

Geographical distribution and Host Range of Genus *Uromyces* (Pucciniaceae, Uredinales) in Pakistan

N.S. AFSHAN^{1*}, A. Ishaq², A. R. Niazi² & A.N. Khalid²

¹Centre for Undergraduate Studies, University of the Punjab, Lahore, Pakistan

²Department of Botany, University of the Punjab, Lahore, Pakistan

Corresponding author: **Dr. Najam-ul-Sehar Afshan**

Abstract: This paper represents a checklist of rust fungi of Genus *Uromyces* (Link) Unger in Pakistan together with their known host plants. A total of sixty four (64) are mentioned here. This number may include two (02) indigenous species of rusts. Several specimens have been found rare, being known from a limited number of collections. Species identification, distribution and host index have been provided.

Key Words: Biodiversity, leguminous rust, Biocontrol, Host specificity

1. Introduction

Uromyces (Link) Unger, the second largest genus of Uredinales (Rust fungi) next to *Puccinia* Pers., parasitizes economically important plants throughout the world. This genus contains about 600 species distributed worldwide, among which sixty four (64) species have been reported in Pakistan till 2013, parasitizing sixteen (16) plant families. Fabaceae has been found having most potential hosts for this genus in Pakistan as thirty (30) species have been recorded on members of this family. Fourteen (14) species on Poaceae hosts, four (04) on Polygonaceae and Euphorbiaceae each, three (03) on Chenopodiaceae and one (01) species of *Uromyces* on Acanthaceae, Boraginaceae, Caryophyllaceae, Cyperaceae, Liliaceae, Geraniaceae, Plumbaginaceae, Ranunculaceae and Valerianaceae each, have been recorded while one (01) species is found having wide host range being a parasite of both Euphorbiaceae and Papilionaceae. Occurrence of maximum number of *Uromyces* species on fabaceous from Pakistan is in line with data from other countries. This manuscript is a compilation of available species of *Uromyces* reported from, or know to occur, in Pakistan. Species identification, distribution and host index have been provided. This data will help in further studies related to diversity of this genus and its usage as biocontrol agents against noxious poaceous weeds.

2. Material and Method

The checklist is based on published literature and study of herbarium specimens (LAH Herbarium). The current names of fungi are given according to www.indexfungorum.org and nomenclature of host plants are given according to www.ipni.org.

