



***Uromyces trifolii*, a new addition to rust fungi of Himachal Pradesh, India, with a checklist of *Uromyces* in India**

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Abstract

Uromyces is a genus of rust fungi that infects both monocots and dicots throughout the world. The genus is particularly common on plant families like Asteraceae, Euphorbiaceae, Fabaceae, Liliaceae, Poaceae, and Loranthaceae. A rust infection was observed on leaves and stem of *Trifolium repens* from Himachal Pradesh, India. The symptoms appeared as dark brown to blackish brown pustules. Morphological and microscopic analyses of diseased samples identified it as *Uromyces trifolii*, which is new to Himachal Pradesh. Taxonomic descriptions and illustrations of the specimen are given. A checklist to assess diversity and distribution of the genus *Uromyces* in India is provided.

Key words – checklist – Himachal Pradesh – new record – rust fungi – *Trifolium repens*

Introduction

Uromyces (Link) Unger, a genus of rust fungi was proposed by Unger (1833). There are more than 1562 taxonomic names within this genus worldwide (IndexFungorum 2016). According to Cummins & Hiratsuka (2003) it is the second largest genus of rust fungi next to *Puccinia* and contains more than 600 reported species. It is mainly characterized by 1-celled teliospores which differentiate it from *Puccinia*, which has 2-celled teliospores. *Uromyces* infects both monocots and dicots throughout the world, infecting plant families like Asteraceae, Euphorbiaceae, Fabaceae, Liliaceae, and Poaceae, but Loranthaceae is a major one (Vidal-Russell & Nickrent 2008).

The genus has a wide diversity and host range in India also. Himachal Pradesh, the northern hilly state of India is situated in the western part of Himalaya. It is a mountainous state with elevations ranging from about 350–7,000 m above sea level. Climatic conditions vary from hot and sub-humid tropical in the southern tracts to cold, alpine and glacial in the northern and eastern mountain ranges. The changeable geographical and climatic conditions of the state are favourable for biodiversity including growth and development of plant pathogens. One of the most important characteristics of plant rusts is their exceptionally high degree of host specificity. The vast biodiversity and climatic conditions of the state lead to a wide rust diversity, distribution and host range of this fungal group.

A rust infection was observed on leaves and stems of *Trifolium repens* L. (Fabaceae) during our routine phytopathological survey from district Mandi of Himachal Pradesh in 2015. A detailed taxonomic study and survey of the literature as well as comparative analyses revealed that the fungus is a new addition to the rust fungi in Himachal Pradesh (Mukherji & Juneja 1974, Sarbhoy 1975, 1980, Bilgrami 1991, Jamaluddin et al. 2004). The disease was studied further and is described in the present study. A checklist to assess diversity and distribution of the genus *Uromyces* in India is also provided.

Materials and methods

Naturally infected plant parts showing rust symptoms were collected from Chail Chowk area of district Mandi, Himachal Pradesh. Infected leaves and stems were placed in separate polythene bags and taken to the laboratory for further examination. Specimens are deposited in the Abhilashi University Mycological Herbarium (AUMH), School of Agriculture, Faculty of Science, Abhilashi University, Mandi, Himachal Pradesh, India. Morphological features of all specimens were noted, and measurements were made. Diseased spots were photographed with a Sony DSC-X80 camera. Mounts of spores and free-hand sections of sori were prepared in lactophenol and heated to boiling. The fungal structures were examined under a light microscope (Olympus). At least 25 measurements for each microscopic structure were taken. Taxonomic analyses were made by consulting relevant literature and illustrations are given in accordance with Cummins & Hiratsuka (2003).

A checklist of the genus *Uromyces* was also prepared to assess diversity and distribution in India. An exhaustive bibliographic survey of the literature published in various national and international journals, monographs, books, book chapters and magazines on these rust fungi was carried out. Some species names as reported in the cited publications have been replaced with their currently accepted name according to the Species Fungorum website (Speciesfungorum 2016).

Results

Trifolium repens is a perennial, herbaceous, low growing flowering plant of family *Fabaceae* and is commonly known as white clover. It is considered as a folk medicine in India, used against intestinal helminthic worms. An experimental *in vivo* study validated that the aerial shoots of *T. repens* bear significant anticestodal properties (Yadav et al. 2004). On leaves and stem dark brown to blackish brown telial pustules were observed (Fig. 1).

