

Uredopeltis chevalieri sp. nov., the rust of *Grewia* (*Tiliaceae*) formerly known as *Phakopsora* (or *Dasturella*) *grewiae*, its first record in Australia and a summary of the known rusts of *Grewia*

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Abstract. The rust of *Grewia* formerly known as *Phakopsora* (or *Dasturella*) *grewiae* is recorded for the first time in Australia from the Kimberley region of northern Western Australia. As no validly published name exists for the telial stage of this rust and as it is placed best in the genus *Uredopeltis*, it is described as new from the Australian collection as *Uredopeltis chevalieri* and is compared with the other known rusts of *Grewia*.

Additional keywords: *Uredo grewiae*, *Uredo corbiculoides*, *Ravenelia atrides*, *Catenulopsora grewiae*, *Malupa*, rusts of *Tiliaceae*.

Introduction

Grewia L. (*Tiliaceae*) is a genus of approximately 150, mainly Old World, species (Mabberley 2000), of which 11 occur in Australia (Halford 1993). In the literature, eight rust species have been recorded on species of *Grewia*. Three (*Uredo corbiculoides* Cummins, *Uredo grewiae* Pat. & Har. and *Aecidium warneckeanum* Henn.) are based on anamorphic (aecial or uredinial) states; the other five are based on teleomorphic (telial) states (*Ravenelia atrides* Syd. & P. Syd., *Cumminsina clavispora* Petrak, *Catenulopsora grewiae* Thirum. & Mundk., *Phakopsora microspora* Cummins and *Puccinia tiliifolia* Ramak. & Sundaram). A telial stage for *U. grewiae* was found by Cummins (1945), to which he applied the name *Phakopsora grewiae* (Pat. & Har.) Cummins.

In March 1994, during a Northern Australian Quarantine Survey, leaves of *Grewia* sp. bearing a uredinial rust were collected on the Mitchell Plateau in the Kimberley region of Western Australia (Shivas 1995). In May the following year, leaves of *G. breviflora* Benth. bearing both uredinia and telia were collected by Mr A. A. Mitchell near Beverley Springs Station in the Kimberley. The telial rust was determined (R.G.S.) as *Phakopsora grewiae* and subsequent examination of the earlier uredinial specimen has shown that it is identical to the uredinial stage associated with the telia. These two collections represent the first records of this rust for Australia.

On later examination of these specimens and of the literature associated with this rust, it became clear that there

were both taxonomic problems associated with its generic placement and nomenclatural problems associated with use of the name *Phakopsora grewiae* (Pat. & Har.) Cummins. A more detailed study was undertaken to resolve them.

Methods

Specimens examined are listed under the description given below. Sections of sori and spores were mounted in clear lactophenol, warmed to expand them and expel air bubbles and examined immediately. After scanning slides to determine the range of spore sizes present, ten spores of each type were measured, with notes on abnormally large or small spores. The position of sori on leaves is described using the terminology of Pascoe and Sutton (1986). Herbarium abbreviations are taken from Holmgren *et al.* (1981) and author abbreviations for fungus and plant names from Brummitt and Powell (1992). The seven *Grewia* rusts listed above and not treated in detail in this paper are summarised briefly in the final section 'Nomenclator and summary of the rusts of *Grewia*'.

Results

The nomenclatural and taxonomic conclusions drawn from this study are most clearly set out as a chronological summary.

Patouillard and Hariot (1900) described the uredinial rust *Uredo grewiae* Pat. & Har. from a specimen collected near Thies, Senegal by A. Chevalier on *Grewia ferruginea* Hochst, although the describing authors indicated some doubt about the specific identity of the host. A brief macroscopic description of uredinia was given, with no mention of structures present (e.g. paraphyses), and pale yellow, thin-walled urediniospores were said to be of variable shape and 21–28 × 16–21 µm in size.

Sydow and Sydow (1923–1924, p.453) gave a much expanded description, including the phakopsoroid nature of uredinia with their margin of abundant, cylindrical, straight to incurved paraphyses 25–45 μm long and 6–9 μm wide. Their measurements for the urediniospores, 20–28 \times 15–21 μm , were virtually the same as those in the original description.

