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The Rust Fungi (Uredinales) of the Loess Hills Region of Iowa

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The records of rust fungi in the Loess Hills region of Iowa show that the earliest collections were made in the Turin (Monona Co.) and Sioux City (Woodbury Co.) areas by L. H. Pammel in the late 1880s. Scattered collections were made by J. C. Gilman and W. A. Archer in the late 1920s, as part of a statewide plant disease survey. Only 24 species of rusts had been reported from this region before the Loess Hills spring forays of 1981-1983. Twenty-three additional species were collected during the three foray years. Three of these species had not been previously reported from Iowa. Additional rust species might be found in this area if field studies were conducted later in the summer.

INDEX DESCRIPTORS: Rusts, Uredinales, plant parasitic fungi, Loess Hills

The rust fungi are characterized by a very delicate and specific physiological dependence on their host plants. Thus, the presence of a host is necessary for a rust fungus to exist in a given location. The flora of the Loess Hills area differs from that of other parts of Iowa, with western species present that do not occur elsewhere in the state. This could result in a somewhat different rust population. The study reported here was conducted primarily during the spring forays sponsored by the Iowa State Preserves Advisory Board, 1981 to 1983, and documents the prevalent rust species found at that season.

The earliest records of rust fungi from the Loess Hills region of Iowa are collections made in Turin (Monona Co.) and Sioux City (Woodbury Co.) areas by L. H. Pammel in the 1880s and 1890s. At least one rust collection was made by A. L. Hitchcock in Fremont Co. in 1888. Collections were made at scattered sites throughout the area and in western Iowa in general in the late 1920s by J. C. Gilman and W. A. Archer, evidently as part of a statewide plant disease survey. By 1980, before the Loess Hills forays of 1981-83, only 24 species of rusts had been reported from this region (Gilman and Archer 1929). Even though the foray collection time has been limited to a few days each year in late May or early June, 23 additional species have now been documented.

The rust species presently known from the Loess Hills and their hosts are summarized in Table 1. A total of 47 species is presented, not recognizing varieties of species as separate entities. In addition to the 23 species not previously collected from this region, we also collected and documented 11 of the 24 species reported by earlier workers. Our collections have been deposited in the mycological section of the Iowa State University herbarium. Only three rust species, *Puccinia minussensis*, *Puccinia tripsaci*, and *Uromyces hordeinus*, are known in Iowa only from the Loess Hills. The first two species were collected during the present survey; the third was collected in Fremont County by Archer in 1927.

The first listed of these species, *Puccinia minussensis*, is a full-cycle autoecious rust on *Lactuca* species. The haploid mycelium is systemic in the host, greatly modifying the host stem and leaves. Scattered spermogonia and aecia are produced over the distorted diseased host, which dries and deteriorates quickly. It was collected only in Woodbury County, but because of the extensive colonization and change in the host and its rapid deterioration, this rust could be easily missed unless intensive field work was carried out at this particular season.

The second species not previously reported from Iowa, *Puccinia tripsaci*, is a heteroecious rust producing spermogonia and aecia only on species of *Ceanothus*. In Iowa, it parasitizes only *Ceanothus ovatus*, a western Loess Hills prairie species. The other hosts, on which uredia

and telia develop, are species of *Andropogon* and *Tripsacum*. Cummins (1971) considers this rust to be a western species, occurring from South Dakota south into Mexico. It should be present on at least one of its grass hosts in the Loess Hills, but would not be developed there until later in the growing season.

The third species, *Uromyces hordeinus*, has been collected only once in Iowa. It is a full-cycle heteroecious rust occurring on *Hordeum pusillum* and *Notboscardium bivalve*. Archer found it in 1927 (Gilman and Archer, 1929) on *Hordeum pusillum* in Fremont County.