Taxonomy

Uromyces trifolii (R. Hedw.) Lév., Anns Sci. Nat., Bot., sér. 3, 8: 371 (1847) (Figs. 1, 2)

=*Uromyces flectens* Lagerh., Svensk bot. Tidskr. 3: 36 (1909).

=*Uromyces nerviphilus* (Grognot) Hotson, Publ. Puget Sound Biol. Sta. Univ. Wash. 4: 368 (1925).

Telia mostly hypophyllous, sometimes epiphyllous, rounded, scattered, subepidermal, erumpent, pulverulent, surrounded by the ruptured epidermis, dark brown to blackish brown, 0.08–0.19 × 0.09–0.3 mm. Teliospores globose to subglobose or ellipsoid to obovoid, 21–30 × 15–24 µm (mean 26.0 × 19.6 µm), the apex rounded with minute hyaline papilla; wall 1–2 µm thick, brown to chestnut brown, smooth or with minute scattered warts; apex 3–4 µm thick, germ pore 1; pedicel hyaline, 4–8 µm wide and up to 24 µm long. Spermagonia, aecia and uredinia not found.

Material examined – On *Trifolium repens* L., with III stage, India, Himachal Pradesh, Chail Chowk (Mandi), at 1400 m, 24 August 2015, coll. Ajay K. Gautam (AUMH 1030).



Fig 1 – Rust infection on *Trifolium repens* caused by *Uromyces trifolii*.



Fig 2 – *Uromyces trifolii*: Teliospores. Scale bar = 20 μ m.

Diversity and distribution

Species of *Uromyces* infect both monocots and dicots throughout the world. Ninety-seven species of *Uromyces* have been identified and reported from India on 180 plant host species that belongs to 85 genera and 32 families. Thirty species have been found associated with family *Fabaceae* followed by *Poaceae* (23), *Asteraceae* (6), *Lamiaceae* and *Caprifoliaceae* (3 each) and *Polygonaceae*, *Cyperaceae*, *Euphorbiaceae*, *Asparagaceae*, *Acanthaceae* and *Oleaceae* (2 each).

The remaining host plant families are associated with a single species of *Uromyces* (Table 1). Of 97 *Uromyces* species reported from India, only 15 species are reported from Himachal Pradesh. *Uromyces* species have also been found in nineteen other states of India (Table 1).

Discussion

Based on morphological characteristics the rust on *Trifolium repens* was identified as *Uromyces trifolii*. This rust has been previously reported on *T. resupinatum* (reversed clover) and *T. pratense* (red clover) from Haryana and Uttrakhand, respectively (Sydow & Butler 1907a, b, Padwick & Khan 1944, Hooda & Saini 1990, Sokhi et al. 1985).

The genus *Uromyces* is mainly characterized by 1-celled teliospores. The *Fabaceae* (legume, pea, or bean family) and *Poaceae* (grass family) are particularly susceptible to infection of *Uromyces* spp. In India, 30 species of *Uromyces* have been reported on legumes and 23 species on grasses. Nearly 180 plant species that belong to 85 genera and 32 families are infected with *Uromyces* spp.

Table 1 *Uromyces* species recorded in India.

