Uromyces euryopsidicola sp. nov., a rust species that forms witches' brooms on *Euryops* (Asteraceae) in South Africa

Alan R. Wood[1*] & Markus Scholler[2]

[1] ARC-Plant Protection Research Institute, P. Bag X5017, Stellenbosch, 7599, South Africa;
[2] Staatliches Museum für Naturkunde, Erbprinzenstr. 13, D-76133 Karlsruhe, Germany

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Uromyces euryopsidicola sp. nov. (Uredinales) is described from South Africa. The species is microcyclic, forming telia on stems of *Euryops* spp. (Asteraceae, Senecioneae). It is systemic, inducing the development of witches' brooms in its hosts.

Keywords: *Uromyces euryopsidicola*, *Euryops*, South Africa

The Fynbos biome of South Africa covers an area of c. 69 875 km^2. It is centered in the Western Cape Province, and extends into the Northern and Eastern Cape Provinces of South Africa. Floristically it is a very diverse area, with approximately 8 000 vascular plant species, of which approximately 80 % are endemic (Low & Rebelo, 1998). *Euryops* (Asteraceae, Senecioneae), with 97 species, is distributed throughout much of Africa. However, it has its greatest concentration in South Africa where 89 species occur, many of which are endemic to restricted areas in fynbos, karroo and grassland habitats (Nordenstam, 1969). Most species are perennial, erect, and multi-stemmed shrubs (Nordenstam, 1968). It is the third largest genus in the Asteraceae, in terms of species numbers in South Africa (Koekemoer, 1996). There is, however, little known about obligate parasitic fungi of *Euryops*. In the following, a species of Uredinales on two perennial *Euryops* species is described as new. It is apparently endemic to arid regions of the Fynbos biome.

[1*] Corresponding author: fax: +27 21 887 5096; tel: +27 21 887 4690
e-mail: WoodA@arc.agric.za

Materials and Methods

Teliospores of dried herbarium specimens were mounted in aqueous lactic acid (50 %) solution, and studied morphologically and measured at 1000 × magnification using a Zeiss Axioskop light microscope. Fifty teliospores were measured. Measurements give the 95 % confidence limits of the mean, with the minimum and maximum extremes given in parentheses. Spores were documented by microphotographs using a Zeiss MC63 camera. In order to study basidia and basidiospores, fresh teliospores were sown on water droplets on glass microscope slides. The slides were placed on moist tissue paper in Petri dishes, after which the Petri dishes were sealed and incubated in the dark at 15 °C for 24 hours, after which time they were examined.

Taxonomic part

***Uromyces euryopsidicola* A.R. Wood & M. Scholler, sp. nov.**
Figs. 1–7

Etymology: named after its host plant Euryops.

Latin diagnosis: Pycnia, aecia et uredinia absentia. Telia in stipitibus subepidermalia vel profunda, erumpentia, pulvinata, dilute brunnea vel aurantio-brunnea, ad 0.5 mm diam. Teliosporae dilute luteae vel aurantio-brunneae, oblongae, utrinque rotundatae, (40)46–48(59) × (17)21–22(24) µm; paries levis, 1–2 µm crassus, sursum ad 4–14 µm inspissatus, poro apicali germinationis distincto; pedicellus persistens, ad 245 µm longus. Mycelium systemicum, scopas densas inducens.

Holotypus: SOUTH AFRICA, Western Cape Province: summit of Kouberg Pass, between Biedou Valley and Wupperthal, Clanwilliam district, 32°15′S 19°11′E, on *Euryops tenuissimus* (L.) DC., 13 July 2001, A.R. Wood 295 (PREM 58122) (isotypus PUR N4582, K (M) 122301).

Pycnia, aecia and uredinia absent. – Telia on stems, subepidermal to deep seated, erumpent, pulvinate, light brown to orange-brown, up to 0.5 mm in diameter. – Teliospores light yellow to orange-brown, oblong, apex and base rounded, (40)46–48(59) × (17)21–22(24) µm, length/width ratio 1:1.67–2.95 (mean 1:2.2); wall smooth, 1–2 µm thick; apex thickened, 4–14 µm, with distinct apical germ pore; pedicel persistent, up to 245 µm; spores may germinate without a period of dormancy (lepto-form). – Basidia four-celled with each cell forming one ovoid basidiospore. – Mycelium systemic, inducing formation of witches' brooms.

Specimens examined in addition to the type: SOUTH AFRICA, Western Cape Province: Montague Nature Reserve, NW

Fig. 1. Witches' broom caused by *Uromyces euryopsidicola* on *Euryops empetrifolius*.

