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## Fungus Diseases of Plants at Ames, Iowa, 1895

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tory. Professor Trelease thought it probable that the species came from the European cultures. We are therefore inclined to believe with Jordan, Russell, and others that the species is not native in this country.

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## FUNGUS DISEASES OF PLANTS AT AMES, IOWA, 1895.

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BY L. H. PAMMEL AND GEO. W. CARVER.

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In previous papers record has been made of the abundance of parasitic fungi for the years of 1891, 1892, 1893 and 1894.<sup>1</sup> We hope to continue these observations for the purpose of making comparison.

Observations from year to year with climatic conditions should make it possible to say how much climate modifies the appearance of disease. Observations in a climate like ours are valuable because of the changeable conditions as to humidity and rainfall. From the nature of the diseases of plants it is difficult to make exact statements. We must speak in relative terms. In 1893 *Puccinia graminis*, *P. rubigo-vera* and *P. coronata* were very destructive. In 1894 these rusts were not absent, but they were not destructive; in fact, scarce as compared with 1893.

In the study of diseases of plants the condition of the atmosphere with reference to moisture is an important factor. The universally low humidity of the atmosphere in 1894, no doubt, largely determined the amount of rust that year. So low was the humidity that during the growing season dew was an unusual condition.

We append table, giving rainfall, relative humidity, 7 A. M. temperature (maximum and minimum), for the months of May, June, July, August and September, taken from the records made at Ames by Dr. J. B. Weems, Mr. W. H. Heileman.

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<sup>1</sup> L. H. Pammel, Jour. Mycology, VII, p. 95.

Agricultural Science, VII, p. 20.

Proc. Iowa Academy of Science, II, p. 201-203

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Rainfall.....	.03	.30	.38	....	.02	1.18	....	....	....	.11	....	....	....	....	.17	....	....	....	....	....	....	....	....	....	....	....	.08	....	....	1.95	....
Rel. hum. 7:00 a. m..	76	75	85	80	73	79	80	89	93	64	63	63	53	53	60	59	69	64	63	62	67	72	77	80	69	74	86	93	88	88	86
Temperature—max..	60	59	56	61	59	56	56	52	61	44	37	29	33	31	43	39	42	47	35	36	31	32	49	40	57	40	40	69	72	66	
Temperature—min..	60	59	56	61	59	56	56	52	61	44	37	29	33	31	43	39	42	47	35	36	31	32	49	40	57	40	40	69	72	66	

JUNE.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Rainfall.....	....	1.06	.08	....	....	....	.12	....	.36	.44	....	....	.40	.99	....	.47	....	....	....	....	....	....	.43	.24	.44	.03	.20	....	....	....	
Rel. hum. 7:00 a. m..	95	78	78	76	71	78	79	71	63	95	99	95	84	94	71	74	90	78	70	85	75	85	90	86	69	79	89	77	83	75	....
Temperature—max..	90	85	83	68	77	84	84	85	86	69	77	81	81	81	85	84	80	76	80	85	80	84	84	88	74	74	72	69	74	81	....
Temperature—min..	67	64	50	48	49	60	57	68	64	63	55	51	54	56	60	62	57	50	56	57	54	69	60	65	57	49	49	50	56	54	....

JULY.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Rainfall.....	....	....	....	....	....	....	....	....	....	....	....	....	....	.18	.22	....	.82	....	....	....	....	....	....	....	.29	....	.38	.09	....	....	
Rel. hum. 7:00 a. m..	85	90	99	86	86	86	66	77	71	81	65	71	95	95	95	95	72	95	95	99	99	89	90	90	95	95	94	85	90	95	99
Temperature—max..	86	85	85	85	86	93	85	65	72	80	84	88	81	89	88	93	89	92	86	82	74	70	79	85	80	89	81	85	81	74	80
Temperature—min..	60	56	63	67	64	58	54	41	46	56	54	53	52	58	52	65	66	66	62	60	57	55	56	57	62	62	63	58	49	52	