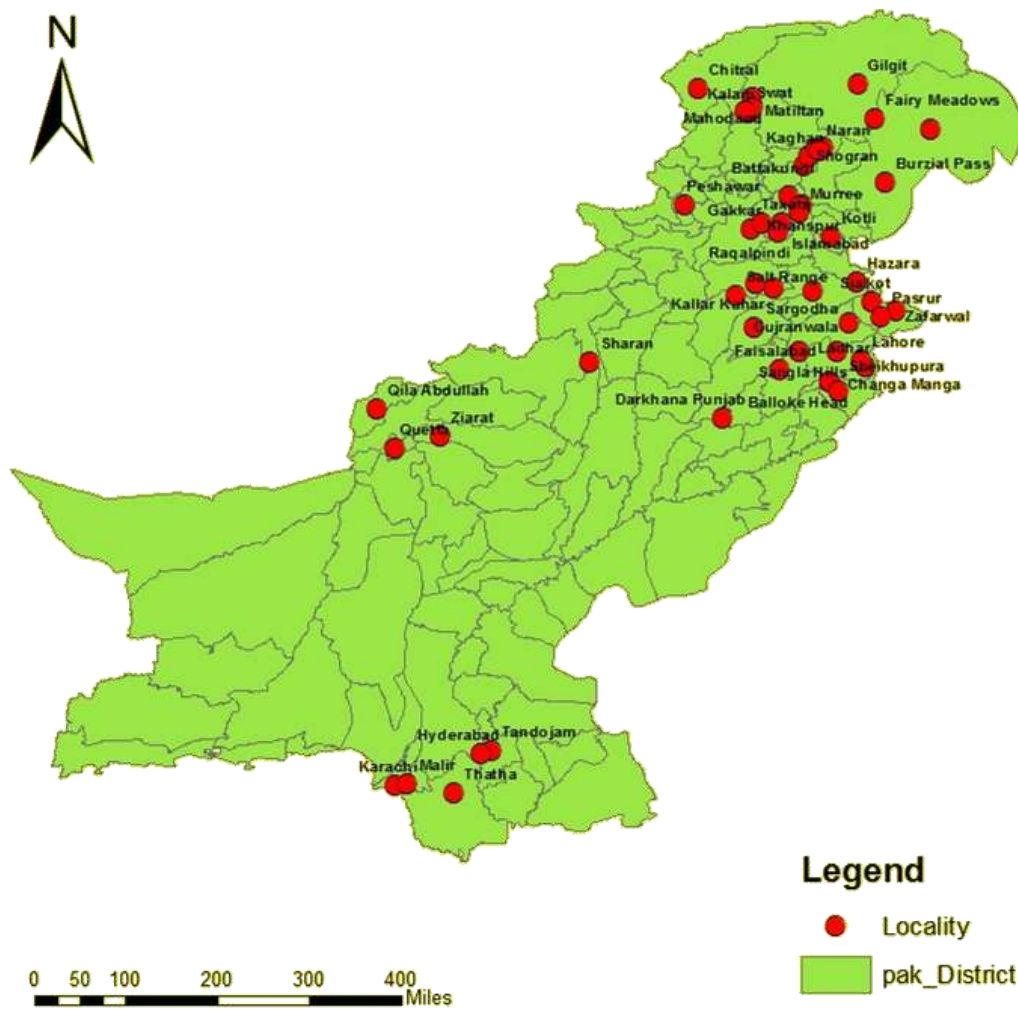


Fig. 1: Map showing distribution of *Uromyces* in Pakistan.

TABLE I: Table showing different species of *Uromyces*, their Host plants and distribution in Pakistan.

Sr. No.	Fungus	Host Plant	Locality	Reference
1	<i>Uromyces acantholimonis</i> Syd. & P. Syd.	<i>Acantholimon munroanum</i> Aitch. & Hemsl.	Ziarat,	Ahmad, 1964, 1969
2	<i>U. alhaginis</i> Szemb.	<i>Alhagi maurorum</i> Medik.	Balloke Head Hyderabad, Lahore	Ahmad, 1967; Ahmad, 1969; Khan & Kamal, 1968
3	<i>U. anthyllidis</i> (Grev.) J. Schröt.	<i>Trigonella gracilis</i> Benth.	Chillan wala, Faisalabad, Gakkar, Murree, Sangla Hills	Ahmad, 1956a,b
4	<i>U. appendiculatus</i> (Pers.) Link	<i>Dolichos lablab</i> L., <i>Lablab purpureus</i> (L.) Sweet	Kulali (Swat)	Ahmad, 1956a, b
5	<i>U. behenis</i> (DC.) Unger	<i>Silene aucheriana</i> Boiss., <i>S. vulgare</i> (Moench) Garcke	Quetta, Sharan, Swat	Ahmad, 1956a, b; Khalid <i>et al.</i> , 1995; Ono & Kakishima, 1993
6	<i>U. capitatus</i> Syd. & P. Syd.	<i>Desmodium elegans</i> Schtdl., <i>D. triflorum</i> (L.) DC.	Lahore, Saidan Shah, Salt range, Sangla Hills,	Ahmad, 1956a, b; Khalid <i>et al.</i> , 1993
7	<i>U. chenopodii</i> (Duby) J. Schröt.	<i>Suaeda fruticosa</i> ex J.F.Gmel., <i>S. monoica</i> ex J.F.Gmel.	Karachi	Ghaffar & Abbas, 1972; Khan & Kamal, 1968
8	<i>U. ciceris-arietini</i> (Grognot) Jacz. & G. Boyer	<i>Cicer arietinum</i> L.	Chillan wala, Sangla Hills, Tandojam	Ahmad, 1956a, b; Khan & Kamal, 1968
9	<i>U. ciceris-soongaricae</i> S. Ahmad	<i>Cicer soongaricum</i> DC.	Swat	Ahmad, 1969