Cummins (1945) examined a specimen from the Patouillard herbarium (in FH) with details of collector, date and locality matching those of the original collection. As well as uredinia, he found telia and teliospores, which he described in English. Pulvinate, erumpent telia contained somewhat rectangular, unicellular teliospores measuring 11–23 \times 8–14 μm , without any definite arrangement in the sorus. Cummins considered that they belonged in the genus *Phakopsora* and made the new combination *Phakopsora grewiae* (Pat. & Har.) Cummins, citing *Uredo grewiae* Pat. & Har. as the basionym. Under Art. 59.6 (with its Example 7) of the International Code of Botanical Nomenclature (ICBN, Greuter *et al.* 2000), and as no Latin description of the telial stage was provided (ICBN, Art. 36.1), his new combination is not valid as the name of a holomorphic rust containing telia but must be considered as a validly published and legitimate binomial based on the anamorph (uredinial stage) that typifies its basionym; in other words, the name *Phakopsora grewiae* (Pat. & Har.) Cummins is a name applicable only to the uredinial rust and not available for the whole rust including its telial stage. Had Cummins provided a Latin description of telia, his binomial would have validly applied to the holomorphic species and been cited as '*Phakopsora grewiae* Cummins' (ICBN Art. 59.6, Ex. 6).

Thirumalachar (1946) examined a specimen of rust on *Grewia monticola* Sond. sent to him from South Africa as suspected *Ravenelia atrides* Syd. & P. Syd. Both paraphysate uredinia with urediniospores 20–26 \times 15–20 μm and erumpent telia with rectangular teliospores 11.5–21 \times 8–12 μm were present. Cummins (in Thirumalachar 1946) confirmed that this rust was identical to that seen by him on the specimen from Senegal and named *Phakopsora grewiae*. However, Thirumalachar considered that the teliospores developed in chains from the base of the telium and, because of this and the erumpent telia, he concluded that the fungus was placed better in the genus *Dasturella* Mundkur & Kheswalla (1943) than in *Phakopsora*. The genus *Dasturella*, type species *D. divina* (Syd.) Mundkur & Kheswalla, was based on a grass (bamboo) rust with paraphysate uredinia and erumpent telia with teliospores in vertical rows. Thirumalachar gave an English description of uredinia and telia of the *Grewia* rust from the South African collection, making the new combination *Dasturella grewiae* (Pat. & Har.) Thirum. and giving *Uredo grewiae* Pat. & Har. as the basionym. Again, in the absence of a Latin description, and for the reasons given above for *Phakopsora grewiae*, the binomial *Dasturella grewiae* must be regarded as the name

of a uredinial rust. Thirumalachar (1946) also listed '*Phakopsora grewiae* Cummins', as a synonym. However, as already explained, there is no '*Phakopsora grewiae* Cummins', only *P. grewiae* (Pat. & Har.) Cummins, as Cummins' binomial is based on, and applies only to, the uredinial anamorph *Uredo grewiae* Pat. & Har. In the literature from 1946 to the present, the names *Phakopsora grewiae* and *Dasturella grewiae* have been in common use for this rust.

Sathe (1969) studied a uredinial and telial collection of the rust on *G. asiatica* L. from Poona, India and compared it with the South African specimen studied by Thirumalachar. He concluded that 'the fungus has all the characteristics of *Uredopeltis* P. Henn. (Laundon 1962)', (the citation of Laundon 1962 was an error by Sathe and should have been Laundon 1963). Sathe (1969) gave no English or Latin description of the *Grewia* rust but transferred it to *Uredopeltis*, under the new binomial *Uredopeltis grewiae* (Cummins) Sathe. He listed as synonyms *Uredo grewiae* Pat. & Har., *Phakopsora grewiae* Cummins and *Dasturella grewiae* Thirum. (in his text, as '(Cummins) Thirum.'). all without bibliographic citations of their place and date of publication. Unfortunately, Sathe's new combination is not validly published and his nomenclature is greatly confused. He apparently assumed (incorrectly) that Cummins (1945) had validly published the name of the telial stage and he thus used '*Phakopsora grewiae* Cummins' as the basionym for his new combination. As noted above, there is no '*Phakopsora grewiae* Cummins' and, similarly, no '*Dasturella grewiae* Thirum.'. Both are new combinations based on the uredinial *Uredo grewiae* Pat. & Har. and thus applicable only to the uredinial anamorph. Sathe's new combination should be more correctly cited as '(Pat. & Har.) Sathe'. Moreover he gave no Latin description of the telial stage (ICBN, Art. 36.1) and made no full and direct reference to the place and date of publication of the supposed basionym, as required when making a new combination (ICBN, Art.33.3).

