

UREDINALES FROM S.W. ASIA

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This second contribution to the knowledge of the rust flora of Turkey and neighbouring countries deals with the collections made by Dr. P. H. Davis and Mr. I. C. Hedge during their extensive collecting expedition in 1957 and with a few rusted specimens found in the Edinburgh phanerogamic herbarium. As previously (Henderson, 1957) I am indebted to my colleagues for numerous identifications and the checking of host plants.

Aecidium asperifolii Pers., Syn. Meth. Fung. 208 (1801).

On *Moltkia caerulea* (Willd.) Lehm.; Turkey: Prov. Erzincan, Tercan, 1450 m., June 1957, Davis & Hedge 29340.

Aecidia hypophyllous and occasionally epiphyllous in pustular groups. Peridium lacinate. Peridial cells $22-26 \times 20-22\mu$ in section, inner wall of cells rough, 3μ thick, outer smooth up to 6μ . Aecidiospores subglobose to broadly elliptic, $22-26 \times 20-24\mu$, thin walled.

This specimen almost certainly belongs to the *Puccinia recondita* group alternating between members of the Boraginaceae and Gramineae for which a number of taxa—*P. bromina*, *P. cerinthes-agropyrina*, *P. aegilopsis*, *P. symphyti-bromorum*—have been proposed according to dicaryont specialisation, but none can be distinguished in the aecidial stage. *Moltkia* appears to be a new aecidial host genus for the group.

Aecidium leonticis Tranz. in Acta Hort. Bot. Univ. Imp. Jurjevensis, ii, 91 (1901).

On *Leontice leontopetalum* L.; Turkey: Prov. Ankara, N. end of Tuz Gölü, 900 m., 1 April 1957, Davis & Hedge 26293.

Spermogonia and aecidia only, on large orange hypophyllous spots.

The aecidium on *Leontice* is generally assumed to belong to *Uromyces* (*Alveomyces*) *vesicatorius* (Bubak) Nattrass and this collection agrees with the aecidia described for that species, but Tranzschel (1939) has suggested that aecidia on *Leontice* may belong to the life cycle of a heteroecious species, *Uromyces fragilipes* Tranz.

Aecidium phlomidis Thuem. in Bull. Soc. Nat. Moscou, lii, 136 (1877).

On *Phlomis capitata* Boiss.; Turkey: Prov. Maraş, Ahir dağı, 1300 m., May 1957, Davis & Hedge 27387.

Spermogonia and aecidia only, completely covering the surfaces of attacked leaves. Aecidiospores faintly echinulate $22-26\mu$ in diameter.

This collection almost certainly belongs to *Puccinia phlomidis* Thuem.

Caeoma sp.

On *Paonia arietina* Anders.; Turkey: Prov. Tunçeli, Pülümür—Selepur, 1900 m., in oak and willow thickets, 8 June 1957, Davis & Hedge 29299.

Caeomata hypophyllous, 1-1.5 mm. in diameter, in circinate group 0.5 cm. in diameter, orange, with subepidermal spermogonia of *Melampsora*

type on upper surface diffuse. Spermogonia with definite wall, spermatophores simple, forming a palisade layer. Caeomasporae, broadly elliptic, $16-20 \times 15-17 \mu$, finely verruculose, wall 4μ thick, hyaline with numerous scattered pores. According to Dr. Davis's notes, the host was growing in a *Salix-Quercus* association so that it is most probably a *Salix*-alternating species. If the taxonomic relationships of the caeoma host are important in this group then *Melampsora chelidonii-pierottii* Mats. alternating between *Chelidonium* spp. and *Salix pierottii* in Japan is the nearest relative. The paecomy caeomata agree completely with Matsumoto's description of the Japanese species (Matsumoto, 1926). Unfortunately the willow specimens (*Salix* sp. aff. *cinerea*) collected in the same locality by Dr. Davis bear no rust sori.

Coleosporium inulae Rabh. in Bot. Zeitung ix, 455 (1851).

On *Inula heterolepis* Boiss.; Turkey: Prov. Gümüşane, Gümüşane, 1800 m., August 1957, *Davis & Hedge* 31942. Uredinia only.

On *Inula helenium* L.; Turkey: Prov. Çoruh (Artvin), Yalnızçam Dağları below Kütül, 1900 m., August 1957, *Davis & Hedge* 32462. Uredinia only.

Melampsora euphorbiae (Schub.) Cast., Obs. Pl. Acotyl. ii, 18 (1843).

On *Euphorbia* sp.; Turkey: Prov. Erzincan, Keşiş dağ above Cimin, 1800 m., July 1957, *Davis & Hedge* 31723.