10	<i>U. clignyi</i> Pat. & Har.	<i>Andropogon annulatus</i> Forssk., <i>Bothriochloa bladhii</i> (Retz.) S.T.Blake, <i>Dichanthium</i> <i>annulatum</i> Stapf, <i>Heteropogon</i> <i>contortus</i> Beauv. ex Roem. & Schult.	Chillanwala, Gujranwala, Kaghan, Kalam, Kallar Kahar, Karachi, Kulali, Rawalpindi, Sangla Hills, Swat, Tandojam	Ahmad, 1956a, b; Ahmad & Arshad, 1972; Ahmad, 1976; Ghaffar & Kafi, 1968; Hasnain <i>et al.</i> , 1959; Khan & Kamal, 1968;
11	<i>U. decorates</i> Syd. & P. Syd.	<i>Crotalaria juncea</i> L., <i>Crotalaria</i> sp.	Sialkot, Zafarwal	Ahmad, 1956a, b; Ahmad, 1964; Ahmad, 1967
12	<i>U. euphorbiae-corniculatae</i> Jordi	<i>Lotus corniculatus</i> L.	Swat	Khalid <i>et al.</i> , 1995
13	<i>U. eragrostidis</i> Tracy	<i>Desmostachya bipinnata</i> (L.) Stapf	Lahore	Ahmad & Kamal, 1968; Ghaffar & Kafi, 1968
14	<i>U. ervi</i> (Wallr.) Westend.	<i>Lens culinaris</i> Medik.	Pasrur	Ahmad, 1968
15	<i>U. euphorbiae</i> Cooke & Peck	<i>Euphorbiae indica</i> Lam., <i>E.</i> <i>prostate</i> Aiton	Lahore, Tandojam	Ahmad, 1956a, b; Khalid <i>et al.</i> , 1995; Khan & Kamal, 1968; Ghaffar & Kafi, 1968; Hasnain <i>et al.</i> , 1959
16	<i>U. fallens</i> (Arthur) Barthol.	<i>Trifolium alexandrianum</i> L.	Lahore	Khalid <i>et al.</i> , 1995
17	<i>U. flectens</i> Lagerh.	<i>Trifolium repens</i> L.	Quetta, Shoran	Ahmad, 1956a, b; Malik & Virk, 1968; Malik <i>et al.</i> , 1968
18	<i>U. fragilipes</i> Tranzschel	<i>Eremopyrum bonarpartis</i> (Spreng.) Nevski	Sheikhupura	Khalid & Iqbal, 1996
19	<i>U. fritillariae</i> Thüm.	<i>Fritillaria roylei</i> Hook.	Kaghan, Saiful Malook	Ahmad, 1956a
20	<i>U. geranii</i> (DC.) G.H. Oth & Wartm.	<i>Geranium aconitifolium</i> Knaf ex Nyman, <i>G. donianum</i> Hook.f. & Thomson, <i>G. wallichianum</i> D.Don	Gilgit,, Kalam, Mahodand, Matiltan, Shogran	Ahmad, 1956a, b; Kakishima <i>et</i> <i>al.</i> , 1993; Ono & Kakishima, 1992
21	<i>U. glycyrrhizae</i> (Rabenh.) Magnus	<i>Glycyrrhiza</i> sp., <i>G. glaba</i> L.	Gilgit	Ahmad, 1969
22	<i>U. heliotropii</i> Sred.	<i>Heliotropium</i> sp.	Karga Nala (Gilgit)	Ahmad, 1960; 1968
23	<i>U. heteromallus</i> Syd.	<i>Haloxylon recurvum</i> Bunge ex Boiss.	Darkhana (Punjab)	Ahmad, 1956a, b
24	<i>U. ignobilis</i> (Syd. & P. Syd.) Arthur	<i>Sporobolus arabicus</i> Boiss.	Lahore	Ahmad, 1956a, b
25	<i>U. inayati</i> Syd. & P. Syd.	<i>Apluda mutica</i> var. <i>aristidae</i> L.	Shogran	Ahmad, 1969; Jorstad & Iqbal, 1967
26	<i>U. kondoi</i> Miura	<i>Gueldenstaedtia</i> sp.	Rawalpindi	Ahmad, 1956a, b
27	<i>U. laburni</i> (DC.) G.H. Oth	<i>Caragana ambigua</i> Stocks	Quetta, Ziarat	Ahmad, 1956a, b
28	<i>U. lapponicus</i> Lagerh.	<i>Astragalus maddenianus</i> Benth. ex Baker	Battakundi, Burzial Pass, Kaghan	Ahmad, 1956a; Cummins, 1942; Ono, 1992
29	<i>U. lespedezae-procumbentis</i> (Schwein.) Lagerh.	<i>Lespedeza sericea</i> (Thunb.) Miq.	Abbottabad, Murree,	Ahmad, 1956a, b
30	<i>U. holwayi</i> Lagerh.	<i>Lilium</i> sp.	Bagh, Qila Abdullah, Quetta, Shaila	Petrack, 1966
31	<i>U. lineolatus</i> (Desm.) J. Schröt.	<i>Scirpus maritimus</i> L.	Choa Saiden Shah, Lahore, Quetta, Sheikhupura, Tandojam	Ahmad, 1956a, b; Khalid <i>et al.</i> , 1993; Khan & Kamal, 1968; ; Malik & Virk, 1968; Malik <i>et</i> <i>al.</i> , 1968
32	<i>U. lycoctoni</i> (Kalchbr.) Fuckel	<i>Aconitum</i> sp.	Kaghan,	Ahmad, 1956a, b
33	<i>U. minor</i> J. Schröt.	<i>Trifolium resupinatum</i> L.	Chillanwala, Sheikhupura	Ahmad, 1956a, b; Sydow and Ahmad, 1939
34	<i>U. orientalis</i> Syd. & P. Syd.	<i>Indigofera linifolia</i> (L.f.) Retz.	Ladhar, Zafarwal	Ahmad, 1956a, 1964a
35	<i>U. penniseti</i> S. Ahmad	<i>Pennisetum lanatum</i> Klotzsch	Leepa Valley, Naran	Ahmad, 1969; Saba <i>et al.</i> , 2011
36	<i>U. phacae-frigidae</i> (Wahlenb.) Har.	<i>Astragalus coluteocarpus</i> Boiss.	Barum Valley (Chitral)	Ahmad, 1956a, b
37	<i>U. pisi</i> (Pers.) de Bary	<i>Euphorbia esula</i> Ten., <i>Euphorbia</i> sp.	Chitral, Naran	Ahmad, 1956a, b; Malik & Virk. 1968