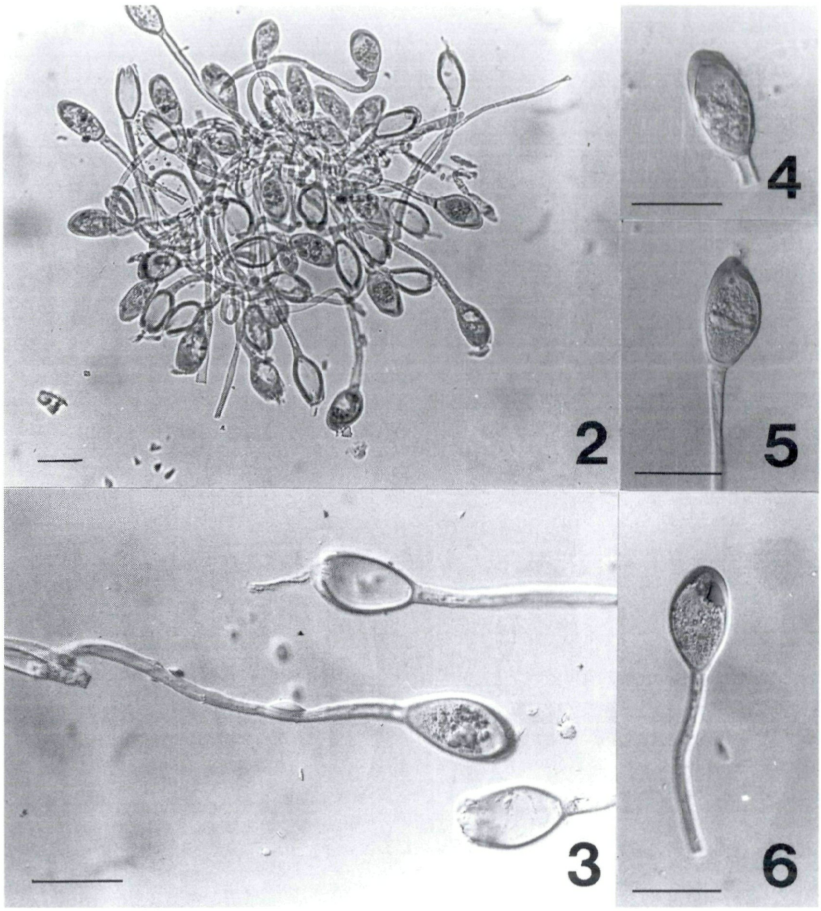

Fig. 2–6. *Uromyces euryopsidicola*. **2.** Group of teliospores. **3.** Teliospores showing germinated spores and long persistant pedicels. **4–6.** Individual teliospores showing thickened apex with germ pore. Scale bar = 40 μm.

outskirts of Montague, 33°47′S 20°05′E, on *Euryops tenuissimus* (L.) DC., 27 Sept.1999, *A.R. Wood 158* (PREM 58123). Northern Cape Province: 2 km S of Nuwerus R., between Matjiesfontein and Sutherland, 33°00′S 20°34′E, on *Euryops empetrifolius* DC., 16 June 2002, *A.R. Wood 398* (PREM 58124); summit of Verlatekloof Pass, S of Sutherland, 32°31′S 20°38′E, on *Euryops empetrifolius* DC., 16 June 2002, *A.R. Wood 399* (PREM 58125); along Visrivier Road, SW of Sutherland, 32°27′S 20°34′E, on *Euryops empetrifolius* DC., 23 Feb. 2003, *A.R. Wood 508* (PREM 58126).