AUGUST.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Rainfall.....	....	.06	.07	T	....	....	....	....	.64	....	....	....	....	....	T	....	....	....	....	....	....	1.92	.74	....	.05	....	1.35	T	....	.1	....
Rel. hum. 7:00 a. m..	84	81	74	69	90	80	67	81	71	99	78	84	80	85	69	90	85	60	83	72	81	85	95	95	81	95	99	99	81	94	76
Temperature—max..	85	87	85	85	80	82	89	94	93	85	88	91	94	84	83	94	81	71	77	84	85	93	71	84	84	87	94	74	79	83	68
Temperature—min..	61	56	63	57	60	55	65	71	67	60	55	58	62	57	62	64	51	52	48	50	59	66	63	59	67	67	65	57	50	52	44

SEPTEMBER.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Rainfall.....	....	....	....	....	.32	....	....	....	....	....	....	....	.52	....	.96	....	....	....	....	1.32	....	.60	....	....	....	....	....	....	....	....	
Rel. hum. 7:00 a. m..	68	89	82	65	95	85	67	61	95	82	82	81	94	78	87	95	95	76	74	66	74	82	85	79	94	65	77	66	70	90	....
Temperature—max..	77	78	89	89	10	78	67	78	86	92	93	87	78	81	98	87	93	92	90	88	88	88	65	72	78	66	65	66	55	60	....
Temperature—min..	51	58	57	57	57	45	43	61	66	72	62	60	58	59	62	64	67	68	73	64	63	26	42	48	46	38	41	37	30	31	....

We have followed Saccardo (*Sylloge Fungorum*) in the arrangement of orders, genera and species, and in most cases have used the synonymy given by him.

## USTILAGINEAE.

*Ustilago hypodytes* (Schlecht.) Fr.

Very abundant. On *Stipa spartea*.

*U. tritici* (Pers.) Jensen.

Not uncommon and was frequent in 1894 on *Triticum vulgare*.

*U. hordei* (Pers.) Kellerman and Swingle.

Common on *Hordeum vulgare*.

*U. nuda* (Jensen) Kellerman and Swingle.

Scarce on *Hordeum vulgare*.

*U. avenae* (Pers.) Jensen.

Not uncommon on *Avena sativa*.

*U. segetum* (Bull) Dittm.

Common on *Arrhenatherum avenaceum*.

*U. neglecta* Niessl.

Abundant on *Setaria glauca*.

*U. Rabenhorstiana* Kuhn.

On *Panicum sanguinale* abundant.

*U. maydis* (D. C.) Corda.

Abundant on *Zea mays*.

*U. pustulata* Tracy & Earle.

Locally abundant in one place, first time observed on *Panicum proliferum*.

*Tilletia-striaeformis* (Westend.) Magnus.

Not abundant on *Phleum pratense*.

*T. foetens* (B. & C.) Trelease.

Not observed in 1895.

*Schizonella melanogramma* (D. C.) Schroet.

Abundant in May, Moingona.

*Sorosporium syntherismæ* (Schw.) Farlow.

Abundant on *Panicum capillare*.

*Urocystis Agropyri* (Preuss) Schroet.

Abundant in June and early July on *Elymus Canadensis*.

## UREDINEÆ.

*Uromyces Polygoni* (Pers.) Fuckel.

Abundant August and September on *Polygonum aviculare* and *P. erectum*.

*U. Trifolii* (Hedw.) Lev.

Abundant in September on *Trifolium pratense*. This fungus has been increasing in severity, large patches of second crop of clover being affected.

*U. appendiculatus* (Pers.) Link.

Abundant on *Strophostyles angulosa*, but not observed here on *Phaseolus vulgaris*. At Indianola it was, however, destructive to the cultivated bean.

*U. Euphorbiae* Cooke & Peck.

Abundant in August and July on *Euphorbia maculata* and *E. Preslii*.

