

OBSERVATIONS CONCERNING PUCCINIA PATTERSONIANA AND
PUCCINIA MORENIANA.¹

E. B. MAINS.

Puccinia Pattersoniana was described by Dr. J. C. Arthur² from material collected by F. W. Anderson at Sandcoulee, Cascade County, Montana, in July, 1888. The host was a grass, *Agropyron spicatum* (Pursh.) Rydb., and this rust has since been found on *Elymus condensatus* Presl., *E. triticoides* Buckl., and *Sitanion jubatum* J. G. Smith in Oregon, Washington, Utah, California, and New Mexico. *Puccinia Pattersoniana* is unique among the grass rusts in that it has verrucose teliospores with the markings arranged in longitudinal lines. While studying some collections of this rust, another interesting character was found in this species. It was noticed that chloral hydrate and iodine, which was being used to bring out the pore character of the urediniospores, stained the pedicels of the teliospores a dark blue. A study of other collections in the Arthur Herbarium, including the type, showed that this character held true for all. The pedicels stained very heavily, many becoming a very dark blue, appearing almost black for a greater part of their length. Herbarium specimens of this rust when sectioned and treated with iodine, showed the stain only in the pedicels of the teliospores, the mycelium from which they arose and the pedicels of the urediniospores not staining. This reaction of iodine appears similar to that found in some of the Ascomycetes (Plicaria, etc.), where the apical portion of the ascus takes a similar stain.

Further interesting light was thrown on this fungus in the summer of 1920 by Prof. A. O. Garrett,³ who noted that apparently the only aecia associated with *Puccinia Pattersoniana* at Gogorza, Summit County, Utah, were on *Brodiaea Douglasii*, supposedly belonging to the autoecious *Uromyces Brodiaeae* Ellis & Hark. Prof. Garrett suggests that these aecia might be in reality the aecial stage of *Puccinia Pattersoniana*, since the latter was especially abundant there, and he was not able to find any further development of the rust on *Brodiaea*. Unfortunately attempts to prove this connection were unsuccessful, since the teliospores from collections sent by Prof. Garrett failed to germinate the next spring. It occurred to the writer, however, that some definite evidence might be obtained as to this connection by the method so successfully used by Tranzschel in connecting several heteroecious rusts with their aecial stage. In making these connections, he made use of the observations made by Dietel⁴ and Fischer,⁵ who noted that a num-

¹ Contribution from the Botanical Department, Purdue University Agricultural Experiment Station.

² Arthur, J. C. Bull. Torrey Club 33, p. 29, 1906.

³ Garrett, A. O. Mycologia 13, p. 104 and 110, 1921.

⁴ Dietel, P. Uredinales, In Engler & Prantl. Natürliche Pflanzenfamilien I. 1** p. 69. 1897.

⁵ Fischer, Ed. Beiträge Kryptogamen Flora Schweiz 1, p. 109, 1898.



PLATE I.

ber of short cycled species of rusts possessed teliospores very similar to the teliospores of heteroecious long cycled species whose aecia were produced on the host of the short cycled species. Thus Tranzschel⁶ noted the striking similarity between the teliospores of *Puccinia Pruni-spinosae* Pers. on *Amygdalus communis* and the teliospores of *Puccinia fusca* Winter on *Anemone*. *Aecidium punctatum* Pers., an unconnected aecial form, was known to occur upon *Anemone* and when aeciospores from this were sown on *Amygdalus communis*, *Puccinia Pruni-spinosae* was produced. In like manner several other rusts were successfully connected.

In consequence, it was thought that if *Puccinia Pattersoniana* is connected with aecia on *Brodiaea*, a short cycled rust having teliospores with the distinguishing characteristics of those of *P. Pattersoniana* should occur on some species of *Brodiaea*. In order that this search might be as complete as possible, all the species represented in the Arthur herbarium, which occur on *Brodiaea*, were examined, including *Puccinia Carnegiana* Arth., *P. subangulata* Holw., *P. Dichelostemmae* D. & H., *P. tumamocensis* Arth., *P. nodosa* Ell. & Hark., *P. Moreniana* Diet. & Thomp. and *Uromyces Brodiaeae* Ellis & Hark. Of these only *Puccinia Moreniana* on *Brodiaea capitata* Benth. showed teliospores with pedicels staining with iodine and these took a dark blue stain similar to those of *Puccinia Pattersoniana*. Not only does *P. Moreniana* resemble *P. Pattersoniana* in this respect but the teliospores of the two are nearly identical in size, wall thickness and in the verrucose markings in lines.

In the light of the observations of Dietel and Fischer and the work of Tranzschel, the striking resemblance between the teliospores of these two rusts strongly indicates that *Puccinia Pattersoniana* has its aecial stage on *Brodiaea*. This also, when taken with the field association noted by Prof. Garrett, can leave but little doubt as to the connection.

⁶Tranzschel, W. Travaux de la Soc. Imper. des Naturalistes de St. Petersbourg 25:286-297. 1904. Abstract in Botanisches Centralblatt 98:150-151. 1905.

DESCRIPTION OF PLATE

PLATE I

A.—Teliospores of *Puccinia Pattersoniana* from the type collection on *Agropyron spicatum* with pedicels stained blue by iodine.

B.—Teliospores of *Puccinia Moreniana* from the type collection on *Brodiaea capitata* with pedicels stained blue by iodine.