Several rust species, reported from other areas in Iowa on their uredial-telial hosts, develop spermogonia and aecia on western plant host species known in Iowa only in the Loess Hills. *Puccinia sporoboli* is a heteroecious rust that produces uredia and telia on species of *Sporobolus* and, in the Loess Hills, spermogonia and aecia on the leaves, stems, flowers and fruits of *Yucca glauca*. Cummins (1971) recognizes two varieties, *Puccinia sporoboli* var. *robusta* on *Yucca glauca*, and *Puccinia sporoboli* var. *sporoboli* on *Sporobolus* species. It has been reported on three species of *Sporobolus* at scattered sites throughout Iowa (Gilman and Archer, 1929), but on *Yucca glauca* only in the Loess Hills bluffs of Woodbury County.

Another species of *Puccinia*, *Puccinia schedonnardi*, also produces uredia and telia on its grass hosts, three species of *Muhlenbergia*, throughout the state. Spermogonia and aecia have been reported previously on *Napaea dioica* in Winneshiek County (Gilman and Archer, 1929). In 1982, these stages of the rust were observed on leaves of *Sphaeralcea coccinea* in Harrison County. This western host species occurs in Iowa only in the western Loess Hills bluffs.

Gymnosporangium corniculans, a demicyclic heteroecious rust occurring on *Amelanchier canadensis* and *Juniperus* species, is unusual in that the aecia develop on *Amelanchier* leaves in September and October rather than in the spring or early summer as do the aecia of most species of *Gymnosporangium*. This rust has been found on *Amelanchier* leaves in Fremont County, as well as at several other sites in Iowa. It has been found on the *Juniperus* host in this state, but the small (3 to 15 mm) galls could easily be overlooked.

Two microcylic rusts, both parasites of *Anemone patens*, were collected in Plymouth and Woodbury counties in 1981. *Tranzschelia anemones* produces spermogonia and telia on chlorotic, dwarfed, highly distorted leaves of *Anemone patens*. The diseased leaves do not persist; and thus, the rust is difficult to observe. *Puccinia pulsatillae* produces only telia on normal-appearing leaves. It would seem that both rusts, parasitizing the single host, might occur on *Anemone patens* throughout Iowa, but they are known only from these separate sites. The only other Iowa collections of these rusts were made in Winneshiek County in northeastern Iowa by E. W. D. Holway in 1880s (Gilman and Archer, 1929).

We anticipate that the number of rust fungi reported from the Loess Hills will increase when collections are made in the late summer

and early fall. It is difficult now to interpret the difference in numbers of rust species known from the Loess Hills region, 47 species, and the much larger number, 132 species, reported from the driftless area of northeastern Iowa (Tiffany and Knaphus, 1984). It is, however, likely that the drier climate of the Loess Hills affects not only the plant species but also the rust fungi that parasitize them.

Table 1. Rust species collected in the Loess Hills region of western Iowa.

*Species not previously recorded from the Loess Hills.