Taxa	Hosts	Distribution*	References
<i>U. pavgei</i> Goswami & Nagachan	<i>Achyranthes aspera</i>	AS	Goswami & Nagachan 1979
<i>U. lycoctoni</i> (Kalchbr.) Fuckel	<i>Aconitum leave</i>	J&K	Arthur 1934, Cummins 1943
<i>U. aconiti</i> Fuckel	<i>Aconitum lycoctonum</i>	J&K	Arthur 1934, Arthur & Cummins 1936
<i>U. acori</i> T.S. Ramakr. & Rangaswamy	<i>Acorus calamus</i>	TN	Ramakrisnan & Rangaswamy 1948
<i>U. sporogoni</i> subsp. <i>asiaticus</i> (T.S. Ramakr. & Rangaswami) Parmelee & Savile	<i>Acorus calamus</i>	TN	Ramakrisnan & Sundaram 1955a
<i>U. agropyri</i> Barclay	<i>Agropyron</i> sp.	HP	Barclay 1891
<i>U. sphaeropleus</i> Cooke	<i>Allium cepa</i>	MS	Cooke 1876
<i>U. aloes</i> (Cooke) Magnus	<i>Aloe spicata</i> , <i>Aloe vera</i>	TN, MS	Ajrekar & Tonapy 1923
<i>U. apludae</i> Syd. & E.J. Butler	<i>Alpuda aristata</i>	MS, PB	Sydow & Butler 1907a
<i>U. amphiphis-insculptae</i> T.S. Ramakr., Sriniv. & Sundaram	<i>Amphilophus insculpta</i>	TN	Ramakrisnan 1952
<i>U. andropogonis-annulati</i> Syd., P. Syd. & E.J. Butler	<i>Andropogon annulatus</i>	BR, UP, UK, AP, MS, MP	Sydow & Butler 1907a, b
	<i>Andropogon pertussis</i>	UP, TN	Ramakrisnan 1951a

Table 1 (continued)

Taxa	Hosts	Distribution*	References
<i>U. clignyi</i> Pat & Har.	<i>Andropogon pumilus</i> , <i>Bothriochloa</i> sp., <i>Dichanthium annulatum</i> , <i>Ermopogon faveolatus</i> , <i>Heteropogon contortus</i> , <i>Themeda triandra</i> ,	TN, MS, AP, KR	Ramakrisnan. 1953, Ramachar 1978, Hosagouder 1985
<i>U. schoenanthi</i> Syd. & P. Syd.	<i>Andropogon schoenanthus</i>	MS, KA, KL	Sydow & Butler 1938
<i>U. andropogonis</i> Tracy	<i>Andropogon</i> sp.	Kud, (J&K)	Pachkheda 1985
<i>U. commelinae</i> Cooke	<i>Aneilema giganteum</i> , <i>Commelina benghalensis</i> , <i>C. obliqua</i> , <i>C. forskalii</i> , <i>C. tuberosa</i> , <i>C. kurzii</i> , <i>C. tricolor</i> , <i>C. attenuate</i> , <i>Cyanotis cristata</i> , <i>C. obtuse</i> , <i>C. axillaris</i> , <i>C. fasciculata</i> , <i>Murdannia divergens</i> , <i>M. versicolor</i> , <i>Zygomenes cucullata</i> ,	KL, TN, MS, RJ, KA, UK	Joshi 1958, Jain 1966, Patil 1966, Patil & Thirumalachar 1968, Rolla & Addala 1963, Sydow & Butler 1938
<i>U. anotidis-monospermatis</i> T.S. Ramakr. & Sund.	<i>Anotis monosperma</i>	TN	Ramakrisnan & Sundaram 1955a
<i>U. inayati</i> Syd. & P. Syd.	<i>Apluda aristata</i> , <i>A. varia</i>	UK	Sydow & Butler 1907a
<i>U. clivalis</i> Mitter	<i>Argyrolobium flaccidum</i>	UK	Sydow & Mitter 1933
<i>U. lapponicus</i> Lagerh.	<i>Astragalus maddenianus</i>	J&K	Cummins et al. 1943
<i>U. hydrabadensis</i> Bhagnarayana, Ramachar & Niranjana Rao	<i>Atylosa scarabaeoides</i>	AP	Bhagyanarayana 1987
<i>U. vestergreni</i> P. Syd. & Syd.	<i>Bauhinia tomentosa</i> , <i>B. accuminata</i>	KA, TN, MS	Magdum 1967, Sydow & Butler 1938
<i>U. bidentis</i> Lagerh.	<i>Bidens pilosa</i> , <i>Bidens</i> sp.	TN, KL, KA	Ramakrisnan & Sundaram 1955a, Sydow & Butler 1938
<i>U. satarensis</i> P.B. Chavan & Bakare	<i>Blainvillea latifolia</i>	MS	Chavan & Bakare 1973a, b
<i>U. blainvilleae</i> Berk.	<i>Blainvillea rhomboidea</i> , <i>B. acmella</i>	AP, MS	Patil & Thirumalachar 1981, Sydow & Butler 1907a
<i>U. leptodermus</i> Syd. & P. Syd.	<i>Brachiaria reptans</i> , <i>B. distachya</i> , <i>B. ramose</i> , <i>Panicum javanicum</i> , <i>P. prostratum</i> , <i>P. antidotale</i> , <i>P. maximum</i>	BR, MS, AP, TN, WB, UP,	Mitter & Tandon 1932, Pandotra 1966, Ramakrisnan 1952, Sundaram 1964, Sydow & Butler 1938, Sydow & Butler 1938