On *Euphorbia* sp.; Turkey: Prov. Erzurum, W. of Ilica, 1850 m., July 1957, *Davis & Hedge* 30857.

On *Euphorbia* sp.; Turkey: Prov. Diyarbakir, Diyarbakir-Ergani, 750 m., June 1957, *Davis & Hedge* 28806.

On *Euphorbia* sp.; Turkey: Prov. Tunceli, Munzur dağ above Ovacik, 2300 m., July 1957, *Davis & Hedge* 31307.

All with uredinia only.

Melampsora lini (Ehrenb.) Lév. in Ann. Sci. Nat., Sér. 3, viii, 376 (1847).

On *Linum mucronatum* Bertol.; Turkey: Prov. Tunceli, Tunceli—Pülümür, 1100 m., May 1957, *Davis & Hedge* 29230.

Uredinia only.

Phragmidium fragariae (DC.) Rabh., Herb. Myc. 1987 (1855).

On *Potentilla* sp.; Turkey: Prov. Gümüşane, pass between Köse and Gümüşane, 2000 m., 2 August 1957, *Davis & Hedge* 31961.

Puccinia arabidis D. M. Henderson, sp. nov.

Telia hypophylla, 1 mm. diametro, epidermide argentea fissa, cincta. Teliosporae pulverulentae obscure brunneae, oblonge ellipticae, medio constricto, $30-40 \times 18-22 \mu$. Episporius brunneus, $1-1.5 \mu$ ad apicem $3-3.5 \mu$ crassus, verrucis in lineis ornatus. Pedicellus $4-5 \mu$ longus, hyalinus. Porus cellulae superioris ad apicem, cellulae inferioris ad pedicellum, dispositus.

In foliis Arabidis graellsii-formis Hedge; Asia Minor: Cilo dağ, 9 August 1954, leg. *Davis & Polunin* 24178A. (E-holotypus, K.)

Telia hypophyllous, 1 mm. in diameter, surrounded by the ruptured silvery epidermis. Teliospores in mass dark brown, pulverulent, oblong elliptic, slightly constricted at the septum, $30-40 \times 18-22 \mu$. Teliospore

wall brown, $1-1.5\mu$ thick and $3-3.5\mu$ at the thickened apex, wall ornamentation of isolated warts arranged in slightly irregular longitudinal rows. Stipe short, $4-5\mu$, hyaline. Pore in upper cell apical, in lower basal, next to the stipe insertion. (Fig. 1.)

This species undoubtedly belongs to a well-characterized group of microcyclic species on various genera of the *Cruciferae*. It resembles *P. graellsiae* and *P. drabae* in the rather coarse wall ornamentation which in the former is fused at least partially to form longitudinal striae and in

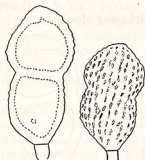


FIG. 1. Teliospores of *Puccinia arabis* (Davis & Hedge 24178A): $\times 1000$.

the latter is isolated as in the species under consideration. Moreover, *P. graellsiae* has the pore in the lower cell of the teliospore superior, next to the septum, in contrast to the basal position in *P. drabae* and the *Arabis* rust. *P. drabae*, from the material I have seen, is similar morphologically to the *Arabis* rust but the teliospores are never apically thickened (in *P. arabis* up to 3.5μ) and are on average somewhat smaller; *P. drabae* mostly about $30 \times 22\mu$; *P. arabis* mostly $35 \times 22\mu$.

***Puccinia ballotae* D. M. Henderson, sp. nov.**

Telia caulicola, erumpentia, usque ad 2 cm. longa, 0.75 cm. lataque, compacta, obscure brunnea vel fere nigra, epiderme fracto cincta. Teliosporae plurimae bicellulares, paucae unicellulares tricellularesque, oblongo-ellipticae, medio constricto, $41-50 \times 21-26\mu$, episporio levi, apice $4-6\mu$ crasso. Stipes hyalina, usque ad 120μ longa, persistens.

Holotypus: in caulibus *Ballotae saxatilis* Sieb. prope Kizilçahamam, Asia Minor, leg. Davis & Hedge 32855 (E-holotypus, K).

Species ex affinitate *Pucciniae polii*, sed in sporis angustioribus et plantis hospitalibus differt.

Telia forming erumpent pustules up to 2 cm. long and 0.75 cm. wide on stems, not pulverulent, surrounded by papery ruptured epidermis, dark chocolate or almost black. Teliospores, a few 1-celled and less than one per cent. 3-celled, oblong-elliptic, constricted at cross wall, pores not observed, wall smooth, $41-50 \times 21-26\mu$, apex with thickened cap, $4-6(-10)\mu$. Stipe hyaline up to 120μ long, persistent. (Fig. 2.)

