

in ordinary practice it was nevertheless sufficiently high to insure killing all spores with which it came in contact. Four lots of seed were treated, for periods varying from one to four hours in the cold water and from ten to thirty minutes in the hot water. The highest germination obtained was from seed which had been soaked four hours in cold water and ten minutes in the hot water.

#### SUMMARY.

A careful consideration of the evidence at hand would seem to indicate that in themselves smut spores are easily destroyed by either formalin or hot water treatments.

Owing to the somewhat impervious nature of the seed coats of wheat, and the not improbable fact that spores find lodgment in the interstices of them, it is difficult to reach and kill all the spores with any ordinary method of treatment.

To render the seed coats of wheat susceptible to such agencies as are commonly employed for the prevention of smut, it appears to be necessary, even imperative, that they should be soaked for some time in cold or tepid water prior to treatment.

A three hours' soaking in cold water and a quarter-hour treatment in an .18 per cent. formalin solution did not materially injure the viability of the seeds.

Seeds soaked four hours in cold water and then treated ten minutes in water at 120 degrees F. gave slightly better germination than the untreated seeds.

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### SOME ADDITIONS TO THE FLORA OF INDIANA.

WILLIAM STUART.

The accompanying list of flowering and fungous plants are some which have been collected by the writer during the past two seasons. In the flowering plants, out of a list of five, three are far removed from the range to which they are accredited.

In presenting the list it has been thought desirable to append a few notes under each species, giving the locality and soil in which they were collected, together with such other observations as might be deemed of interest.

## FLOWERING PLANTS.

1. *Agropyron occidentale* Scribn. (*A. Spicatum* L. & L.) Colorado Blue-stem. Tippecanoe County.

This species is not listed in Britton and Brown, but may be found in the revised edition of Bulletin 17 of Division of Agrostology, United States Department of Agriculture, p. 298, 1901. According to Scribner it is found "in dry or moist soil, Wisconsin to Iowa, and westward to Washington, Texas and Arizona." It was found in abundance by the writer along the Wabash and Monon railroads south of Lafayette, in dry, gravelly soil. Its introduction into the State is doubtless due to the railroads.

2. *Sporobolus neglectus* Nash. (*S. vaginaeflorus* Vasey.) Small Rush-grass. Tippecanoe County.

Found growing in abundance along sidewalks in West Lafayette. No other station noted.

3. *Chenopodium murale* L. Nettle-leaved Goosefoot. Tippecanoe County. Collected along sidewalk in Lafayette.

4. *Astragalus Tennesseensis* Asa Gray. Tennessee Milk Vetch. Tippecanoe County.

This plant was collected in sandy bottom land along the Wea Creek, about four miles south of Lafayette, and some two hundred yards down stream from the Wabash railroad bridge. It is probable that it owes its introduction into the State to the railroad. Not very abundant. Of this plant Britton and Brown say: "On hillsides, Tennessee to Alabama and Missouri, March to May." It was collected in fruit the latter part of May.

5. *Psoralea tenuiflora* Pursh. Few-flowered Psoralea. Tippecanoe County.

Found growing along the Wabash railroad south of Lafayette. Not abundant. Collected in fruit July 7, 1901. Britton and Brown give the range as follows: "Prairies of Illinois and Minnesota to Texas and Sonora west to Colorado and Montana, May to October."

## PLANT RUSTS.

6. *Puccinia vexans* Farlow. On *Bouteloa curtipendula* (Michx.) Fon. Tippecanoe County. II, III, collected July 20, 1900.
7. *Puccinia panici* Dietl. On *Panicum virgatum* L. Tippecanoe County. III, collected May 30, 1901. (Teleutospores of previous season.) II, collected June 22.

This rust was collected on an isolated clump of *Panicum virgatum*, in the same region as that in which *P. vexans* was found. The date of the formation of teleutospores was not obtained owing to the destruction of the grass by fire.

8. *Aecidium Pammelii* Trelease. On *Euphorbia corollata* L. Tippecanoe County.

This aecidium was collected June 9, 1901, on plants of *E. corollata*, which were growing in close proximity to the clump of *P. virgatum* that was affected with the rust *P. panici*. The absence of any other aecidium suggested to the writer that possibly this was the aecidial stage of *P. panici*. Accordingly some of the affected *Euphorbia* leaves were collected and inoculations made upon potted plants of *P. virgatum* in the station greenhouse. Leaves of these plants were inoculated June 11 and 14, the latter being made with freshly collected material. In each instance well-developed uredosori were obtained in eight days from the time of infection. As both inoculations were entirely successful, it would appear reasonably certain that *A. Pammelii* on *E. corollata* is the aecidial stage of *P. panici* on *P. virgatum*.

9. *Aecidium physalides* Pk. On *Physalis heterophylla* Nees. Tippecanoe County. Collected May 22, 1901.

The writer wishes to acknowledge his indebtedness to Dr. Arthur for the determination of the rusts.

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## EFFECT OF THE COMPOSITION OF THE SOIL UPON THE MINUTE STRUCTURE OF PLANTS.\*

HERMAN B. DORNER.

The growth and distribution of plants are dependent upon four factors, namely, light, temperature, moisture and soil. Under moisture are included both that of the soil and that of the atmosphere. Soil and moisture may well be treated together, since the one is greatly dependent upon the other. In the work carried out, the only factor which was varied was that of the soil.

The changes occurring in plant structures, due to the variation of any of these factors, may be divided into two groups. These may be con-

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