Table 1 (continued)

Taxa	Hosts	Distribution*	References
<i>U. ambiens</i> Cooke	<i>Buxus sempervirens</i>	UK, HP	Barclay 1891, Cooke 1874, Sydow 1913
<i>U. oculiformis</i> T.S. Ramakr. & K. Ramakr.	<i>Chlorophytum attenuatum</i>	TN	Ramakrisnan & Ramakrisnan 1948
<i>U. ciceris-arietini</i> (Grognot.) Jacz. & G. Boyer	<i>Cicer arietinum</i> , <i>Lathyrus aphaca</i> , <i>L. odoratus</i> , <i>Trogonella corniculata</i> , <i>T. polyrata</i> , <i>Vicia biennis</i> , <i>V. ervillia</i> , <i>V. faba</i> , <i>V. gracilis</i> , <i>V. hirsuta</i> , <i>V. narbonensis</i> , <i>V. sativa</i> , <i>V. tetrasperma</i>	BR, MS, MP, UP, DL, HP	Agarwal 1959, Asthana 1957, Bhahadur & Singh 1967, Butler & Mcrae 1930, Jain 1966, Payak 1949, Payak 1962, Vasudeva 1950
<i>U. nilagiricus</i> T.S. Ramakr. & K. Ramakr.	<i>Citrus reticulata</i> , <i>Dendrophthoe falcata</i> , <i>Loranthus</i> sp.,	TN, MS,	Chavan 1975, Ponappa 1961
<i>U. decorates</i> Syd.	<i>Crotalaria juncea</i> , <i>C. rustica</i> , <i>C. retusa</i> , <i>C. medicagenia</i>	AP, UK, KR, UP, MS, KL, BR	Behera & Mukherji 1974, Chaudhari & Singh 1974, Hosagouder 1985, Khan 1994, Ramakrisnan & Sundaram 1955a, Patil 1966, Payak 1949, Prakash. 1979
<i>Uromyces achrous</i> Syd. & P. Syd.	<i>Dalbergia latifolia</i>	KL	Hosagouder 1985
<i>U. ascorus</i> Syd.	<i>Dalbergia latifolia</i>	KL	Hosagouder 1985
<i>U. capitatus</i> Syd. & P. Syd.	<i>Desmodium tiliaefolia</i>	UK	Sydow 1913, Sydow 1937
<i>U. appendiculatus</i> (Pers.) Link	<i>Dicanthium annulatum</i> <i>Dolichos lablab</i> , <i>haseolus</i> sp., <i>P. mungo</i> , <i>P. vulgaris</i> , <i>P. aconitifolius</i> , <i>Vigna unguiculata</i> , <i>V. vexillata</i> , <i>Vigna sinensis</i>	MP TN, BR, MS, HP, KA, KA, RJ, AP, MP, GJ	Mishra & Nema 1976 Butler & Mcrae 1930, Jain 1966, Joshi 1958, Nema & Mishra 1965, Patil 1966, Prasad & Sinha 1962, Ramakrisnan & Sundaram 1955a, b, Sydow & Butler 1907a, b
<i>U. eragrostidis</i> Tracy	<i>Eragrostis cynosuroides</i> , <i>Eleusine coracana</i>	BR, UP	Dublish & Singh 1977, Sydow & Butler 1907a
<i>U. prominens</i> (DC.) Lév.	<i>Euphorbia hypericifolia</i> , <i>E. hispida</i> , <i>E. dracunculoides</i>	UP, MS,	Butlere & Bisby 1931, Chavan & Bakare 1977, Cummins 1943, Sydow & Butler 1938
<i>U. haussknechtii</i> Tranz.	<i>Euphorbia pilosa</i>	J&K	Cummins 1943
<i>U. euphorbiae</i> Cooke & Peck	<i>Euphorbia thymifolia</i>	GJ	Ajrekar 1912
<i>U. fritillariae</i> Thum.	<i>Fritillaria roylei</i>	J&K	Arthur & Cummins 1936