This species is clearly allied to a group of microcyclic species all with compact, black or very dark brown sori on other labiate genera and especially to species on *Teucrium*. *P. bithynica* Magnus belongs to the same affinity but produces uredospores sparingly in the telia. The accompanying key summarises the differential characters of the taxa involved.

Teliospores with apical thickening.

Pedicels deciduous, III's $28-42 \times 16-27\mu$

P. constricta (Lagerh.) Bub.

Pedicels persistent

Teliospores narrow (usually less than 20μ)

P. polii Guyot (= *P. teucriicola* Katajev) and

P. majoricensis Maire

Teliospores broader (usually more than 22μ)

P. ballotae D. M. Henderson

Conspicuous apical thickening absent

P. istriaca Syd.

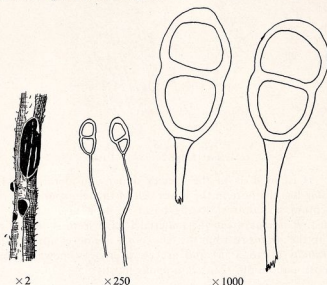


FIG. 2. Cauliculous sori and teliospores of *Puccinia ballotae* (Davis & Hedge 32855).

Puccinia bupleuri Rud. in Linnaea, iv, 514 (1829).

On *Bupleurum* sp.; Turkey: Prov. Diyarbakir, Diyarbakir—Ergani, 750 m., 1 June 1954, Davis 28802.

Puccinia calcitrapae DC., Fl. Fr. ii, 221 (1805).

On *Echinops* sp. aff. *viscosus* DC.; Turkey: Prov. Erzincan, Aşkale—Terecan, 1700 m., 25 May 1957, Davis & Hedge 32658.

On *Echinops* sp. aff. *viscosus* DC.; Turkey: Prov. Kars, Haçuvan, 1800 m., 20 August 1957, Davis & Hedge 32575.

Uredospores echinulate $28-32 \times 27-29\mu$ with three equatorial pores. Teliospores minutely verruculose, $36-42 \times 22-25\mu$, constricted at septum, upper pore subapical, lower in upper half.

This rust on *Echinops* is most frequently referred to *P. echinopsis* but it is morphologically indistinguishable from the wide ranging *P. calcitrapae*.

On *Centaurea virgata* Lam. var. *squarrosa* (Willd.) Boiss.; Turkey: Prov. Tunceli, above Pertek, 1600 m., July 1957, Davis & Hedge 31037.

Puccinia crucianellae Desm. in Ann. Sci. Nat., Ser. 3, viii, 12 (1847).

On *Crucianella macrostachya* Boiss.; Transjordan: bluff above Zerka river, Jordan valley, April 1954, leg. E. K. Trought.

Uredospores few, mixed with teliospores. Teliospores smooth slightly constricted at septum, $48-52 \times 21-26\mu$, apex very thick $8-12\mu$, rather blunt, stipe persistent $28-32\mu$ long. Pore apical in upper cell, at septum in lower cell.

This species has been recorded from many countries from Spain eastwards to Tadzhikistan (see Guyot, 1952).

Puccinia heterophylla Cooke in Grevillea, ix, 14 (1880).

On *Serratula cerinthefolia* Sb. & Sm.; Turkey: Prov. Gaziantep, Dülük Baba, 1100 m., 12 May 1957, *Davis & Hedge* 27881.

Uredinia and telia hypophyllous, abundant, often confluent, uredospores globose $20-23\mu$ in diameter, echinulate with 3 equatorial pores. Teliospores oblong elliptic, slightly constricted, $32-36 \times 23-27\mu$, wall verrucose, upper pore subapical, lower pore depressed one third, stipe short.

It seems very probable that *P. heterophylla* is the earliest correct name for *P. schirajewskii* Tranz. and *P. serratulae-pinnatifidae* Fragoso. At least they are all closely allied to *P. punctiformis* and may eventually be placed under that species. Spermogonia appear to be lacking in *P. heterophylla* and *P. serratulae-pinnatifidae*.

Puccinia hieracii Mart., Prod. Fl. Mosq. 227 (1817).

On *Taraxacum megalorhizon* (Forsk.) Hand.—Mzt.; Turkey: Prov. Kars, Ardahan—Haçuvan, 1700 m., August 1957, *Davis & Hedge* 32597.

Uredinia and telia present. Uredospores with two supra-equatorial pores. On *Tanacetum balsamita* L.; Turkey: Prov. Çoruh (Artvin), Yalınızam Dağları, 2350 m., August 1957, *Davis & Hedge* 32531.

Puccinia hordei Otth in Mitt. Naturf. Ges. Bern, 114 (1871).

