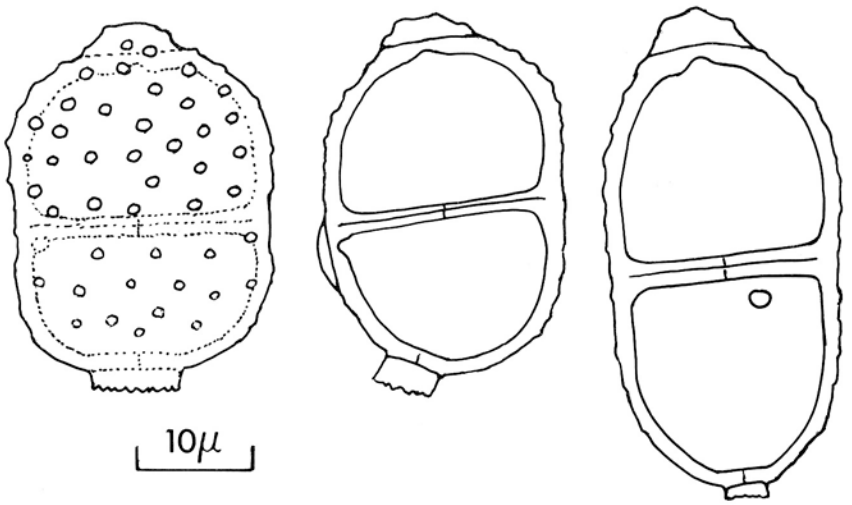
PUCCINIA VIOLAE SSP. AMERICANA



Teliospores in surface view and optical section, from DAOM 13257 on *Viola septentrionalis*. Scale = 10μ

Puccinia violae (Schum.) DC., Fl. Fr. 6: 62. 1815, ssp. **americana** ssp. nov.

A ssp. *violae* differt praecipue teliosporis semper majoribus, (24.5-)25.5-42(-47) ((-51)) × (15-)16-28(-30)μ, urediniosporis plerumque latioribus, 16-25.5(-27.5)μ lat., et aeciosporis saepe usque ad 27μ long.

Type: On *Viola palustris* L.: British Columbia: Revelstoke, 13 Aug. 1901, Holway (Barth. N. Am. Ured. 1575 in DAOM, as *Viola* sp.)

PYCNIA flask-shaped, epiphyllous, hypophyllous or occasionally petiolicolous, varying from well-developed to very small and few or none. AECIA hypophyllous or petiolicolous, or occasionally epiphyllous on veins, cupulate. AECIOSPORES (15-)16-27(-29) × 12-21μ; walls ca. 0.4-0.8μ excluding warts, hyaline; warts 0.2-0.7μ high × 0.2-0.8(-1.0)μ diam., varying in arrangement – uniform in size within but variable between spores, randomly variable on single spores (type 1) or somewhat irregularly bizonate (type 2, Savile, Rept. Tottori Inst. 10: 233. 1973). UREDINIA and TELIA pulverulent, generally mainly to fully hypophyllous (or petiolicolous), but sparingly epiphyllous on some hosts and usually equally epiphyllous and hypophyllous on *Viola adunca*. UREDINIOSPORES (20-)21-31(-35.5) × 16-25.5(-27.5)μ; walls (1.5-)1.8-3.0(-3.5)μ, light to medium yellow-brown; echinulations 0.6-0.8 (-1.0)μ diam. × 1.7-3.5(-4.5)μ spacing, continuous to hilum; germ-pores 2(-3) generally equatorial, with slight to moderate internal annular thickening and slight or no hyaline cap. TELIOSPORES (24.5-)25.5-42(-47)((-51)) × (15-)16-28(-30)μ, not or slightly constricted; walls 1.0-2.3μ, light chestnut, with warts ca. 0.1-0.3(-0.5)μ high × (0.6-)0.8-1.3(-1.7)μ wide over upper 1/3 to 3/4 of spore, or sometimes to base but generally shallower below; germ-pores apical to 1/4(-2/3) depressed with yellow cap 1.5-3.0(-3.5)μ high, and septal to slightly (-1/2) depressed with smaller cap; pedicels hyaline, deciduous, basal to slightly (-moderately) offset. Based on over 100 Canadian specimens and some from Alaska and northern U.S.A., all in DAOM.

HOSTS: *Viola* spp.

DISTRIBUTION: Coast to coast in Canada, sparingly north to the subarctic; also in S and SE Alaska, and south through United States and beyond (southernmost populations not critically examined).

COLLECTIONS: *Viola adunca* J.E. Sm.: Mack., Fort Smith, DAOM 25392 (Cody & Loan 4517); B.C., 16 collns., S from Queen Charlotte Is.; Alta., Edburg, DAOM 4156 (Brinkman 2174); Sask., Indian Head, DAOM 96 (Cowan); Que., Great Whale River, DAOM 23670 (Savile 514). *V. canadensis* L.: Ont.,