No further names have been given to the telial rust commonly known as *Phakopsora grewiae* or *Dasturella grewiae* and, as this survey shows, all names so far proposed apply only to the uredinial state. Buriticá and Hennen (1994) revised anamorphic and teleomorphic genera of Phakosporaceae and, from their descriptions and the earlier literature, the *Grewia* rust does not fit well into either *Phakopsora* or *Dasturella*. It has prominently erumpent telia, in contrast to the subepidermal, non-erumpent telia of *Phakopsora*. Buriticá and Hennen (1994) included *Dasturella* in *Kweilingia* Teng (1940), type species *K. bambusae* (Teng) Teng, described from bamboo in China (Teng 1940, 1996) but Berndt (1997) retained them as separate genera. Species of *Dasturella* and *Kweilingia* occur on grasses (bamboos) and have unicellular teliospores arranged in strictly vertical chains which are laterally united

into erumpent pulvinate telia. The vertical chains are well illustrated for *Dasturella* by Mundkur and Kheswala (1943) and for *Kweilingia* by Berndt (1997) and Vánky (2002). Although described originally as a rust, *Kweilingia* had been placed in Auriculariales (Thirumalachar and Narasimhan 1951) and in Ustilaginales (Thirumalachar *et al.* 1961; Vánky 1987). However, it was accepted as a rust by Cummins and Hiratsuka (1983) and later by Buriticá and Hennen (1994), Berndt (1997) and Vánky (2002). The *Grewia* rust differs from *Dasturella* and *Kweilingia* in having more irregularly arranged teliospores.

Of the teleomorphic genera in Buriticá and Hennen (1994), the *Grewia* rust fits best into *Uredopeltis*, type species *U. congensis* Henn. on leaves of *Markhamia* spp. (Bignoniaceae) in Africa, whose morphology was clarified by Laundon (1963). As noted above, Sathe (1969) had come to the same conclusion. *Uredopeltis* has erumpent, paraphysate uredinia and erumpent telia composed of a mass of unicellular, irregularly arranged teliospores. As no valid name is available for the telial rust on *Grewia*, it is described below as a new species of *Uredopeltis* from the Australian collection.

In Laundon's (1973) key to anamorphic rust genera, *Uredo grewiae* Pat. & Har. falls into the genus *Uredo*. Of the segregate anamorphic genera considered by Buriticá and Hennen (1994), it is closest to *Malupa* Ono, Buriticá & Hennen (1992), whose uredinia have surrounding paraphyses, initially covering the spore mass, and sessile urediniospores. The type species nominated was *M. meibomiae* (Arthur) Ono, Buriticá & Hennen; however, this new combination was not validly published as neither a basionym nor a bibliographic reference to a basionym was given. In a later paper, Buriticá and Hennen (1994) again listed *M. meibomiae* as the type species but again no basionym or bibliographic reference was given. In the *Grewia* rust, young spores seen in sections of uredinia are not strictly sessile but show an intercalary cell (perhaps a vestigial pedicel) between the sporogenous cell and the young urediniospore (Fig. 1A). In free, more mature spores, there is often a broken fragment of a subtending cell remaining attached to the spore base (Fig. 1B) but this is not always present. No distinct remnants of old pedicels were seen in mature uredinia. More detailed studies are needed to clarify the presence or absence of a urediniospore pedicel. For the present, *Uredo grewiae* is retained in the genus *Uredo sensu lato*. Further details of urediniospore development and the taxonomy and nomenclature of uredinial anamorphs such as *Malupa* are being investigated.