On *Ornithogalum eigii* Feinbrun; Turkey: Prov. Mersin, dist. Tarsus, between Ulaş and Şamlar, 5 April 1957, *Davis & Hedge* 26430.

Puccinia libani Magn. in Verh. Zool.-Bot. Ges. Wien, i, 442 (1900).

On *Prangos ferulacea* Lindl.; Turkey: Ahir dağ, Maraş, 1934, *E. K. Balls* 971. Aecidia only. *Ibid.*, 1100 m., 2 May 1957, *Davis & Hedge* 27479. Aecidia and telia.

On *Prangos uechtritzi* Boiss. & Hausskn.; Turkey: Prov. Maraş, Binboğa dağ, 14 July 1952, *Davis* 19936.

Telia on main axes of leaves, crust-like; teliospores somewhat clavate, apex blunt $6-8\mu$ thick, $56-66\mu$ long, upper cell $22-26\mu$ broad, lower $15-20\mu$ broad; upper pore apical, lower pore depressed one third. Spermogonia and aecidia aggregated in pulvinate clusters.

On *Prangos lophoptera* Boiss.; Turkey: Prov. Erzurum, Pasinler—Horasan, 1650 m., 12 June 1957, *Davis & Hedge* 29389.

Telia on laminar segments and main axes, elliptic, 2×1 mm., compact crust-like, long covered by silvery epidermis; teliospores oblong or slightly clavate, constricted at septum, upper cell $20-23 \times 20-22\mu$, pore apical in brown thickened spore apex ($2-7\mu$), lower cell $20-26 \times 18-20\mu$. Stipe persistent $14-26\mu$ long. (Fig. 3a). Spermogonia and aecidia densely aggregated in pulvinate, slightly swollen groups.

On *Peucedanum pisidicum*. Boiss., Turkey: Antalya, Takhtali dağ, 2100 m., 16 July 1947, Davis 14196.

Aecidia amphigenous, densely aggregated. Teliospores $43-52 \times 22-30 \mu$, apex truncate $4-7 \mu$ thick. (Fig. 3b.)

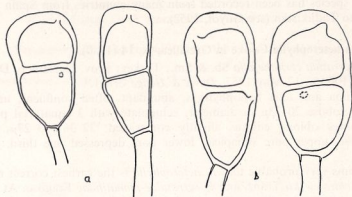


FIG. 3 (a) Teliospores of *Puccinia libani* on *Prangos lophoptera* (Davis & Hedge 29389). (b) Teliospores of *P. libani* on *Peucedanum pisidicum* (Davis 14196). All $\times 1000$.

Puccinia libani belongs to a distinctive group of umbelliferous rusts characterized by smooth-walled teliospores with conspicuous apical thickening. *P. libani* is most closely allied to *P. carniolica* and appears to differ from it only in the more densely aggregated aecidia. In *P. libani* these may number 20-30 in a group whereas in *P. carniolica* rarely more than six occur together. Mesospores are frequently present in the collection on *Prangos lophoptera*. The collection on *Peucedanum pisidicum* in teliospore characters closely matches the one collection seen of *P. carniolica* on its type host *Peucedanum schottii* but in aecidial characters is referable to *P. libani*.

***Puccinia liliacearum* Duby, Bot. Gall. ii, 891 (1830).**

On *Ornithogalum* sp.; Turkey: Prov. Hatay, Karlik Tepe above Soğuk Oluk, 1200 m., 24 April 1957. Davis & Hedge 27061A.

Teliospores only, smooth, elliptic, $43-50 \times 26-29 \mu$.

***Puccinia mesneriana* Thuem. in Flora, ix, 175 (1877).**

On *Rhamnus oleoides* L.; Turkey: Prov. Maraş, Maraş, 500 m., 30 April 1957, Davis & Hedge 27314.

Telia only, forming black pulvinate hypophyllous sori. Teliospores $50-80 \times 15-18 \mu$ with usually 4 apical spines $4-18 \mu$ long, the spore separates readily into two cells. (Fig. 4.)

This microcyclic rust allied to the *P. coronata-festuca* group varies considerably in spore shape and degree of development of the apical spines and it may be desirable when more material is examined to subdivide it.

***Puccinia pachyphloea* Syd., Monographia Uredinearum, i, 581 (1903).**

On *Rumex acetosella* L.; Turkey: Prov. Tunceli, Pülümür—Selepur, 1950 m., 23 July 1957, Davis & Hedge 31587.

Telia mainly hypophyllous and on petioles, not forming spots, black, pulverulent with conspicuous epidermal covering which is soon ruptured. Uredospores mixed with teliospores, subglobose to obovate, $24-26 \times 29-32\mu$, wall echinulate with two supra-equatorial pores. Teliospores oblong elliptic, slightly constricted at septum, $32-46 \times 18-24\mu$, wall conspicuously verrucose in irregular lines, $3-4\mu$ thick, upper pore one third or less depressed, lower pore half depressed. Stipe short, hyaline. (Fig. 5.)

