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NOTE ON THE VARIATIONS IN THE TELEUTO- SPORES OF PUCCINIA WINDSORIÆ.

JOSEPH ALLEN WARREN.

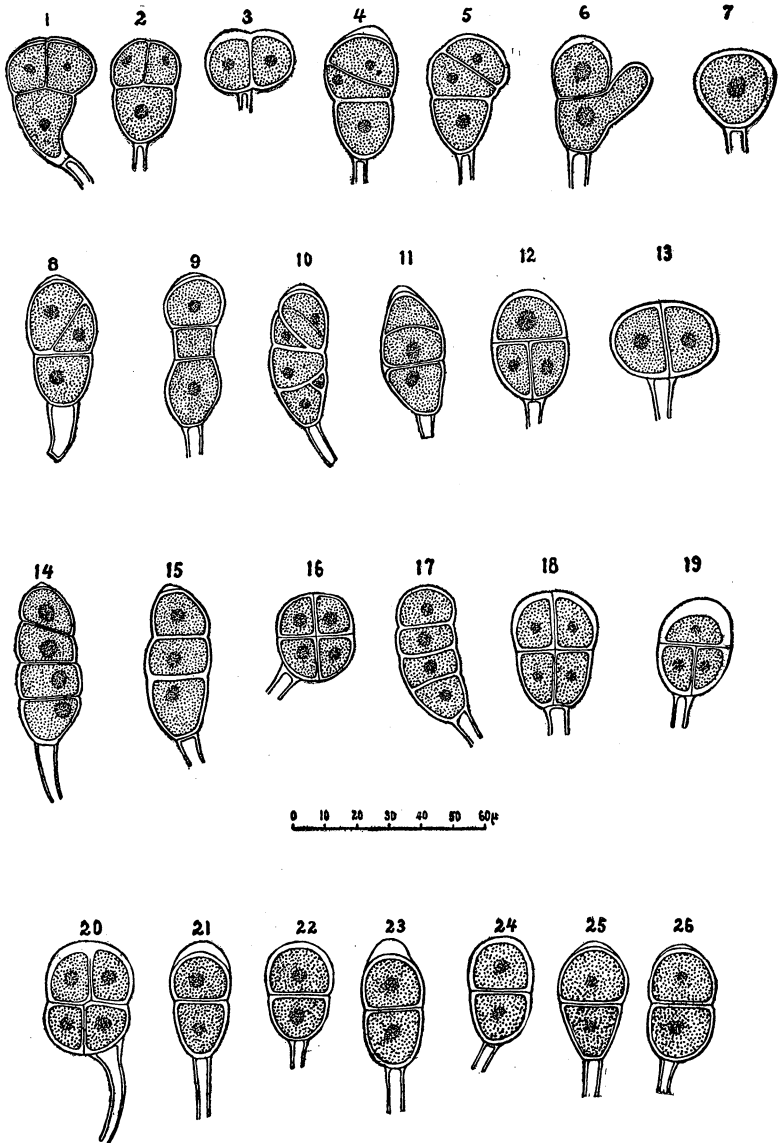
EVERY one who has studied the rusts has observed that the teleutospores are often very irregular in their general shape, number of cells, and the relation of the cells to one another. This fact has frequently been recorded, and is often referred to in books and papers on the Uredineæ. In studying the teleutospores of *Puccinia windsoriæ* Schw., collected in a scattered maple grove on the "bottom land" bordering a small creek near Lincoln, Neb., March 31, 1898, on *Muhlenbergia racemosa* B. S. P., I found some more than usually interesting forms, which are shown in the accompanying plate.

In the genus to which this species is referred there are two cells in the teleutospore, as shown in Figs. 21-26, but a reference to the plate shows one-celled, two-celled, three-celled, four-celled, and five-celled forms. Normally also the two cells lie in the extension of the axis of the pedicel, as in Figs. 21-23 and 25, but all kinds of departures from the normal may be observed on the plate. Out of 572 spores counted in several mounts from different leaves, the microscope fields being taken at random, I found 27 abnormal spores, or about $4\frac{3}{4}$ per cent. On some leaves the proportion of abnormal spores was much higher, and in one cluster of 11 spores still holding together in the mount, five had more than two cells.

Of the 572 spores referred to above —

- 1 (or 1.93 per cent) were three-celled, with septa parallel.
- 12 (or 2.10 per cent) were three-celled, with septa in two planes.
- 1 (or .17 per cent) was four-celled, with septa in one plane.
- 1 (or .17 per cent) was one-celled.
- 2 (or .35 per cent) were turned upon their pedicels.

In other mounts I found several four-celled spores, with the septa in two planes, as in Figs. 16, 18, and 20.



FIGS. 1 and 2.—Three-celled form, with single cell basal. **FIGS. 3 and 13.**—Two-celled form, turned upon the pedicel. **FIGS. 4, 5, 8, and 10.**—Forms intermediate between 1, 2, and 9, 11, 14, 15, and 17. **FIG. 6.**—Two-celled form, with lower cell branched. **FIG. 7.**—One-celled form. **FIGS. 9, 11, 14, 15, and 17.**—Three and four-celled forms, with septa parallel. **FIGS. 12 and 19.**—Three-celled form, with single apical cell. **FIGS. 16, 18, and 20.**—Four-celled form, with septa at right angles. **FIGS. 21 to 26.**—Normal form. (Scale of micromillimeters on plate.)

If the variations found in these specimens were to become permanent, we should have representatives of at least four genera in this single species, or we should have to discard or modify our present notions as to the relationship and classification of Uredineæ. It may be that the morphology of the teleutospore is not to be considered of as much importance as we have supposed. One-celled teleutospores (Fig. 7) are common, and if these should eventually predominate the species must be referred to *Uromyces*, or *Melampsora*, instead of *Puccinia*. If such forms as Figs. 1, 2, 12, and 19 become most common, we must refer the species to *Triphragmium*. The forms shown in Figs. 16, 18, and 20 may be allied to the latter, with an additional septum. If spores like Figs. 4, 5, 9, 11, 14, 15, and 17 were most numerous, we could not avoid referring the species to the genus *Phragmidium*. Yet all these forms have been found in this species, often on the same leaf, and nearly all have occasionally been found in the same sorus. In my specimens nearly every leaf contained a number of several-celled spores, but I found them more numerous on the leaves which lay near the ground, those which stood free in the air bearing fewer abnormal spores.

The normal spores agree well with Burrill's description in his "Parasitic Fungi of Illinois,"¹ though more variable in size. I measured 58 spores and found them to be 16.8 to 24 μ by 26.4 to 48 μ , averaging 20.8 by 34.3 μ , while Burrill's measurements are 18 to 21 by 27 to 30 μ .

I have examined herbarium specimens of this species from Iowa, Illinois, and Nebraska (Lincoln, 1889), but found no spores with more than three cells.

UNIVERSITY OF NEBRASKA.

¹ Parasitic Fungi of Illinois, Pt. i, Uredineæ, by T. J. Burrill, in *Bull. Ill. State Lab. Nat. Hist.*, 1885.