Canada 1960–1980. Agriculture Canada, Ottawa. Publication 1813.
- Gjaerum, H. B. 1985. East African rusts (Uredinales), mainly from Uganda. 4. On families belonging to Apetalae and Polypetalae. *Mycotaxon* **24**: 237–273.
- Grand, L. F. 1985. North Carolina plant disease index. North Carolina Agric. Res. Serv. Tech. Bull. **240**: 1–157.
- Hennen, J. F. and McCain, J. W. 1993. New species and records of Uredinales from the Neotropics. *Mycologia* **85**: 970–986.
- Lindquist, J. C. 1970. Notas uredinologicas XI. *Rev. Fac. Agron. Univers. Nac. La Plata* **46**: 199–205.
- MacLachlan, D. S. 1976. (Subject: The importation of geranium from California, USA) Quarantine Circular No. 14C. Agriculture Canada, Product and Marketing Branch, Plant

- Protection Division.
- McCain, A. H. and Trujillo, E. E. 1967. Plant diseases previously unreported from Hawaii. *Plant Disease Repr.* **51**: 1051-1053.
- Natrass, R. M. 1961. Host lists of Kenya fungi and bacteria. *Mycol. Paper* **81**: 1-46.
- Nichols, L. P. and Forer, L. B. 1972. Geranium rust discovered in Pennsylvania. *Plant Disease Repr.* **56**: 759.
- Riley, E. A. 1956. A preliminary list of plant diseases in Northern Rhodesia. *Mycol. Paper* **63**: 1-28.
- Singh, R. and Rao, N. N. R. 1990. Occurrence of rust on florist geranium. *Indian Phytopathol.* **43**: 481.
- Sivanesan, A. 1970. *Puccinia pelargonii-zonalis*. C.M.I. Descriptions of pathogenic fungi and bacteria No. 266.
- Stienstra, W. C., Jacobsen, B. J. and Anderson, N. A. 1973. *Pelargonium* rust, *Puccinia pelargonii-zonalis*, discovered in Minnesota. *Plant Disease Repr.* **57**: 890.
- Wehlburg, C. 1970. *Pelargonium* rust (*Puccinia pelargonii-zonalis*) in Florida. *Plant Disease Repr.* **54**: 827-828.
- Yohem, K. H., Cummins, G. B. and Gilbertson, R. L. 1985. Revised list and host index of Arizona rust fungi. *Mycotaxon* **22**: 451-468.