Delaware, Middlesex Co., DAOM 59744 (Parmelee 613); Que., Kingsmere, Gatineau Co., DAOM 3393 (Conners), 18319 (Savile). *V. conspersa* Reichenb.: Ont., Arthur, Wellington Co., DAOM 51832 (Parmelee & Shoemaker 362). *V. cucullata* Ait.: Que., Wakefield, Gatineau Co., DAOM 26501 (Parmelee & Breitung). *V. epipsila* Ledeb. ssp. *repens* (Turcz.) Becker: B.C., 7 mi. SSW Port Alberni, Vancouver I., DAOM 147528 (Calder & MacKay 30314). *V. fimbriatula* J.E. Sm.: N.S., Morristown, Kings Co., DAOM 78890 (Roland). *V. glabella* Nutt.: B.C., 12 collns., Queen Charlotte Is. and Skeena R., S to Vancouver I., E to near Revelstoke and Nelson. *V. howellii* Gray: B.C., Agassiz, DAOM 5523 (Jones). *V. incognita* Brainerd: Que., Beauceville, DAOM 14428 (Anselme); N.B., St. Andrews, DAOM 12239 (Adams); P.E.I., Brackley Beach, DAOM 12224 (Adams), 49244 (Hurst); N.S., Hillsborough, DAOM 75333, 75334 (Cinq-Mars et al. 90, 93). *V. langsdorffii* Fisch.: B.C., 4 collns. Skeena R. to Bella Coola R. *V. nephrophylla* Greene: Alta., E of Whiskey Gap, DAOM 105592 (Moss 9672 as *adunca*); Sask., Indian Head, DAOM 4083 (Russell); Watson, DAOM 2567 (Howe & Russell). *V. pallens* (Banks) Brainerd: Ont., L. Timagami, DAOM 78892 (Cain 651); Que., Great Whale River, DAOM 23618 (Savile 343); P.E.I., Orwell, DAOM 55015 (Hurst); N.S., Blomidon, DAOM 1214 (Groh). *V. palustris* L.: B.C., Queen Charlotte Is. 6 collns., Vancouver I. 1 colln., Revelstoke 1 colln. (Holway, Barth. N. Am. Ured. 1575, TYPE). *V. pedatifida* G. Don: Alta., E of Fort Saskatchewan, DAOM 105593 (Moss 4135). *V. pensylvanica* Michx. (*V. eriocarpa* Schw.): Ont., 9 collns., Lake Huron eastward; Que., 4 collns. *V. pubescens* Ait.: Ont., 4 collns., S and E; Que., 2 collns. SW and S. *V. renifolia* Gray var. *brainerdii* (Greene) Fern.: B.C., 4 collns., Wolverine Ra. and S.; Alta., near Bruderheim, DAOM 105591 (Moss 11018); P.E.I., Bellview, DAOM 40427 (Erskine & Smith 1740). *V. rugulosa* Greene: B.C., 2 collns.; Alta., 5 collns.; Sask., 6 collns. E to Moosomin on Man. border. *V. selkirkii* Pursh: Que., Rougemont, DAOM 75337 (Cinq-Mars 92). *V. septentrionalis* Greene: Que., 4 collns. *V. sororia* Willd.: Ont., 3 collns.; Que., Rougemont, DAOM 87693 (Cinq-Mars 521).

NOTES: European specimens, on *Viola canina, hirta, jordanii, montana, odorata, reichenbachiana* (incl. *sylvestris, sylvatica*), *riviniana, rupestris, tricolor, williamsii,* and ×*wittrockiana*, yield consistently smaller teliospores (18.5-)20-33((-34)) × 14.5-22.5μ, the shorter spores generally being globose. The urediniospores of ssp. *violae* are also narrower, 18.5-29 × 15-22μ; and the aeciospores (in limited measurements) seem to be slightly smaller, 16-22 × 13-19μ. The greater size of the teliospores in North America has been noted previously (e.g. Sydow, Monogr. 1: 441. 1903), but has never been contrasted in detail with that of ssp. *violae*; and regional floras have not always limited measurements to those of local material. The teliospore size contrast between ssp. *violae* and ssp. *americana* is very constant despite minor distinctions in wall sculpturing.

P. violae ssp. *violae* is known to me in Canada only on garden pansies, *V.* ×*wittrockiana* (*V. hortensis, V. tricolor maxima* hort.), from Victoria, DAOM 19717 (Güssow) and New Westminster, DAOM 118801 (Eastham), B.C., presumably both from contaminated European seed. Arthur (Manual, 1934) stated that teliospores are longer in western than eastern North America. Long spores do tend to predominate in Pacific coast collections on *V. glabella* and *V. palustris* (probably an ecological effect), but teliospores from interior British Columbia average about the same as from the east, and a few collections on *V. pensylvanica* and *pubescens* in eastern Canada have spores up to 47μ long.

There seem to be small host-limited or regional distinctions. Pycnia are large and abundant on *V. rugulosa* in the west and *V. pensylvanica* in the east, but are small or even lacking on most hosts. The teliospore warts are largest on *V. rugulosa* in the west, but smaller on *V. canadensis*, its eastern counterpart. On *V. adunca* in B.C. the warts are very small, but east of the Rockies they are appreciably coarser.

The aeciospore warts are unusually variable for a character that is usually very constant within populations. It perhaps reflects introgression between rusts, similar to that between hosts, after forest clearing destroyed ecological barriers.

On, especially, *V. glabella* uredinia may be almost wholly suppressed under dry conditions or at high elevations, an extreme example being Calder & MacKay 32251, near Moat L., Vancouver I., 1190 m. alt., in which primary sori bear I and III or I,(II) and III, or even I, II and III successively in one aecial cup. Such collections simulate *P. effusa* Diet. & Holw., which, however, has teliospore walls 2.0-3.5μ thick and germ-pores often strongly depressed. *P. effusa* is not reliably recorded north of southern Washington.

D.B.O. Savile

National Mycological Herbarium, Biosystematics Research Institute
Research Branch, Agriculture Canada
Ottawa, Ontario, K1A 0C6

June, 1975