*Melampsora farinosa* (Pers.) Schroet.

Abundant on *Salix*, August and September.

*M. Populina* (Jacq.) Lev.

Abundant on *Populus monilifera*, August and September.

*Puccinia Helianthi* Schw.

Abundant on *Helianthus tuberosus* and *H. grosse-serratus* July, August and September. In August especially destructive to cultivated *Helianthus annuus*.

*P. Convolvuli* (Pers.) Cast.

Abundant on *Convolvulus sepium* July, August and September.

*Gymnosporangium macropus* Link.

Teleuto stage on *Juniperus Virginiana* not as abundant as in 1894; nor was the æcidium (*Roestelia pyrata*) so abundant on *Pyrus Iowensis*. Locally, however, in Madison county it seriously affected the leaves, stems and fruit of the wild crab. May was unfavorable for the germination and development of the teleutospores.

*Phragmidium subcorticium* (Schrank.) Winter.

Abundant on the leaves of the cultivated rose, as Madam Charles, Frederick Worth, August and September.

*Aecidium Grossulariae* Schum.

Not so common as in 1894 on *Ribes Grossulariae*, *R. gracile*.

*Uredo Caeoma-nitens* Schw.

(*C. interstitiale*, Schlecht and is supposed to be connected with *Puccinia Peckiana*.) Abundant on *Rubus villosus*; large patches of native blackberry destroyed; seriously affecting cultivated blackberry locally. It was also observed in Story, Polk, Louisa and Henry counties.

*P. Graminis* Pers.

Not common on *Triticum vulgare*, *Avena sativa* and *Hordeum jubatum*. June and July. *Aecidium* abundant on *Berberis vulgaris* May-June. Very destructive on fall sown oats and wheat. August and September; also *Hordeum jubatum*.

*P. coronata* Corda.

Not common on *Avena sativa*, June and July. Abundant August and September. Klebahn has recently separated another species out of what has passed as this, until further work in this country, the species is used here as it is by American authors generally.

*P. rubigo-vera* (D. C.) Wint.

Not common, on wheat June and July. Abundant on fall sown wheat, *Hordeum jubatum*, August and September. Squirrel-tail grass is held in check by this fungus.

*P. Sorghi* Schw.

Abundant August and September on *Zea Mays*.

*P. emaculata* Schw.

Abundant on *Panicum capillare* August and September.

*P. Andropogonis* Schw.

Not abundant on *Andropogon furcatus*. *A. scoparius*, August and September.

*P. Xanthii* Schw.

Abundant on *Xanthium Canadense*, July, August and September. In low grounds destroyed a large number of plants.

## PERONOSPORACEÆ.

*Cystopus candidus* (Pers.). Lev.

Abundant early in the season on *Lepidium intermedium*, *L. Virginicum*, *Capsella bursa-pastoris*. Later, oospores abundant in inflorescence of *Rhaphanus sativa*.

*C. Tragopogonis* (Pers.) Schroet.

Locally abundant in June and early July.

*C. Portulacæ* (D. C.) Lev.

Abundant on *Portulaca oleracea* from the middle of June to the first of September. Oospores abundant.

*C. Bliti* (Biv.) De By.

Abundant July, August and September on *Amarantus albus*, *A. retroflexus*. More severe on the latter species.

*Sclerospora graminicola* (Sacc.) Schroet.

Abundant during the latter part of May till middle of June,

destroying large numbers of young plants of *Setaria viridis*. In whole patches it prevented the maturing of seeds.

*Plasmopara Viticola* (B. and C.) B. and DeT.

Abundant. Destructive to cultivated grape (*Vitis Labrusca*), affecting leaf, stem and fruit. Also affecting the growing of young shoots of *Vitis riparia*, in some cases killing the young shoots.

*P. Halstedii* (Farlow) B. and DeT.