38	<i>U. polygona-avicularis</i> (Pers.)	<i>Lathyrus sativus</i> L., <i>Polygonum aviculare</i> Bert. ex Meisn. <i>P. viviparum</i> L., <i>P. paronychioides</i> C.A.Mey.	Hazara, Kaghan Quetta, Sharan, Swat	Ahmad, 1956a, b; Malik & Khan, 1944; Malik & Virk, 1968; Malik <i>et al.</i> , 1968; Ono, 1992
39	<i>U. punctatus</i> J. Schröt.	<i>Oxytropis</i> sp., <i>Euphorbia stracheyi</i> Boiss.	Batakundi, Kaghan	Ahmad, 1956a, b; Ono, 1992
40	<i>U. rumicis</i> (Schumach.) G. Winter	<i>Rumex chalepensis</i> Mill.	Changa Manga, Chillianwala, Choa Saiden, Lahore, Peshawar, Shah, Salt Range	Ahmad, 1956a, b; Ahmad & Arshad, 1972; Khalid <i>et al.</i> , 1993; Khan & Kamal, 1968
41	<i>U. salsolae</i> Rabenh.	<i>Salsola kali</i> L.	Quetta	Ahmad, 1960, 1969
42	<i>U. schoenanthi</i> Syd. & P. Syd.	<i>Apluda mutica</i> L.	Lahore	Ahmad, 1956a, b
43	<i>U. setariae-italicae</i> Yoshino	<i>Brachiaria reptans</i> (L.) C.A.Gardner & C.E.Hubb., <i>B. ramosa</i> Stapf, <i>Setaria geniculata</i> P.Beauv., <i>S. glauca</i> Kunth, <i>S. lutescens</i> (Weigel) C.E.Hubb., <i>S. verticillata</i> (L.) P.Beauv., <i>S. viridis</i> P.Beauv.,	Faisalabad, Islamabad, Ladhara, Lahore, Malir, Tandojam, Taxala	Afshan <i>et al.</i> , 2008; Ahmad, 1956a, b; Ahmad, 1976; Ghaffar & Kafi, 1968; Husnain <i>et al.</i> , 1959; Khan & Kamal, 1968; Kakishima <i>et al.</i> , 1993b
44	<i>U. sophorae</i> Peck	<i>Sophora alopecuroides</i> L., <i>S. mollis</i> (Royle) Graham ex Bake	Gilgit	Kaneko, 1993
45	<i>U. striatus</i> J. Schröt.	<i>Argyrolobium roseum</i> (Cambess.) Jaub. & Spach, <i>Medicago lupulina</i> L., <i>M. sativa</i> L.,	Baloke Head, Chillianwala, Kotli, Ladhara, Malir, Quetta, Raqalpindi, Sargodha, Sialkot, Tandojam	Ahmad, 1956a, b; Ahmad, 1967; Ahmad, 1969; Ahmad & Arshad, 1972; Ghaffar & Kafi, 1968; Hasnain <i>et al.</i> , 1959; Khan & Kamal, 1968; Malik & Virk, 1968; Malik <i>et al.</i> , 1968
46	<i>U. striolatus</i> Tranzschel	<i>Euphorbia esula</i> L.	Barum Valley	Ahmad, 1956a, b
47	<i>U. strobilanthis</i> Barclay	<i>Pteracanthus urticifolius</i> (Kuntze) Bremek.	Chitral, Sharan	Ahmad, 1956a, b; Ono, 1992