Table 1 (continued)

Taxa	Hosts	Distribution*	References
<i>U. geranii</i> (DC.) G.H. Otth & Wartm.	<i>Geranium wallichianum</i> , <i>G. aconitifolium</i>	J&K, BR	Cummins 1943, Sydow & Butler 1907a, Yadav 1963
<i>U. sojae</i> (P. Henn.) Syd. & P. Syd.	<i>Glycine max</i>	TN	Ramakrisnan 1951b
<i>U. hedysari- obscuri</i> (DC.) Carestia & Picc.	<i>Hedysarum cachemirianum</i>	J&K	Arthur 1934, Arthur & Cummins 1936
<i>U. macintirianus</i> Barclay	<i>Hemigraphis latebrosa</i>	HP, BR	Sydow & Butler 1938
<i>U. heterogenus</i> Cooke	<i>Hibiscus esculentus</i>	MS	Uppal 1935
<i>U. muscari</i> (Duby) Graves	<i>Hyacinthus orientalis</i>	TN	Agarwal 1985
<i>U. orientalis</i> Syd.	<i>Indigofera linifolia</i> , <i>I. cordifolia</i> , <i>I. glandulosa</i> , <i>I. hirta</i>	BR, MP, MS	Sydow & Butler 1907a, b, Thite & Patil 1975
<i>U. indigoferae</i> Dietel & Holw.	<i>Indigofera tinctoria</i> , <i>I. linifolia</i>	AP, MS	Chavan & Bakare 1977, Joshi & Reddy 1958, Joshi & Reddy 1959, Manoharachery 1975, Saksena 1955, Vasudeva 1960 Patil & Thirumalachar 1981
<i>U. gemmatus</i> Berk. & M.A. Curtis	<i>Jacquemontia paniculata</i>	MS	
<i>U. hobsonii</i> Vize	<i>Jasminum grandiflorum</i> , <i>J. malbaricum</i> , <i>J. scandens</i> , <i>J. auriculatum</i>	AP, J&K, HP, UK, KA, MS, MP, BR, RJ	Butler & Mcrae 1930, Jain 1966, Joshi 1958, Mishra 1976, Parndekar 1964, Patil 1966, Ramakrisnan & Sundaram 1955b, Rao 1989, Sydow & Butler 1907a, b, Yadav & Thirumalachar 1955 Vasudeva 1960
<i>U. comedens</i> P. Syd. & Syd.	<i>Jasminum</i> sp.	AS	
<i>U. pisi</i> (DC.) G.H. Otth	<i>Lathyrus sativus</i>	BR	Saksena 1956
<i>U. fabae</i> (Pers.) de Bary	<i>Lathyrus sphaericus</i> , <i>L. sativus</i> , <i>L. odoratus</i> , <i>Lens esculenta</i> , <i>Pisum sativum</i> , <i>P. arvense</i> , <i>Vigna radiata</i> , <i>Ocimum</i> sp., <i>Vicia faba</i> , <i>V. biennis</i> , <i>V. hirsuta</i> , <i>V. tetrasperma</i> , <i>V. narborensis</i> , <i>V. gracilis</i> ,	HP, UP, BR, UK., MS, KA, TN, MP	Butler & Mcrae 1930, Jain 1966, Kapooria & Sinha 1966, Kulshreshtha 1998, Mishra 1969, Mishra & Khare 1969, Mitter & Tandon 1932, Patel 1973, Pavgi & Upadhyay 1966, Sydow & Butler 1938, Sydow & Butler 1907a, b, Ramakrisnan & Sundaram 1955a, b
<i>U. lespedezae- procumbentis</i> (Schwein.) Lagerh.	<i>Lespedeza bicolor</i>	J&K	Sydow & Butler 1907a

Table 1 (continued)