Rust	Rust Stages ^a	Host	County ^b
* <i>Cerotelium dicentrae</i> (Trel.) Mains and F.W. Anderson	O, I	<i>Dicentra cucullaria</i> (L.) Bernk.	3
* <i>Gymnosporangium corniculans</i> Kern.	O, I	<i>Amelanchier canadensis</i> (L.) Medic.	7
<i>Gymnosporangium globosum</i> Farl.	O, I	<i>Crataegus</i> sp.	2,3,5
	III	<i>Juniperus virginiana</i> L.	
<i>Gymnosporangium juniperi-virginianae</i> Schw.	III	<i>Juniperus virginiana</i> L.	3,5
<i>Kunkelia nitens</i> (Schw.) Arth.	III	<i>Rubus</i> sp.	5
<i>Melampsora medusae</i> Thuem.	II, III	<i>Populus deltoides</i> Marsh	7
<i>Phragmidium speciosum</i> (Fr.) Cooke	III	<i>Rosa arkansana</i> T. Porter	2,3,4,7
<i>Puccinia andropogonis</i> Schw.	II,III	<i>Andropogon gerardi</i> Vitm.	2,5,7
	II,III	<i>Schizothyrium scoparium</i> Michx.	2,5,7
<i>Puccinia andropogonis</i> var. <i>xanthoxyli</i> (Pk.) Arth.	O, I	<i>Xanthoxylum americanum</i> Mill.	1,2,3,5
<i>Puccinia andropogonis</i> var. <i>penstemonis</i> (Schw.) Arth.	O, I	<i>Penstemon grandiflorus</i> Nutt.	2,3,4,5,6,7
<i>Puccinia andropogonis</i> var. <i>pustulata</i> (Cart.) Arth.	O, I	<i>Comandra pallida</i> A.DC.	1
	O, I	<i>Comandra umbellata</i> (L.) Nutt.	3,4,6,7
<i>Puccinia andropogonis</i> var. <i>micropuncta</i> (E.&E.) Arth.	O, I	<i>Castilleja coccinea</i> (L.) Spreng.	2,7
<i>Puccinia caniculata</i> (Schw.) Lagerh.	O, I	<i>Ambrosia trifida</i> L.	1
<i>Puccinia caricina</i> DC.	O, I	<i>Ribes</i> sp.	2,3,5,6,7
<i>Puccinia caricina</i> var. <i>urticata</i> (Kern) Arth.	O, I	<i>Urtica dioica</i> L.	1,2
<i>Puccinia caricina</i> var. <i>limosae</i> (P. Magn.) Jorst.	O, I	<i>Lysimachia ciliata</i> L.	6
<i>Puccinia chloridis</i> Spreng.	O,I	<i>Asclepias verticillata</i> L.	2,3,7
	II,III	<i>Bouteloua curtipendula</i> (Michx.) Torr.	7
* <i>Puccinia circaeae</i> Pers.	III	<i>Circaea quadrisulcata</i> Maxim	3
<i>Puccinia cnici-oleracei</i> Pers. ex Desm.	III	<i>Aster sagittifolius</i> Willd.	4
* <i>Puccinia cyperi</i> Arth.	O, I	<i>Erigeron annuus</i> (L.) Pers.	3,4
* <i>Puccinia dioicae</i> P. Magn.	O, I	<i>Solidago canadensis</i> L.	1,2,5
	O, I	<i>Aster cordifolius</i> L.	3
	O, I	<i>Oenothera biennis</i> L.	3
	O, I	<i>Oenothera serrulata</i> L.	2
	O, I	<i>Phryma leptostacha</i> L.	1,2,3,
	O, I	<i>Erigeron canadensis</i> L.	6
* <i>Puccinia ellisiana</i> Thuem.	II, III	<i>Schizothyrium scoparium</i> (Michx.) Nash	3,4
<i>Puccinia emaculata</i> Schw.	II, III	<i>Panicum virgatum</i> L.	5,7
<i>Puccinia helianthi</i> Schw.	O, I, II, III	<i>Helianthus grosse-serratus</i> Martens	4
<i>Puccinia hieracii</i> (Roehling) Mart.	O, I, II, III	<i>Taraxicum officinale</i> Weber	3
* <i>Puccinia minusensis</i> Thuem.	O, I, II, III	<i>Lactuca</i> sp.	2
* <i>Puccinia pimpinellae</i> (Str.) Roehling	O, I, II, III	<i>Osmorrhiza claytoni</i> (Michx.) C.B. Clarke	3
	O, I, II, III	<i>Osmorrhiza longistylis</i> (Torr.) DC.	2
* <i>Puccinia plumbaria</i> Peck	O, I, II, III	<i>Pbiox pilosa</i> L.	2
* <i>Puccinia pulsatillae</i> Kalchb.	III	<i>Anemone patens</i> Gray	1,2