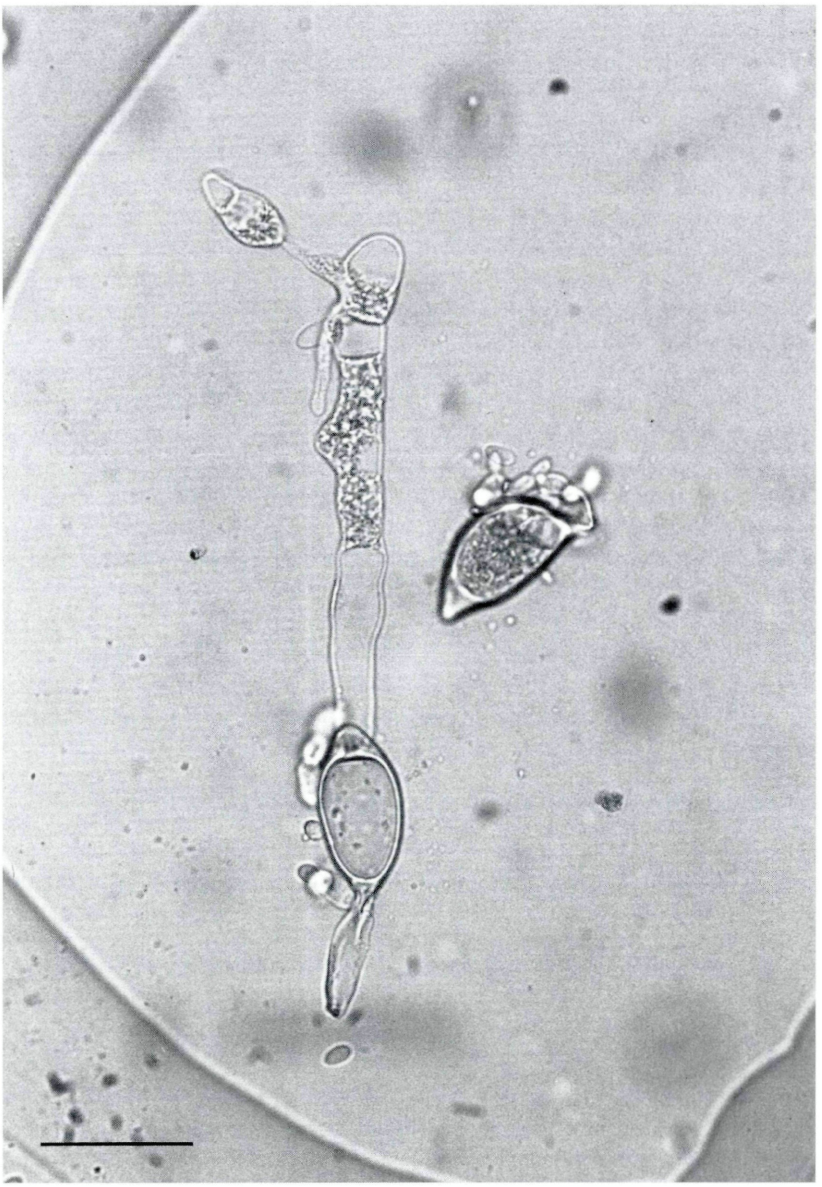

Fig. 7. Germinated teliospore of *Uromyces euryopsidicola* showing metabasidium, sterigmata in various stages of development, and a single basidiospore. Scale bar = 40 μm.

Discussion

The new species is morphologically similar to *Uromyces kurtzii* Henn., a native of Argentina on *Senecio salsus* Griseb. Common features of the two species are the life cycle (formation of spore stages III and IV only), related host plants (Senecioneae) and induction of witches' brooms. The species, however, can be delimited by morphological features (teliospores and pedicels of *U. kurtzii* are shorter and the spore apex is often acute (Sydow & Sydow, 1910), whereas the apex in *U. eurysopsidicola* is rounded). The new species can hardly be misidentified with African *Uromyces* spp. on Asteraceae. *Uromyces melantherae* Cooke on *Melanthera scadens* (Schuhmach. & Tonn.) Roberty ssp. *dregei* (DC.) Wild (originally identified as *Melanthera brownei* Sch. Bip.), the only other *Uromyces* recorded on a species of the Asteraceae indigenous to southern Africa (Doidge, 1950), differs by the presence of uredinia and smaller teliospores (Doidge, 1927). The microcyclic *U. senecionis-gigantis* Gæjrum recorded from Ethiopia differs in having sub-ovoid and smaller (22–29 µm) teliospores (Gjærum, 1976). The African species that is most similar to *U. euryopsidicola* in morphology, habit (systemic growth causing witches' brooms) and life cycle (microcyclic, lepto-form), however, is a fabaceous species (on *Aspalathus* spp.), *Uromyces bolusii* Massee. The new species can be distinguished by the apex of the teliospores being rounded, not acuminate (as in *U. bolusii*), and thinner (up to 20 µm in *U. bolusii*) (Doidge, 1927).

Uromyces euryopsidicola seems to have a restricted host range and a distribution clearly smaller than the host genus' distribution. The first host species, *Euryops tenuissimus*, is a common and widespread species of the western parts of South Africa. *Euryops empetrifolius* also has a wide distribution, occurring in the interior of the Northern Cape from the Roggeveld mountains (Sutherland district) to Lesotho (Nordenstam, 1968, 1969). The areas where *U. euryopsidicola* has so far been collected have an average annual rainfall of approximately 300–400 mm (Schulze, 1997). This is exemplified by the type specimen that was collected in arid fynbos at the summit of the Kouberg Pass, despite the plant being a common constituent of the drier karroo vegetation at lower altitudes no rust was found in these areas. Despite there being numerous species of *Euryops* in areas of the fynbos with greater rainfall, and intuitively a more suitable environment for rust fungi, this rust species has up to the present only been observed on these two plant species.

The production of localized systemic infections causing abnormal proliferation of shoots (witches' brooms) on a perennial woody host allows high survival rates over hot dry summers experienced in the localities where this rust has been found. Subsequent visits to

localities up to four years after specimens were first collected revealed that the rust survived in the host individuals studied. Witches' brooms can become quite large (up to 20 cm diam.) relative to the size of the plant stems (approx. 0.5–1 cm diam.), indicating that individual ones may persist for several years.

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