Taxa	Hosts	Distribution*	References
<i>U. rugulosus</i> Pat.	<i>Lespedeza eriocarpa</i>	UK	Saksena 1956
<i>U. lespedezae-sericae</i> S. Ahmad	<i>Lespedeza stenocarpa</i>	UK	Sachin et al.1980
<i>U. behenis</i> (DC.) Unger	<i>Lychnis indica</i>	J&K	Sydow & Butler 1907a
<i>U. striatus</i> Sch.	<i>Medicago sativa, M. denticulata</i>	J&K, MS, HR, PB, BR,	Joshi 1958, Pandotra & Sastry 1969, Sydow & Butler 1938
<i>U. mucunae</i> Rabenh.	<i>Mucuna pruriens, M. deeringiana, M. rajada, M. cochinchinensis</i>	WB, BR, MS, KL, AP	Butler & Mcrae 1930, Chavan & Patil 1972, Prakash & Singh 1976, Rabenhorst 1878, Sydow & Butler 1907a, b
<i>U. ramacharii</i> Ravinder & Bhagyan.	<i>Ocimum</i> sp.	AP	Bhagyanarayana & Ravinder 1994
<i>U. orthosiphonis</i> T.S. Ramakr & Shriniv.	<i>Orthosiphon glabratus</i>	TN	Ramakrisnan & Srinivasan 1950
<i>U. superfluens</i> Syd.	<i>Panicum antidotale</i>	MP	
<i>U. linearis</i> Berk. & Broome	<i>Panicum miliare, P. repens</i>	MS, BR, TN, CG, KA, AP	Butler & Mcrae 1930, Sydow & Butler 1907b
<i>U. dactylidis</i> var. <i>poae</i> (Rabenh.) Grove	<i>Poa annua</i>	HR	Saini & Chand 1984
<i>U. polygoni-avicularis</i> var. <i>polygoni-avicularis</i> (Pers.) P. Karst.	<i>Polygonum aviculare, P. cogatum, P. paronychioides</i>	J&K, HP, J&K	Cummins 1943, Sydow & Butler 1907b, Sydow 1938
<i>U. pontederiae</i> W.R. Gerard	<i>Pontederia cordata</i>	AS	Agarwal & Sarbhoy 1986
<i>U. pseudoarthriae</i> Cooke	<i>Pseudarthria viscida</i>	MS	Chavan 1975, Patil & Thirumalachar 1981
<i>U. dolicholi</i> Arthur	<i>Rhynchosia minima</i>	MS	Arthur 1934, Patel et al. 1949
<i>U. rottboelliae</i> Arthur	<i>Rottboellia speciosa</i>	UP, HP, J&K	Sydow & Butler 1938
<i>U. rumicis</i> (Schumach.) G. Winter	<i>Rumex dentatus, R. vescarius, R. dentatus</i>	HR, MS, J&K	Behera & Mukherji 1974, Patel et al. 1949, Pandotra & Sastry 1969
<i>U. scillarum</i> (Grev.) G. Wint.	<i>Scilla indica, S. hyacinthine</i>	RJ, MS	Chakrabarty 1983, Prasad et al. 1962
<i>U. indicus</i> Pat.	<i>Scirpus affinis</i>		Butler & Bisby 1960
<i>U. scirpi</i> Burrill	<i>Scirpus maritimus</i>	PB	Arthur & Cummins 1936
<i>U. poonensis</i> W.D. More & Moni	<i>Sesbania aegyptiaca</i>	MS	More & Moniz 1964

Table 1 (continued)