Not common, on *Helianthus annuus*, *H. tuberosus*, *Silphium laciniatum*, *Xanthium Canadense*, *Centaurea*.

*Bremia Lactuæ* Regel.

Not observed although abundant in 1893.

*Peronospora Viciæ* (Berk.) DeBy.

Abundant in latter part of May and early June on *Vicia Americana*.

*P. Arthuri* Farlow.

Abundant on *Oenothera biennis*.

*P. parasitica* (Pers.) DeBy.

Abundant on leaves and stems of *Lepidium intermedia*, *L. Virginicum*, killing the affected plants. On leaves of *Capsella bursa pastoris* not destructive. *Brassica nigra*, *B. campestris*, *Raphanus sativa*, *Draba Caroliniana*. *Sisymbrium officinale* seriously affected.

*P. Potentillæ* DeBy.

Not found in 1895. Local in 1894.

*P. effusa* (Grev) Rabenh.

Abundant on *Chenopodium album* in May and June.

*P. Euphorbiæ* Fuck.

Locally abundant on *Euphorbia Preslii* and *E. maculata*.

*P. alta* Fuckel.

Abundant on *Plantago major*.

#### PERISPORIACEAE.

*Podosphaera Oxyacanthæ* (D. C.) De By.

Abundant on cultivated (*Prunus Cerasus*) and *P. pumila*. Not common on *P. Americana*; also observed on young shoots of *Crataegos punctata*, and *C. mollis*; July, August and September.

*Spærotheca Mali* (Duby) Burrill.

Common on suckers of *Pyrus Malus* and young shoots of *P. toringo* in nursery, June, July and early August.

*S. Mors-uvae* (Schw.) Berk & Curt.

Abundant on *Ribes Grossulariæ*, *R. floridum*, June, July; leaves, stem and fruit.

*Phyllactinia suffulta* (Reb.), Sacc.

Abundant on *Fraxinus Americana*, August and September.

*Uncinula necator* (Schw.) Burrill.

Common on *Vitis Labrusca*, Concord, Worden and especially Roger hybrids (Agawam).

*Microsphaera Alni* (D. C.) Wint.

Abundant on *Syringa vulgaris*, *S. Persica*, *Lonicera*, August and September. Abundant latter part of August and September.

*Erysiphe Cichoracearum* D. C.

Very abundant on *Helianthus annuus*, *H. tuberosus*. Not so common on *H. grosseserratus*. Abundant on *Ambrosia artemisiaefolia*, *A. trifida*, *Artemisia*, *Ludoviciana*; generally attacked by *Cicinnobulus Cesatii*. Abundant on *Verbena stricta*; less common on *V. hastata*.

*E. communis* (Wallr.) Schl.

Abundant on *Rannuculus abortivus* and *Amphicarpæa monoica*.

#### SPHÆRIACEÆ.

*Phyalospora Bidwellii* (Ell.) Sacc.

None observed in 1895.

#### DOTHIDEACEÆ.

*Phyllachora Graminis* (Pers.) Fuck.

Common on *Muhlenbergia Mexicana*, *Elymus Canadensis*, *Panicum scoparium* *Asprella hystrix*.

*P. Trifolii* (Pers.) Fuck.

Abundant, conditial stage on *Trifolium pratense*, September.

*Plowrightia morbosa* (Schw.) Sacc.

Abundant on *Prunus domestica*, *P. Padus*, and wild *P. Americana*, *P. Virginiana* and Japan plum.

#### GYMNOASACEÆ.

*Exoascus communis* Sadebeck.

Rare on *Prunus Americana* in 1895; abundant on *Prunus Cerasus* and *P. domestica*. Nursery stock defoliated in August. Not as severe on *P. Americana*. Also occurred on *P. Mahaleb* and *P. avium*.

#### HYPHOMYCETEÆ-MUCEDINEÆ.

*Monilia fructigena* Pers.

Abundant late in season on fruit of *Prunus Americana*.