48	<i>U. superfluous</i> P. Syd. & Syd.	<i>Panicum antidotale</i> Retz.	Changa Manga, Karachi	Ahmad, 1956a; Ghaffar & Kafi, 1968; Hasnain <i>et al.</i> , 1959
49	<i>U. tenuicutis</i> McAlpine	<i>Sporobolus arabicus</i> Boiss.	Lahore	Ahmad, 1956a,b; Masood <i>et al.</i> , 1995
50	<i>U. thellungi</i> Maire	<i>Rumex vesicarius</i> L.	Karachi, Peshawar	Ahmad, 1956a,b; Ghaffar & Kafi, 1968; Hasnain <i>et al.</i> , 1959; Jafri, 1968; Petrak, 1966;
51	<i>U. trifolii</i> sensu auct.	<i>Trifolium alexandrianum</i> L., <i>T. repense</i> L., <i>T. resupinatum</i> L.,	Fairy Meadows, Peshawar, Sangla Hills, Sargodha	Afshan <i>et al.</i> , 2012; Ahmad, 1956a,b; Khan & Kamal, 1968; Malik & Khan, 1944;
52	<i>U. trifolii-repentis</i> Liro	<i>Trifolium repens</i> L.	Gilgit, Kaghan, Quetta	Ahmad, 1956a, b; Malik & Virk, 1968
53	<i>U. trifolii-repentis</i> var. <i>fallens</i> (Arthur) Cummins	<i>Trifolium pretense</i> L.	Kaghan	Ono, 1992
54	<i>U. tuberculatus</i> Focke	<i>Euphorbia</i> sp.	Quetta	Ahmad, 1956a, b; Malik & Virk, 1968; Malik <i>et al.</i> , 1968
55	<i>U. valerianaewallichii</i> Arthur & Cummins	<i>Valeriana jatamansi</i> Jones ex Roxb.	Changla gali, Swat	Ahmad, 1956a, b; Ono, 1992; Ono & Kakishima, 1992
56	<i>U. viciaefabae</i> var. <i>fabae</i> (Pers.) J. Schröt.	<i>Lathyrus odoratus</i> L., <i>Pisum sativum</i> L., <i>Vicia faba</i> L., <i>Vicia sativa</i> L.	Chillianwala, Faisalabad, Peshawar, Quetta, Salt Range	Ahmad, 1956a, b; Malik & Virk, 1968
57	<i>U. vossiae</i> Barclay	<i>Phacelurus speciosus</i> C.E.Hubb.	Fairy Meadows, Kaghan, Khanspur, Leepa Valley,	Afshan <i>et al.</i> , 2008; Ahmad, 1969; Saba <i>et al.</i> , 2011; Saba <i>et al.</i> , 2013
58	<i>U. dactylidis</i> G.H. Otth	<i>Agrostis gigantea</i> Roth	Khanspur	Afshan <i>et al.</i> , 2008
59	<i>U. graminicola</i> Burrill	<i>Panicum antidotale</i> Retz.	Khanspur	Afshan <i>et al.</i> , 2008
60	<i>U. peglerae</i> var. <i>peglerae</i> Pole-Evans	<i>Digitaria adscendens</i> Henrard	Lahore	Afshan <i>et al.</i> , 2008
61	<i>U. polygona-avicularis</i> (Pers.) G.H. Otth	<i>Bistorta vivipara</i> (L.) Gray, <i>Polygonum aviculare</i> Bert. ex Meisn.	Bial Camp, Fairy Meadows	Afshan <i>et al.</i> , 2011