***Uredopeltis chevalieri* J. Walker & R.G. Shivas sp. nov.** (Etym. A. Chevalier, *Uredinis grewiae* Pat. & Har. collector primus)

Syns. *Uredo grewiae* Pat. & Har., *Journal de Botanique* 14: 237, 1900 (uredinial anamorph)

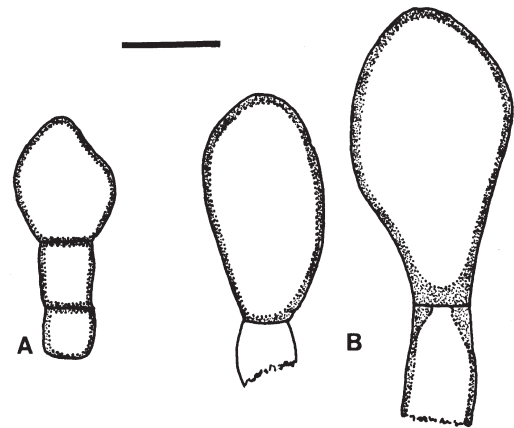


Fig. 1. *Uredopeltis chevalieri*. (A) Intercalary cell between young urediniospore and sporogenous cell, ex PERTH 3270092. (B) Two young urediniospores with attached fragment of subtending cell, ex PERTH 3970574. Bar = 10 μ m.

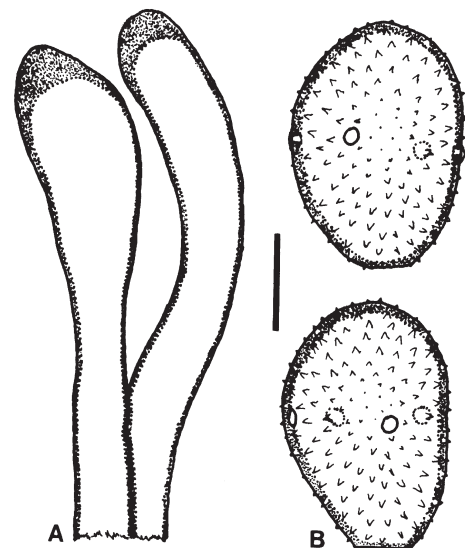


Fig. 2. *Uredopeltis chevalieri*, ex PERTH 3970574. (A) Two paraphyses fused towards the base. (B) Two urediniospores with equatorial germ pores. Bar = 10 μ m.

Phakopsora grewiae (Pat. & Har.) Cummins, *Bulletin of the Torrey Botanical Club* 72: 206, 1945 (based on uredinial anamorph; telia described in English)

Dasturella grewiae (Pat. & Har.) Thirum., *Bulletin of the Torrey Botanical Club* 73: 348, 1946 (based on uredinial anamorph; telia described in English)

Uredopeltis grewiae (Pat. & Har.) Sathe (in error as '(Cummins) Sathe'), *Bulletin of the Botanical Survey of India* 11: 176, 1969 (not validly published, ICBN Art.33.3; incorrect author citation and based on uredinial anamorph; see text for explanation)

Pycnia et aecia ignota. *Uredinia* amphigena, minuta, conica, 130–140 μ m lata, 100–110 μ m alta, subepidermalia,

erumpentia, paraphysisibus clavatis marginalibus circumcincta. *Paraphyses* clavatae, infra medium connatae, incurvatae vel irregulares, 50 μm longae, infra 5–6 μm latae, ad apicem 10–12 μm latae, pariete laterale 1 μm lato, 2–3 μm prope apicem. *Uredinosporae* formae variabilis, ovaes, obovatae vel anguste obovatae, late fusiformes, aliquot pyriformes, pallide luteae vel flavae-brunneae, (22–) 24–31 (–33) \times (17–) 18–21 (–22) μm , interdum ad 37 μm longae, pariete 1 (–1.5) μm lato, dense et subtiliter echinulato, poris germinationibus 4 (–5), indistinctis, plusminusve aequatoriis. *Telia* praecipue hypogena, erumpentia, pulvinata, atra, 175–180 μm alta, ad paginem folii 110–120 μm lata, supra ad 180 μm . *Teliosporae* unicellulares, sine dispositionibus regularibus, hyalinae vel pallide flavae-brunneae vel porphyreae (*teliosporae* externae), cubiformes vel rectangulares, (15–) 16–22 (–23) \times (10–) 11–13 (–15) μm , pariete 2 (–2.5) μm lato, ad apicem ad 4 μm lato.