<i>Puccinia recondita</i> Rob. and Desm.	O, I	<i>Delphinium virescens</i> Nutt.	3
	O, I	<i>Hydrophyllum virginianum</i> L.	2
	O, I	<i>Anemone canadensis</i> L.	4
	II, III	<i>Elymus canadensis</i> L.	7
	II, III	<i>Elymus virginicus</i> L.	7
	O, I	<i>Sphaeralcea coccinea</i> (Nutt.) Rydb.	4
* <i>Puccinia schedonardii</i> Kell. & Swingle	O, I	<i>Polygonatum biflorum</i> (Walt.) Ell.	2,3
* <i>Puccinia sessilis</i> Schneid.	O, I	<i>Polygonatum biflorum</i> (Walt.) Ell.	2,3
* <i>Puccinia seymouriana</i> Arth.	O, I	<i>Asclepias syriaca</i> L.	4,7
	II, III	<i>Spartina pectinata</i> Link	6
	III	<i>Silphium integrifolium</i> L.	7
	O, I	<i>Fraxinus pennsylvanica</i> Marsh.	3,5,6
<i>Puccinia silphii</i> Schw.	III	<i>Silphium integrifolium</i> L.	7
<i>Puccinia sparganioides</i> Ell. & Barth	O, I	<i>Fraxinus pennsylvanica</i> Marsh.	3,5,6
* <i>Puccinia sporoboli</i> Arth. var. <i>robusta</i> Cumm. & H.C. Greene	O, I	<i>Yucca glauca</i> Nutt.	2
* <i>Puccinia sporoboli</i> Arth. var. <i>sporoboli</i> Cumm.	II, III	<i>Sporobolus</i> sp.	2
	II, III	<i>Calamovilfa longifolia</i> (Hook.) Scribn.	7
* <i>Puccinia stipae</i> Arth. var. <i>stipae</i> Cumm.	II, III	<i>Stipa comata</i> Trin. & Rupr.	1
	II, III	<i>Stipa spartea</i> Trin.	1,2
* <i>Puccinia tripsaci</i> Diet. & Holw.	O, I	<i>Ceanothus ovatus</i> Desf.	3,5
<i>Puccinia tumidipes</i> Pk.	O, I, II, III	<i>Lycium balmifolium</i> Mill.	5
<i>Puccinia vernoniae</i> Schw.	O, I, II, III	<i>Vernonia</i> sp.	5
<i>Puccinia vilfae</i> Arth. & Holw. var. <i>vilfae</i> Cumm.	O, I	<i>Verbena stricta</i> Vent.	3,4,6,7
* <i>Puccinia violae</i> (Schm.) DC	O, I, II, III	<i>Viola</i> sp.	2
<i>Puccinia xanthii</i> Schw.	II, III	<i>Xanthium strumarium</i> L.	3
* <i>Tranzschelia anemones</i> (Pers.) Nannf.	O, III	<i>Anemone patens</i> L.	1,2
* <i>Uromyces ari-triphylli</i> (Schw.) Seeler	O, I, II, III	<i>Arisaema triphyllum</i> (L.) Schott	3,7
<i>Uromyces coloradensis</i> E.&E.	O, I, II, III	<i>Vicia americana</i> Muhl.	2
	O, I, II, III	<i>Vicia linearis</i> Greene	1
<i>Uromyces euphorbiae</i> Cke. & Pk.	O, I, II, III	<i>Euphorbia dentata</i> Michx.	1
	O, I, II, III	<i>Euphorbia maculata</i> L.	3,2
	O, I, II, III	<i>Euphorbia</i> sp.	2
* <i>Uromyces graminicola</i> Burr.	II, III	<i>Panicum virgatum</i> L.	6
<i>Uromyces hordeinus</i> (Arth.) Barth.	II, III	<i>Hordeum pusillum</i> Nutt.	7
* <i>Uromyces perigynius</i> Halst.	O, I	<i>Rudbeckia laciniata</i> L.	2
<i>Uromyces sporoboli</i> Ell. & Cav.	O, I	<i>Allium canadense</i> L.	6
	II, III	<i>Sporobolus cryptandrus</i> (Torr.) Gray	2
	II, III	<i>Sporobolus neglectus</i> Nash	2
<i>Uromyces striatus</i> Schroet.	II, III	<i>Medicago sativa</i> L.	5
* <i>Uropyxis petalostemonis</i> (Farl.) Det.	O, I, II, III	<i>Petalostemum purpureum</i> (Vent.) Rydb.	1,2

^a - Stages of rust cycle: O = spermagonia, I = aecia, II = uredia, III = telia

^b - County symbols: 1 = Plymouth, 2 = Woodbury, 3 = Monona, 4 = Harrison, 5 = Pottawattamie, 6 = Mills, 7 = Fremont

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