62	<i>U. hedysari-obscuri</i> (DC.) Carestia & Picc.	<i>Hedysarum falconeri</i> Baker	Fairy Meadows	Afshan <i>et al.</i> , 2011
63	<i>U. appendiculatus</i> (Pers.) Link	<i>Vigna mungo</i> (L.) Hepper	Leepa Valley	Afshan <i>et al.</i> , 2011
64	<i>U. sporobolicola</i> J.C. Lindq.	<i>Sporobolus marginatus</i> Hochst. ex A.Rich.	Sialkot	Ishaq <i>et al.</i> , 2011

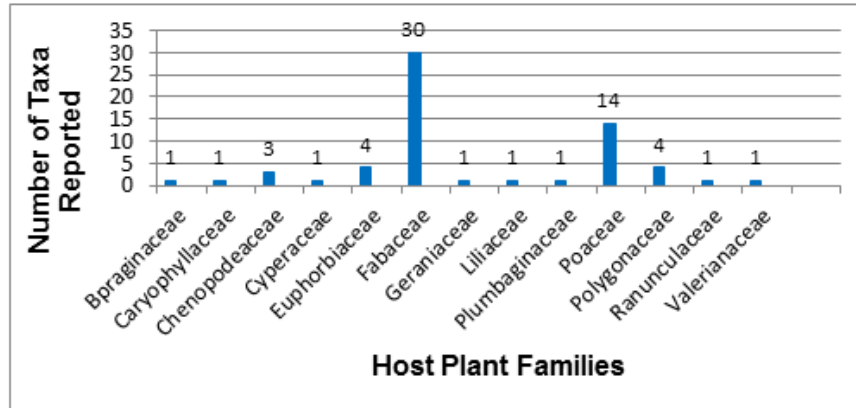


Fig. 2: Graph showing diversity of *Uromyces* on different host plant families

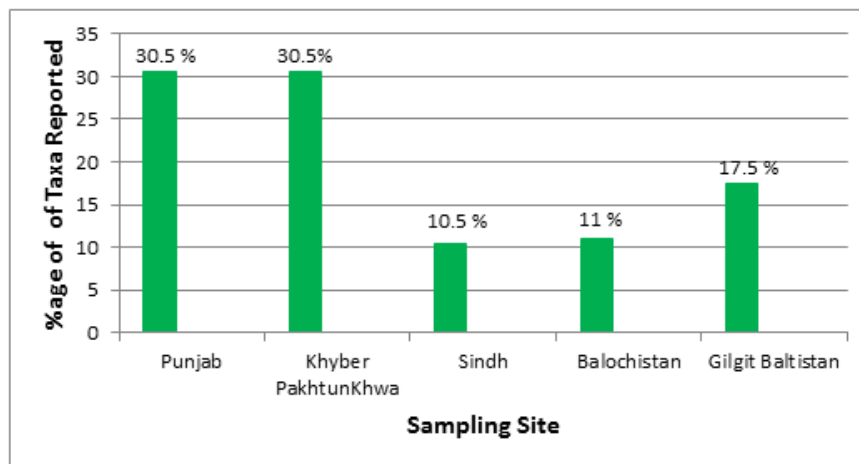


Fig. 3: Graph showing diversity of *Uromyces* in provinces of Pakistan.