Holotypus hic designatus: in foliis *Grewiae breviflorae* Benth., Beverley Springs Station, regio Kimberleyensis, Australia Occidentalis, 9.v.1995, A.A. Mitchell, PERTH 3970574.

Isotypus hic designatus: DAR 74838.

Pycnia and *aecia* not known. *Uredinia* amphigenous, phakosporoid, scattered or clustered in small groups of 3–5

to 1 mm across, individually 130–140 μm wide, to 110 μm high, subepidermal, surrounded by clavate paraphyses (Fig. 2A) which are fused below and free above, incurved to irregular, hyaline to faintly yellowish, to 50 μm long, 5–6 μm wide below, 10–12 μm wide in apical portion, side walls thin (1 μm), thickened to 2–3 μm above. *Uredinospores* (Fig. 2B) variable in shape, oval to obovate, or narrowly obovate to broadly fusoid, a few pyriform, pale yellow to pale yellowish-brown, (22–) 24–31 (–33) \times (17–) 18–21 (–22) μm , an occasional spore to 37 μm long, hilum 4–6 μm wide, wall uniformly 1 (–1.5) μm thick, finely and densely echinulate with spines (1–) 1.5 (–2) μm apart, germ pores 4 (–5), indistinct, roughly equatorial, each with a small shallow hyaline cap. *Telia* (Figs 3 and 4) mainly hypogenous, few epigenous, subepidermal, arising in leaf mesophyll from a hyaline, dense pseudoparenchymatous layer to 20 μm thick, composed of thin-walled subglobose to angular hyaline cells 3–6 μm diam., slightly larger above and giving rise to a compact, erumpent cellular mass of teliospores, hyaline to pale brown within, externally dark brown to black, to 180 μm high, 110–120 μm wide near leaf surface, to 180 μm wide above. *Teliospores* unicellular, inner spores hyaline to pale yellowish-brown, surface spores dark



Fig. 3. *Uredopeltis chevalieri*, ex PERTH 3970574. Erumpent telium showing irregular arrangement of teliospores. Bar = 60 μm .

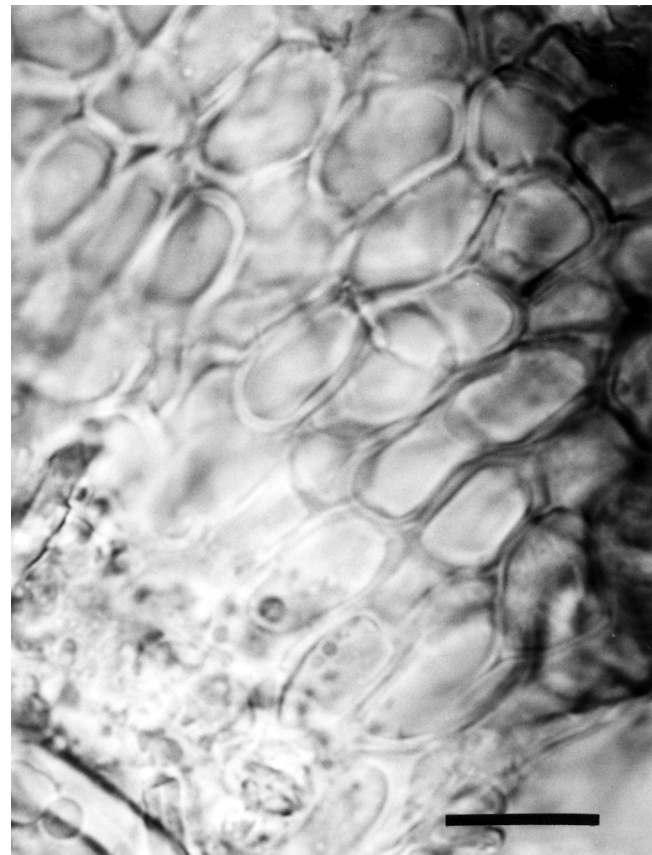


Fig. 4. *Uredopeltis chevalieri*, ex PERTH 3970574. Close-up of portion of telium showing individual teliospores, irregularly arranged. Bar = 20 μm .