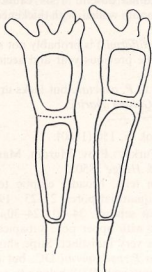


FIG. 4. Teliospores of *Puccinia mesneriana* on *Rhamnus oleoides* (Davis & Hedge 27314): $\times 1000$.

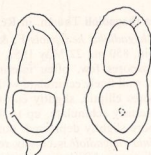


FIG. 5. Teliospores of *Puccinia pachyphloea* on *Rumex acetosella* (Davis & Hedge 31587): $\times 1000$.

This species was originally described on *Rumex tuberosus* from Riwandous (N. Iraq) and has since been recorded by Tranzschel (1939) from Turkmenistan. It is morphologically similar to *Puccinia acetosae* but differs in the more verrucose and thicker teliospore wall. This collection does not contain any of the aberrant two-pored teliospores mentioned by Tranzschel which Lagerheim interpreted as thick walled uredospores in the related species *P. bififormis*.

***Puccinia pimpinellae* (Strauss) Roehling, Deutsch. Fl. iii, 131 (1813).**

On *Pimpinella kotschyana* Boiss.; Turkey: Prov. Tunçeli, Selepur—Püllümür, 1500 m., 11 July 1957, Davis & Hedge 30928.

On *Pimpinella tragiolum* Vill.; Turkey: Prov. Van, Artos Dağ, 2900 m., 2 September 1956, J. McNeill 763.

On *Pimpinella corymbosa* Boiss.; Turkey, Armenia, leg. H. H. Calvert & J. Zohrab.

***Puccinia punctata* Link in Mag. Ges. Naturf. Fr. vii, 30 (1815).**

On *Galium* sp.; Turkey: Prov. Tunçeli, above Pertek, 1600 m., 13 July 1957, Davis & Hedge 31043.

Aecidia sparse, hypophyllous. Telia elliptic 2–3 mm. long, black. Teliospores $40-48 \times 22-24\mu$. smooth, apex $7-12\mu$ thick. Stipe persistent, $30-48\mu$ long.

On *Asperula breviflora* Boiss.; Lebanon: Becharze, 1500 m., 15 August 1945, Davis 10111.

Uredospores $25-28 \times 20-22\mu$ with two, rarely three, equatorial pores. Teliospores $50-70 \times 20-24\mu$, apex $9-16\mu$ thick, stipe $20-40\mu$ long, upper pore apical, lower pore beside septum.

On *Cruciata coronata* (Sibth. & Sm.) Ehrendf.; Turkey: Prov. Maraş, Ahir dağ above Maraş, 1300 m., May 1957, Davis & Hedge 27390.

Aecidia hypophyllous, crowded. Uredinia absent. Telia caulicolous, pulvinate. Teliospores mostly $50 \times 22\mu$, smooth walled, with thickened apex and persistent stipes.

The absence of uredinia (suggesting *P. difformis*) is probably not significant as the telia occur on old stems of the previous year and aecidia on current year's growth.

P. difformis is morphologically similar to *P. punctata* but lacks uredinia and is said to be completely restricted to *Galium aparine*.

Puccinia rhagadioli Thuem. in Rev. Mycol. vi, 150 (1880).

On *Rhagadiolus hedynois* F. & M.; Turkey: Prov. Mardin, Mardin—Nusaybin, 850 m., 22 May 1957, Davis & Hedge 28502.

Uredospores few, often intermixed in telia, broadly elliptic to subglobose, wall finely echinulate with two equatorial pores, $21-23 \times 19-21\mu$. Teliospores elliptic, slightly constricted at septum, $34-40 \times 24-30\mu$, wall conspicuously echinulate, up to 4μ thick with upper pore subapical and lower pore slightly depressed, both pores very indistinct. Stipe short.

Puccinia rhagadioli is closely related to *P. podospermi* DC. but differs in less distinct echinulations on the teliospore wall. Both belong to a group of species on Compositae (including *P. crepidis*, *P. scorzonerae* and *P. hysteriorum*) in which the aecidium-bearing mycelium causes deformation of host organs. *Puccinia rhagadioli* (Pass.) Syd. is based of *Aecidium rhagadioli* Pass. for which Passerini (1877) described only aecidia.

Puccinia scorzonerae Juel in Ofvers K. Vetensk.-Akad. Forh. liii, 222 (1896).