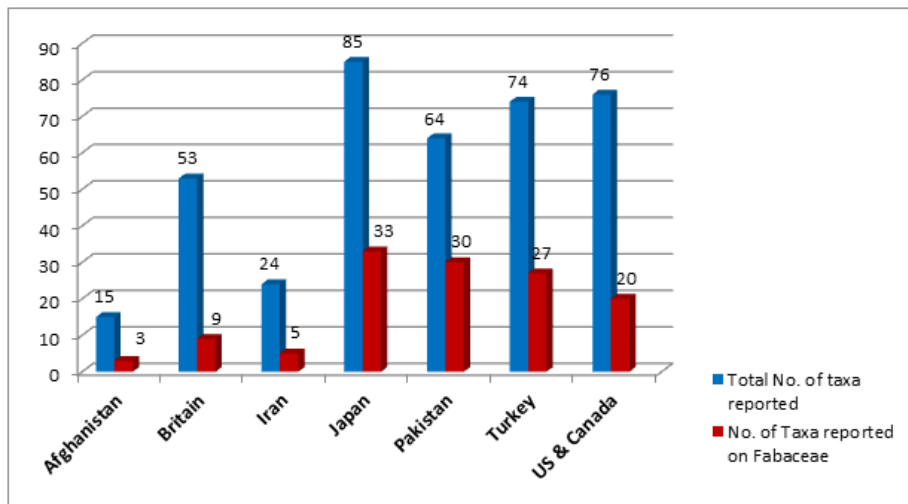


Fig. 4: Graph showing comparative data of host plant families of *Uromyces* in world.

3. Conclusion

The *Uromyces* genus is poorly known throughout Pakistan as compared to rest of the world, which is clearly demonstrated by the above described data. An accurate picture of the diversity and distribution of *Uromyces* throughout the region awaits further surveys.

4. References

- [1] N. S. Afshan, A. N. Khalid, and A. R. Niazi, "New Records and distribution of rust fungi from Pakistan," *Mycotaxon*, vol. 105, pp. 257-267, 2008a.
- [2] N. S. Afshan, A. N. Khalid, and A. R. Niazi, "New records of Graminicolous Rust Fungi from Pakistan," *Pak. J. Bot.*, vol. 40(3), pp. 1279-1283, 2008b.
- [3] N. S. Afshan, A. N. Khalid, and A. R. Niazi, "Some new rust fungi (Uredinales) from Fairy Meadows, Northern Areas, Pakistan," *J. Yeast Fungal Res.*, vol. 3(5), pp. 65-73, 2012.
- [4] S. Ahmad, "Uredinales of West Pakistan," *Biologia*, vol. 2(1), pp. 29-101, 1956a.
- [5] S. Ahmad, "*Fungi of Pakistan*," Biological Society of Pakistan, Lahore, Monograph 1, 1956b, pp. 1-126.
- [6] S. Ahmad, "Further contributions to the fungi of Pakistan," II, *Biologia*, vol. 8, pp. 123-150, 1960.
- [7] S. Ahmad, "Contribution to the fungi of Pakistan," IV, *Biologia*, vol. 10, pp. 1-62, 1964.
- [8] S. Ahmad, "Contributions to the fungi of Pakistan," VI, *Biologia*, vol. 13, pp. 15-42, 1967.
- [9] S. Ahmad, "Contributions to the fungi of Pakistan," VII, *Biologia*, vol. 14, pp. 1-11, 1968.
- [10] S. Ahmad, "*Fungi of Pakistan*," Biological Society of Pakistan, Lahore, Monograph 5, Suppl. 1, pp.110, 1969.
- [11] S. Ahmad, "Contribution to the fungi of Pakistan," XVII, *Sultania*, vol. 2, pp. 17-21, 1976.
- [12] S. Ahmad, and M. Arshad, Contributions to the fungi of Pakistan, XII, *Biologia*, vol. 8, pp. 7-17, 1972.
- [13] G. B. Cummins, "Uredinales from the North West Himalayas," *Mycologia*, vol. 35, pp. 446-458, 1942.
<http://dx.doi.org/10.2307/3754596>
- [14] A. Ghaffar, and S. Q. Abbas, "Fungi of Pakistan," Suppl. II, *Pak. J. Bot.*, vol. 4, pp. 195-208, 1972.
- [15] A. Ghaffar, and A. Kafi, "Fungi of Karachi," *Pak. J. Sc.*, vol. 20, pp. 5-10, 1968.
- [16] S. Z. Hasnain, A. Khan, and A. J. Zaidi, "*Rusts and smuts of Karachi*," Bot. Deptt. Karachi Univ. Mont. Vol. 2, pp. 36. 1959.
- [17] A. Ishaq, A. N. Khalid, and N. S. Afshan, "New records of Poaceous rusts from Pakistan," *Mycotaxon*, vol. 118, pp. 237-244, 2011.
<http://dx.doi.org/10.5248/118.237>
- [18] C. H. Jafri, M.Sc. Thesis, W.P.A.U., Faisalabad, 1968.
- [19] I. Jorstad, and S. H. Iqbal, "Uredinales from West Pakistan," *Nytt. Mag. Bot.*, vol. 14, pp. 31-38, 1967.
- [20] M. Kakishima, O. Izumi, and Y. Ono, "Rust Fungi (Uredinales) of Pakistan collected in 1991," *Cryptogamic Flora of Pakistan*, vol. 2, pp. 169-179, 1993.
- [21] S. Kaneko, "Parasitic fungi on wood plants from Pakistan," In: *Cryptogamic Flora of Pakistan*, vol. 2 (EDS. t. Nakaike and S. Malik), pp.149-168. Nat. Sci. Mus., Tokyo, 1993.
- [22] A. N. Khalid, S. H. Iqbal, and F. Ahmad, "Rust Flora of Pakistan. Uredinales collected in Salt Range, Pakistan," *Sci. Int. (Lahore)*, vol. 5(2), pp. 211-214, 1993
- [23] A. N. Khalid, S. H. Iqbal, and A. Masood, "New records of Uredinales from Pakistan," *Sci. Int.*, vol. 7(4), pp. 531-532, 1995.
- [24] A. N. Khalid, and S. H. Iqbal, "Additions to the rust flora of Pakistan," *Pak. J. Bot.*, vol. 28(1), pp. 115-117, 1996.
- [25] S. A. Khan, and M. Kamal, "The fungi of South West Pakistan," *Pat 1. Pak. J. Sci & Ind. Res.*, vol. 11, pp. 61-80, 1968.
- [26] S. A. Malik, and M. A. Khan, "Parasitic fungi of North West Frontier Province," *Ind. Jour. Agri. Sci.*, vol. 13, pp. 522-527, 1944.
- [27] S. A. Malik, and Virk, "Contribution to the knowledge of parasitic fungi of Quetta-Kalat Region," *Biologia*, vol. 14, pp. 27-35. 1968.