reddish-brown, variable in shape from elongated to broadly oval, rounded rectangular to cuboid, higher than wide, (15–) 16–22 (–23) × (10–) 11–13 (–15) μm, wall of mature (outer) spores 2 (–2.5) μm thick, slightly thicker at corners, the apical wall of some outer layer spores to 4 μm thick, spores not in strictly vertical rows, united to adjacent spores, no distinct germ pore seen but a small, clear apical spot to 3 μm diam., which may be a germ pore, present in some spores.

On *Grewia* spp., Africa, India, Pakistan, Australia.

Specimens examined: on leaves of *Grewia breviflora* Benth., Beverley Springs Station, Kimberley region, Western Australia, 9.v.1995, A.A. Mitchell, PERTH 3970574, Holotype (Isotype as DAR 74838), uredinia and telia; on leaves of *Grewia* sp., Mitchell Plateau, Kimberley region, Western Australia, 16.iii.1994, R.G. Shivas, PERTH 3270092 (microscope slide as DAR 75610), uredinia only.

The Australian collections agree closely with the descriptions of the rust given by Sydow and Sydow (1923–1924), Cummins (1945) and Thirumalachar (1946). Infected leaves show yellow to pale brown blotches 2–3 cm across corresponding to the sori on the lower leaf surface. Where infection is light, a fine brown to purplish stippling on the upper leaf surface indicates the presence of sori on the lower.

Further searches on *Grewia* spp. in northern Australia may extend both the host range and geographic distribution of this rust in Australia. In Africa, the rust has been recorded on *G. ferruginea* Hochst. in Senegal (Patouillard and Hariot 1900), *G. pubescens* Beauv. in Ivory Coast (Viennot-Bourgin 1953) and *G. cana* Sond. and *G. monticola* Sond. in South Africa (Doidge 1926; Thirumalachar 1946; Viennot-Bourgin 1953). In Asia, it occurs on *G. abatifolia* Vent. ex Juss., *G. asiatica* L., *G. salvifolia* Heyne and *G. tiliifolia* Vahl in India (Payak 1953; Patil and Thirumalachar 1972) and is reported on *G. asiatica* in Pakistan (Rahber-Bhatti *et al.* 1988). In the Pacific region, Cummins (1937) recorded a specimen he identified as *U. grewiae* on *G. multiflora* Juss. from the Philippines; it was said to have urediniospores (size not given) with six germ pores, arranged equatorially or irregularly distributed in the upper part of the spore. This collection has not been examined and its precise relationships remain to be clarified.

Nomenclator and summary of the rusts of *Grewia*

All names found for rusts of *Grewia* are listed below, with a brief summary of characteristics of species not considered in detail in this paper, and how they differ from *Uredopeltis chevalieri*. Names are listed in chronological order of date of publication and accepted, validly published, names are in bold face italic. This summary is included to clarify the nomenclature and characteristics of these rusts, to compare them with *Uredopeltis chevalieri* and to bring them to the attention of Australian plant pathologists, quarantine authorities, mycologists and botanists.

Uredo grewiae Pat. & Har., *Journal de Botanique* **14**: 237, 1900. On *Grewia ferruginea*, Senegal. The uredinial anamorph of *Uredopeltis chevalieri*; see text.

Aecidium warnekeanum Henn., *Engler Botanischer Jahrbücher* **38**: 105, 1905. On branches of *Grewia carpinifolia* Juss., Tanzania (originally as German East Africa). Aecia are deeply embedded in distorted branches forming galls and witches' brooms. Sydow and Sydow (1923–1924, p.175) found only empty aecia in the original collection and saw peridial cells but no aeciospores. They considered that the measurement of 10–13 μm for aeciospores given in the original description was erroneous. Known only from the original collection and relationships unknown.