On *Scorzonera* sp. aff. *sericea*; Turkey: Prov. Van, dist. Başkale, Ispiriz dağ, 2800 m., 31 July 1954, Davis & Polunin 23658.

Spermogonia and aecidia only, spread over lower surfaces of the host leaves.

Puccinia serpylli Lindr. in Acta Soc. F.F. Fenn. xxvi, 10 (1904).

On *Thymus kotschyanus* Boiss. & Hoh.; Turkey: Prov. Bitlis, slopes of Nemrut dağ, 2000 m., 11 Aug. 1956, McNeill 531.

Telia only, amphigenous, erumpent, black. Teliospores oblong elliptic, somewhat constricted at septum, $44-52 \times 19-23\mu$, apex rounded, $2-4\mu$ thick, upper pore apical, lower pore superior but very indistinct, wall smooth. (Fig. 6.)

This rare species is known only from three collections in Finland, Russia and Iran, the latter on *Thymus balansae* (Petrak 1941). In spore morphology it closely resembles *P. stipina* and is probably a microcyclic species derived from *P. stipina* f. sp. *thymi-stipae* Kleb. which forms aecidia on *Thymus* and telia on *Stipa*.

Puccinia stapfiana Petrak in Ann. Naturh. Hofmus. Wien, lii, 307 (1941).

On *Phlomis armeniaca* Willd.; Turkey: Prov. Erzurum, Horasan—Pasinler, 1800 m., 7 July 1957, *Davis & Hedge* 30831.

Telia only, amphigenous, black. Teliospores broadly elliptic, slightly constricted at septum, apex blunt, $37-43 \times 23-26\mu$, upper pore apical or subapical, lower pore superior. Wall 1.5μ , smooth. Stipe deciduous.

The spore measurements of this collection agree very well with those given by Petrak in his original description ($28-45 \times 23-34\mu$) where the host plant is *Phlomis persica*.

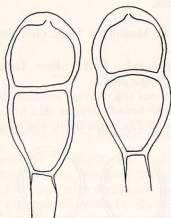


FIG. 6. Teliospores of *Puccinia serpylli* on *Thymus kotschyanus* (McNeill 531): $\times 1000$.

Puccinia thesii Duby, Bot. Gall. ii, 889 (1830).

On *Thesium micranthum* Fenzl; Turkey: Prov. Mardin, Mardin, 1100 m., 21 May 1957, *Davis & Hedge* 28381.

Aecidia on basal non-flowering shoots and occasionally on leaves of flowering shoots, probably at least in the former case arising from a systemic mycelium. Telia pulvinate, black. Teliospores oblong-elliptic, constricted at septum $36-42 \times 25-28\mu$, wall faintly verruculose, apex 5μ thick, upper pore apical, lower pore superior adjacent to the septum, stipe $10-15\mu$ long.

Uromyces acantholimonis Syd. in Ann. Mycol. iv, 28 (1906).

On *Acantholimon acerosum* Willd.; Turkey: Prov. Van, Gevaş—Edremit, 9 July 1954, *Davis & Polunin* 22602.

Uredinia only, amphigenous, pulverulent, uredospores broadly elliptic $28-34 \times 23-25\mu$, wall finely echinulate with usually three equatorial pores.

On *Acantholimon olivieri* J. & Sp.; Iran: Durud, Luristan, 23 May 1940, *Koelz* 15794.

Telia only, hypophyllous. Teliospores broadly elliptic to sub-globose, $28-32 \times 26-30\mu$, wall smooth, brown, up to 7μ thick at apex, stipes hyaline, broad, persistent, up to 80μ long.

This species is certainly very close to *U. armeriae* and *U. limonii* and should perhaps be united with them. However, the teliospores are appreciably broader than those of *U. limonii* and *U. armeriae*; Guyot (1951) from

extensive examination of specimens gives $25-35 \times 18-24\mu$ for the former species and $26-32 \times 22-26\mu$ for the latter.

Uromyces anthyllidis (Grev.) Schroet. in Hedwigia, xiv, 162 (1875).

On *Hymenocarpus circinnatus* (L.) Savi; Transjordan: Wadi Heidan (Moab), 26 April 1954, Davis 9606.

The type host of *Uromyces hymenocarpi* Jaap is *Hymenocarpus circinnatus* but that rust species is usually reduced to synonymy with *U. anthyllidis*. Certainly this Transjordan collection cannot be distinguished from that wide ranging species.

Uromyces bornmuelleri P. Magnus in Verh. Ges. Deutsch. Naturf. Ärzte, lxi, 151 (1893).

On *Bongardia chrysogonum* L.; Turkey: Prov. Urfa near Hilvan, 650 m., 18 May 1957, Davis & Hedge 28272.