- [28] S. A. Malik, M. T. Javaid, and M. Ahmad, "Uredinales of Quetta-Kalat region of Pakistan," *Biologia*, vol. 14, pp. 37-46, 1968.
- [29] A. Masood, A. N. Khalid, and S. H. Iqbal, "New records of Graminicolous Rust Fungi (Uredinales) from Pakistan," *Sci. Int.*, vol. 7(3), pp. 415-416, 1995.
- [30] Y. Ono, "Uredinales collected in the Kaghan Valley, Pakistan," *Cryptogamic flora of Pakistan*, vol. 1, pp. 217-240, 1992.
- [31] Y. Ono, and M. Kakishima, "Uredinales collected in the Swat Valley, Pakistan," *Cryptogamic flora of Pakistan*, vol. 1, pp. 197-216, 1992.
- [32] F. Petrak, "Beitrage Zur Ustilagineen und Urideen Flora on Afghanistan and Pakistan," *Sydowia*, vol. 2, pp. 278-287, 1966.
- [33] M. Saba, A. N. Khalid, and N. S. Afshan, "Species of the genus *Uromyces* (Basidiomycota: Pucciniales) from Leepa Valley, Azad Jammu and Kashmir (AJ and K), Pakistan," *African Journal of Biotechnology*, vol. 10(73), pp. 16480-16483, 2011.
- [34] M. Saba, A. R. Niazi, and A. N. Khalid, "New records of Uredinales (Basidiomycota) from Azad Jammu and Kashmir and adjacent Northern Areas of Pakistan," *Int. J. Agric. Biol.*, vol. 15, pp. 878-884, 2013.
- [35] H. Sydow, and S. Ahmad, "Fungi Punjabensis," *Ann. Myc.*, vol. 37, pp. 439-447, 1939.