Ravenelia atrides Syd. & P. Syd., *Annales Mycologici* **10**: 438, 1912. On leaves of *G. caffra* Meisn. (type host) and *G. occidentalis* L., Natal, South Africa. Cummins (1950) identified a uredinial state collected in China on *G. parviflora* Bunge as this species and also mentioned its occurrence in the Philippines (host species not mentioned). He commented that telia have been found only in Africa. The rust occurs on the lower leaf surface and does not cause leaf spotting. Sydow and Sydow (1912) described teliospore heads as shortly pedicellate, dirty brown, convex, orbicular to ellipsoidal, smooth, 110–190 μm diam., composed of a mass of bicellular spores 35–45 × 14–19 μm, 15–22 spores across, subtended by numerous minute globose cysts. Uredinia contain numerous straight to slightly curved paraphyses, 30–50 × 10–13 μm and ellipsoidal to ovate, yellow to pale yellowish-brown urediniospores 16–20 × 12–14 μm, with a thin (1.5 μm) wall. These are smaller than urediniospores of *U. chevalieri*. The description of *R. atrides* given in Doidge (1926) is identical to that of Sydow and Sydow (1912).

Phakopsora grewiae (Pat. & Har.) Cummins, *Bulletin of the Torrey Botanical Club* **72**: 206, 1945. Based on the uredinial ***Uredo grewiae*** Pat. & Har. A validly published but incorrect name for the uredinial stage of *Uredopeltis chevalieri*; see text.

Uredo corbiculoides Cummins, *Bulletin of the Torrey Botanical Club* **72**: 219–220, 1945. On leaves of *Grewia* sp., Uganda, Africa. The hypogenous uredinia are described with smaller urediniospores (16–20 × 13–16 μm) and much longer paraphyses (50–100 μm) than found in *Uredopeltis chevalieri*. Urediniospores are of a similar size to those described for *R. atrides* but paraphyses of *R. atrides* are only half as long. It appears to be known only from Africa.

Dasturella grewiae (Pat. & Har.) Thirum., *Bulletin of the Torrey Botanical Club* **73**: 348, 1946. Based on the uredinial ***Uredo grewiae*** Pat. & Har. A validly published but incorrect name for the uredinial state of *Uredopeltis chevalieri*; see text.

Catenulopsora grewiae Mundkur & Thirum., *Mycological Papers* **40**: 13–14, 1951. On leaves of *G. populifolia* Vahl, Punjab, India. The rust produces indistinct leaf spots with

hypogenous sori. Uredinia have abundant, cylindrical paraphyses $22\text{--}37 \times 5.5\text{--}7 \mu\text{m}$, the marginal ones incurved, with pale yellow, densely verruculose, pedicellate urediniospores $15\text{--}22 \times 13\text{--}16.5 \mu\text{m}$ and unicellular, hyaline, pyriform teliospores $13\text{--}20 \times 11\text{--}18 \mu\text{m}$ arranged in separate, diverging vertical chains 16–20 spores long. Thirumalachar (1961) merged *Catenulopsora* with *Kuehneola* and transferred this *Grewia* rust as *K. grewiae* (Mundkur & Thirum.) Thirum. Laundon (1975) compared the two genera, finding that they differed in several characters, including non-paraphysate uredinia in *Kuehneola*. Laundon (1975) considered *Catenulopsora* very similar to *Cerotelium*, type species *C. canavaliae* Arthur, in its uredinial stage and Cummins and Hiratsuka (1983) included *Catenulopsora* in synonymy under *Cerotelium*. The taxonomic status of *Catenulopsora grewiae* remains to be resolved.