Telia only, amphigenous on leaves, covered by silvery epidermis. Teliospores sub-globose to broadly elliptic thin walled, smooth with faint subapical pore, $23-25 \times 20-22\mu$, stipe up to 10μ long. (Fig. 7.)

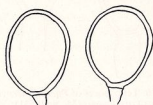


FIG. 7. Teliospores of *Uromyces bornmuelleri* (Davis & Hedge 28272): $\times 1000$.

The species is obviously closely related to *Uromyces* (*Alveomyces*) *vesicatorius* which attacks the berberidaceous genus *Leontice*. Both appear to have aecidia and immersed teleutosori (Natrass 1937). The latter character induced Bubak to describe the genus *Alveomyces* for the parasite of *Leontice*. Magnus obviously made a mistake in describing the spores of *U. bornmuelleri* as $11.9 \times 9.6\mu$. Both his illustration (1899, Tab. ii, 14 & 15) and another collection determined by him (Born. Iter Syriacum 1047) show spores over 20μ long, in the latter they are $24-28 \times 19-22\mu$.

Uromyces galegae (Opiz) Sacc. in Mem. R. Acad. Padova, xxiv, 13 (1874).

On *Galega officinalis* L.; Turkey: Vil. Antalya, Kara Göl, 1000 m., 7 Aug. 1947, Davis 13919.

Uredosori and telia mixed, mostly hypophyllous, cinnamon brown. Uredosores broadly elliptic, $20-23 \times 19-21\mu$, wall echinulate with 4-5 scattered pores. Teliospores subglobose to shortly elliptic with apical pore and inconspicuous papilla, $20-22 \times 18-20\mu$, wall verrucose, the verrucae ordered in lines often slightly confluent.

This rust on *Galega* spp. is not well known, and descriptions of it are confused (Guyot 1957, p. 415 footnote). *U. galegae* seems clearly referable according to Guyot's description to *U. pisi* (DC.) Wint. *sensu lato* and the present collection supports this alliance. It is quite possible, of course,

that more than one rust occurs on *Galega*—this would explain the confusion. Nothing is known of an aecidial stage of *U. galegae*, presumably it should occur on a species of *Euphorbia* in conformity with the usual *U. pisi* pattern of alternation.

***Uromyces glycyrrhizae* (Rabh.) P. Magnus** in Ber. Deut. Bot. Ges. viii, 383 (1890).

On *Lathyrus tukhtensis* Cz.; Turkey: Prov. Gümüşane, pass between Köse and Gümüşane, 2000 m., 2 August 1957, *Davis & Hedge* 31962.

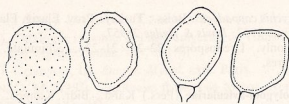


FIG. 8. Uredospores and teliospores of *Uromyces glycyrrhizae* on *Lathyrus tukhtensis* (Davis & Hedge 31962): $\times 1000$.

Uredinia and uredospores $26-28 \times 20-22\mu$, wall echinulate with two equatorial pores. Telia replacing uredinia, teliospores $22-26 \times 16-18\mu$, wall smooth, $2-4\mu$ thick at apex, stipe deciduous, up to 10μ long. (Fig. 8).

The specimen agrees completely with *U. glycyrrhizae* which has not previously been found on any host other than species of *Glycyrrhiza*.

***Uromyces gypsophilae* Cooke** in Grevillea, ix, 14 (1880).

On *Saponaria orientalis* L.; Turkey: Prov. Erzurum, Horasan—Pasinlar, 1700 m., 7 July 1957, *Davis & Hedge* 30827.

Telia mostly hypophyllous, black. Teliospores subglobose, $20-24 \times 19-20\mu$, wall coarsely verrucose, $2-2.5\mu$ thick, with pale cap on apical pore, stipe short, hyaline. Uredospores few, scattered amongst teliospores, broadly elliptic $22-25 \times 19-21\mu$, wall finely echinulate with two pores. (Fig. 9.)

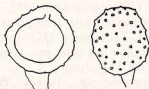


FIG. 9. Teliospores of *Uromyces gypsophilae* on *Saponaria orientalis* (Davis & Hedge 30827): $\times 1000$.

This species was originally described on *Gypsophila* sp. from Kurdistan. It reaches its westernmost limit in Roumania (Savulescu, 1953) and is widely distributed in south western Russia (Tranzschel, 1939).

***Uromyces limonii* (DC.) Lév.** in Orbigny, Dict. Univ. Hist. Nat. xii, 756 (1849).

On *Limonium* aff. *pycnanthum* Koch; Turkey: Prov. Niğde, Tuz Gölü, N.W. of Ulukişla, 900 m., 1 Sept. 1957, *Davis & Hedge* 32826.