Taxa	Hosts	Distribution*	References
<i>U. setariae-italicae</i> Yoshino	<i>Setaria italica</i> , <i>S. verticillata</i> , <i>V. glauca</i> , <i>Eriochola trypheron</i> , <i>Cordia rothii</i>	MS, AP, Bihar, Kerela, UK, UP, MP, WB	Butler & Mcrae 1930, Sydow & Butler 1938, Dublisch & Singh 1977, Mishra et al. 1976, Narasimhan & Thirumalachar 1964
<i>U. sommerfeltii</i> Hyl., Jorst. & Nannf.	<i>Solidago virgaurea</i>	HP	Annonymus 1954, Barclay 1890, Dietel 1890
<i>U. tenuicutis</i> MacAlpine	<i>Sporobolus diander</i>	AS, UP, MS	Butler & Bisby 1931, Dube et al. 1979b, Goswami & Singh 1973, Patil & Date 1980a,
<i>U. wellingtonica</i> T.S. Ramakr. & K. Ramakr.	<i>Sporobolus indicus</i>	TN	Ramakrisnan & Ramakrisnan 1948
<i>U. mussooriensis</i> Syd. & P. Syd.	<i>Stipa sibirica</i>	Uttk.	Sydow & Butler 1938
<i>U. strobilanthus</i> Barclay	<i>Strobilanthes dalhausianus</i>	HP, UP, UK, MP	Mitter & Tandon 1938, Mishra 1969, Sydow & Butler 1938
<i>U. triandrae</i> T.S. Ramakr. & Shriniv.	<i>Themeda triandra</i>	TN	Ramakrisnan & Srinivasan 1950
<i>U. trifolii</i> (R. Hedw.) Lév.	<i>Trifolium pratense</i> , <i>T. repens</i> , <i>T. resupinatum</i>	HR, J&K, PB	Hooda & Saini 1990, Padwick & Khan 1944, Sokhi et al. 1985, Sydow & Butler 1907b, Annonymous 1950
<i>U. minor</i> J. Schrot.	<i>Trifolium resupinatum</i>		
<i>U. anthyllidis</i> (Grev.) J. Schroet.	<i>Trigonella foenum- graecum</i>	MS, RJ, HP	Joshi 1958, Payak 1962, Sydow & Butler 1907
<i>U. tripogonicola</i> Payak & Thirum	<i>Tripogon jacquemontii</i> , <i>T. lisboa</i>	MS	Patil & Date 1980b
<i>U. trichoneuræ</i> Doidge	<i>Tripogon lisboæ</i>	MS,	Kaul 1962, Patil 1966
<i>U. trogonellæ</i> Pass.	<i>Trogonella emodi</i>	UK.	Sydow & Mitter 1933
<i>U. valerianæ</i> (Schumach.) Lév.	<i>Valeriana wallichii</i>	J&K	Pandotra & Sastry 1969
<i>U. valerianæ- wallichii</i> Arthur & Cummins	<i>Valeriana wallichii</i> , <i>V. leschenaultia</i>	HP, UK	Arthur & Cummins 1936, Butler & Bisby 1931
<i>U. viciae-fabæ</i> (Pers.) J. Schroet.	<i>Vicia sativa</i> , <i>V. hirsuta</i> , <i>Lathyrus aphaca</i>	UP	Butler & Bisby 1931, Dube et al. 1979a, Shrivastava 1979
<i>U. phaseoli</i> G. Winter	<i>Vigna capensis</i>	MS	Chavan & Bakare 1974
<i>U. vignæ</i> Barclay	<i>Vigna vexillata</i>	HP	Barclay A 1891
<i>U. vossia</i> Barclay	<i>Vossia speciosa</i>	HP	Barclay 1890
<i>U. pianhyensis</i> Henn.	<i>Wedelia urticaefolia</i>	TN, KL	Hosagouder 1985, Padwick & Merh 1943

Table 1 (continued)

Taxa	Hosts	Distribution*	References
<i>U. wedeliae-biflorae</i> Boedijn	<i>Wedelia urticaefolia</i>	MS	Ramakrisnan & Subramanian 1951
<i>U. coronatus</i> Miyabe & Nishida	<i>Zizania latifolia</i>	MN	Nagachan & Verma 1984
<i>U. ignobilis</i> (Syd. & P. Syd.) Arthur	--	--	Butler & Bisby 1931
<i>U. pegleriae</i>	--	PB	Sokhi et al. 1985

*Jammu & Kashmir (J&K); Punjab (PB); Haryana (HR); Delhi; Utrakhand (Uttk); Uttar Pradesh (UP); Rajasthan (RJ); Madhya Pradesh (MP); Gujarat (GJ); Bihar, (CG) Chhattisgarh, Tamil Nadu (TN); Andhra Pradesh (AP); Maharashtra (MS); Karnataka; Kerala; Assam; West Bengal (WB) and Manipur (MN).

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