Puccinia tiliifolia T.S. Ramakr. & Sundaram (as '*tiliaeifolia*'), *Proceedings of the Indian Academy of Sciences*, Section B, **41**: 194, 1955. On leaves of *Grewia tiliifolia* (as '*tiliaeifolia*'), India. This poorly known rust forms hypogenous brown erumpent telia bearing oblong to obovate two-celled teliospores $19\text{--}43 \times 12\text{--}19 \mu\text{m}$, with a long pedicel and germinating at maturity by a basidium and basidiospores. Numerous mesospores $19\text{--}25 \times 12\text{--}19 \mu\text{m}$, and the occasional three-celled teliospore, were present. No other spore stages were found (Ramakrishnan and Sundaram 1955). This rust is distinct from *U. chevalieri*, which has been recorded on the same host in India (Payak 1953, Patil and Thirumalachar 1972, both as *Dasturella grewiae*). Excluding *Aecidium warneckeanum*, whose affinities are unknown, this is the only puccinoid rust recorded on *Grewia*, although in the absence of pycnia, its precise relationships cannot be clarified.

Cumminsia clavispora Petr., *Sydowia* **9**: 474, 1955. On *Grewia* sp. (as '*Grewia nenensis*'), Angola. This monotypic genus produces erumpent sori on small (1 mm) round to angular, yellowish-green leaf spots, often confluent into larger areas. Marginally paraphysate uredinia bear pedicellate echinulate urediniospores $19\text{--}30 \times 13\text{--}23 \mu\text{m}$. Teliospores are amongst the most complex seen in the rusts. Borne on a simple pedicel, several laterally united apical cells each bears a vertical chain of rough-walled cells, the chains laterally united and forming a large, multicellular, club-shaped structure, resembling an inverted *Alternaria* conidium (Petraček 1955). Spores are illustrated by Cummins and Hiratsuka (1983). The relationships of this rust are unknown. The host name '*Grewia nenensis*' used by Petraček (1955), whose epithet is presumably based on the River Nene in Angola where the type collection of *C. clavispora* was made, is not listed in the International Plant Name Index (2003) and appears to have not been published (Dr K. N. Gandhi, personal communication 22 and 23 March 2003).

Phakopsora microspora Cummins, *Bulletin of the Torrey Botanical Club* **87**: 37, 1960. On leaves of *Grewia*

carpinifolia, Ghana. Hypogenous uredinia with incurved hyaline marginal paraphyses $20\text{--}35 \times 6\text{--}8 \mu\text{m}$ produce broadly ellipsoidal, echinulate urediniospores $16\text{--}19 \times 14\text{--}17 \mu\text{m}$ with obscure germ pores. Telia are hypogenous, to 100 μm wide, with irregularly arranged yellowish teliospores $(8\text{--}) 11\text{--}17 (-20) \times (6\text{--}) 8\text{--}11 (-13) \mu\text{m}$ (Cummins 1960). Both spore stages are smaller than those of *U. chevalieri*. The urediniospores are similar in size to those of *Uredo corbiculoides* but the paraphyses of that species are much longer.

Kuehneola grewiae (Mundkur & Thirum.) Thirum., *Mycologia* **52** (1960): 692, 1961. Based on *Catenulopsora grewiae* Mundkur & Thirum.; see above.

Uredopeltis grewiae (Pat. & Har.) Sathe (as '(Cummins) Sathe'), *Bulletin of the Botanical Survey of India* **11**: 176, 1969. Based on the uredinial *Uredo grewiae* Pat. & Har.; not validly published. See under Sathe (1969) in chronological summary above for full discussion.

Uredopeltis chevalieri J. Walker & R.G. Shivas, this paper. This is the rust of *Grewia* formerly known as *Phakopsora grewiae* and *Dasturella grewiae*.

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Notes on references

The papers published as Thirumalachar (1961), and Thirumalachar and Narasimhan (1951), both have the title 'Critical notes on some plant rusts III'. The 1961 paper should be number 'IV' in the series. Both the 1951 and 1961 papers have footnotes referring to the previous paper, number 'II' in the series, in *Sydowia* **5**: 23–29, 1951. Thirumalachar (1961) obviously overlooked the second 1951 paper (Thirumalachar and Narasimhan 1951), the correct number 'III' in the series, when preparing his 1961 contribution.

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