Uredinia and telia only. Uredospores $27-32 \times 22-26\mu$, wall $1.5-2\mu$ thick with 2-3 equatorial pores. Teliospores $30-34 \times 18-22\mu$, wall rather granular at thickened apex ($5-6\mu$) otherwise smooth, stipe persistent, $40-70\mu$ long.

It is noteworthy that Maire (1906) described *U. limonii* var. *statices-pycnanthae* on *Statice pycnantha* from Niğde. Its chief distinction is its almost spherical teliospores measuring $25-29 \times 23-25\mu$.

Uromyces onobrychidis (Desm.) Lév. in Ann. Sci. Nat., Ser. 3, viii, 371 (1847).

On *Onobrychis cappadocica* Boiss.; Turkey: Prov. Elazığ, Elazığ—Kale, 1100 m., 4 June 1957, Davis & Hedge 28957.

Uredinia only. Uredospores $22-28 \times 21-23\mu$, echinulate, with 3-4 equatorial pores.

Uromyces polygoni-aviculariae (Pers.) Karst., Bidr. Kanned. Finl. Nat. Folk, iv, 12 (1879).

On *Polygonum aviculare* L.; Turkey: Prov. Gaziantep, Dülük Baba, 1100 m., 13 May 1957, Davis & Hedge 28056.

On *Polygonum bellardii* All.; Turkey: Prov. Tunceli, Tunceli—Pülümür, 7 June 1957, Davis & Hedge 29207.

Uromyces salsolae Reich. in Verh. Zool.-Bot. Ges. Wien, xxvii, 842 (1877).

On *Petrosimonia brachiata* (Pall.) Bunge; Turkey: Prov. Niğde, Aksaray—Sultanhani, 950 m., 31 August 1957, Davis & Hedge 32805.

Uredinia and telia deeply immersed in leaves. Uredospores $21-28 \times 16-22\mu$, finely echinulate, with six to eight scattered pores. Teliospores $26-29 \times 23-25\mu$, wall smooth, $3.5-5\mu$ thick at apex, stipe up to 20μ long.

Uromyces scillarum (Grev. ex. Berk.) Lév. in Ann. Sci. Nat., Ser. 3, viii, 376 (1847).

On *Muscari comosum* Mill.; Turkey: Prov. Hatay, dist. Belen, Karlik Tepe above Soğuk Oluk, 1200 m., 24 April 1957, Davis & Hedge 27122.

Uredospores sparse, intermixed with teliospores, rather hyaline, $24-28 \times 22-26\mu$, wall echinulate. Teliospores $23-26 \times 16-18\mu$, rather angular, wall smooth except for irregular line markings. Uredospores of this species are rarely found (Guyot, 1951, p. 106).

On *Muscari* (Sect. *Leopoldia*) sp.; Turkey: Prov. Kars, Sarikamiş, 2100 m., 13 May 1957, Davis & Hedge 29528.

Uromyces trigonellae Pass. in Grevillea, viii, 50 (1880).

On *Trigonella astriotes* Fisch. & May.; Turkey: Prov. Urfa, Akçakale, 400 m., 17 May 1957, Davis & Hedge 28098.

On *Trigonella monantha* C.A.M. ssp. *monantha*; Turkey: Prov. Urfa, Akçakale, 400 m., 17 May 1957, Davis & Hedge 28096.

Uredospores $20-23 \times 21-22\mu$, wall 2μ thick with 5-6 pores. Teliospores, $20-23 \times 16-19\mu$, coarsely verrucose.

On *Trigonella radiata* (L.) Boiss.; Turkey: Prov. Urfa, Akçakale, 400 m., 17 May 1957, Davis & Hedge 28094.

Uredinia sparse, replaced by teliospores. Uredospores $24-26\mu$ in diameter, wall almost smooth with 5-6 pores. Teliospores $19-22 \times 18-20\mu$, prominently verrucose with papilla on apical pore.

This species is undoubtedly closely allied to *U. anthyllidis* but appears distinct in the fewer uredospore pores as Guyot (1957) has pointed out in his monograph of the group.

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Correction

In a previous note (*Urocystis floccosa* in Britain, *Notes Roy. Bot. Gard. Edinb.* xxi, 241, 1955) the new combinations *Urocystis ficariae* and *U. floccosa* were published. In Spanish Rust and Smut Fungi (*Notes Roy. Bot. Gard.* xxii, 609, 1958) I inadvertently used the binomial *Urocystis syncocca* (Kirchn.) Henderson without formally proposing the new combination. To correct this error the following is proposed.

***Urocystis syncocca* (Kirchn.) Henderson, comb. nov.**

Basionym: *Uredo syncocca* Kirchn. in Lotos, vi, 179 (1856).