DEMATIACEÆ.

*Cladosporium carpophilum* Thum.

Rare on *Prunus Americana*, but abundant on *Cratægus mollis* late in August and September.

*Helminthosporium Graminum* Rabh.

Not common on *Hordeum vulgare* in July.

*Cercospora Resedæ* Fuck.

Abundant on *Reseda odorata* in August and September.

*C. Beticola* Sacc.

Abundant on *Beta vulgaris*. (Sugar and mangel beets).  
September. In some cases leaves completely covered  
with cinereous spots.

*C. angulata* Winter.

Abundant on *Ribes rubrum*, shrubs nearly defoliated latter part of July and early August. Fungus appeared early in May.

SPHÆROPSIDÆ SPHÆROIDACEÆ.

*Septoria Rubi* West.

Abundant on *Rubus odoratus*, *R. canadensis* August and September.

*Septoria Ribis* Desm.

Abundant on *Ribes nigrum*, June and September.

Melanconiaceæ.

*Cylindrosporium Padi* Karst.

Abundant on Cherry.

*Marsonia Juglandis* Sacc.

Trees of *Juglans cinerea* nearly defoliated by middle of August. Not so severe on *Juglans nigra*.

*M. Martini* Sacc.

Abundant on *Quercus robur*; majority of leaves affected; also occurred on *Q. macrocarpa*.

BACTERIACÆ.

*Bacillus amylovorus* (Burrill) Trev.

Blight more severe than in 1894. *Pyrus Malus*, *P. prunifolia*, *P. Sinensis*, *P. communis* and *P. Iowensis* especially severe on the following varieties of *P. Malus*: Yellow Transparent apple, Red Queen-Lead, Arabskoe Antonovka, Thaler, Oldenburg. It seems, also, to have been severe in other parts of the state. Fruiting orchards less affected than nursery stock. It would seem that the condition of the soil may influence the

severity of the disease. We should also observe that flowers are occasionally affected, but not so severe as in 1894. The disease gradually subsided by the middle of July and early August.

*B. Sorghi* W. A. Kellerman.

Not severe. It occurred on *Andropogon Sorghum* var *Halepense* and *A. Sorghum* (*Sorghum*).

*B. cloaceæ* (Jordan).

On *Zea* mays; not abundant.

*B. campestris* Pammel.

Not observed in 1895.

## SOME ANATOMICAL STUDIES OF THE LEAVES OF SPOROBULUS AND PANICUM.

EMMA SIRRINE AND EMMA PAMMEL.

Numerous writers have called attention to the value of anatomical studies for diagnostic purposes in the recognition of Phaenogams. We may note in this connection the paper by Pfister, who has made a comparative study of the leaves of some palms.

The author considers anatomical characters of value because so many palms are collected without flower or fruit. Bertrand<sup>2</sup> in a general paper considers the characters and important points to be observed in making anatomical studies of this kind. He notes that we must not lose sight of: 1. Inequalities in the grouping of subdivisions with the association of higher groups. 2. The paucity of material of certain forms, many intermediate species having disappeared in the lapse of time. These objections hold with equal truth to the characters now used in the classification of Phaenogams. He states that there are good differential characters in fibro-vascular bundle found in Gymnosperms, vascular cryptogams and Phaenogams, but the arrangement of the fibro-vascular bundle is of less value. For the families such characters as the veins of leaf; development of stomata; secretion reservoirs; arrangement of inner phloem; for species the cuticle and trichomes are of value in diagnosis.

<sup>1</sup>Beitraege zur vergleichenden Anatomie der Sabaleen Blartter. Inaugural Diss. 2 plates, Hofer and Burger (1892) Abst. Bot. Centralblatt, LI, p. 300.

<sup>2</sup>Des caracteres que l'anatomie peut fournir a classification des vegetaux, pp. 54-55. Antun (Dejussieu) 1891, Abst. Bot. Centralblatt Vol. L. p. 375.