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Research Article

Nomenclatural updates in the Grass flora of Western Uttar Pradesh

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Abstract

In the current situation, establishing the correct identity and nomenclature for all plants is essential. Therefore, an updated list and nomenclature status of grasses of Western Uttar Pradesh, India has been provided here. This study includes a thorough review of publications, including Ph.D. theses, research articles, books, and floras, as well as an investigation of type specimens and taxonomic databases. Using search engines to cross-check and validate nomenclatural data is the first step in a methodical strategy to ensuring the accuracy of binomial nomenclature. To obtain the most recent data on botanical nomenclature, the authors have been conducted a thorough investigation of internet resources and databases. This paper aims to provide accepted binomials with correct author citations of the grass taxa growing in Western Uttar Pradesh because several names in the published literature are not accepted now. Many synonyms for the corrected name have been included in this manuscript, along with errors in authorities. A key component of this effort is the validation of binomial identities by means of protologue and type specimen investigations. In light of this, an extensive investigation has been conducted utilizing a variety of databases, websites, and current publications in order to resolve and update nomenclature. Each and every name for a grass in Western Uttar Pradesh that was published in publications after 1959 has been revised. Western Uttar Pradesh is home to 248 species under 99 genera. 189 names of previous publication have been corrected in this study. This study is the first on revised and corrected names for grasses in the floristic area of Western Uttar Pradesh. In this study a total of 90 names has been updated. The accepted name, synonym, taxonomic treatment, and typification have been covered in this manuscript.

Keywords: *Grasses, Nomenclature, Poaceae, Taxonomic Database & Websites, Type Address, Western Uttar Pradesh.*

Introduction

Poaceae are one of the largest families of annual and perennial grasses which occur globally in every habitat. It comprises about 11000 species under 792 genera (Christenhausz *et al.*, 2017). In India, the family is represented by 247 genera and 1623 taxa (1321 species, 150 infraspecific) except Bambosoideae (Prasanna *et al.*, 2020). The subfamily Bambosoideae is represented 31 genera and 137 taxa (131 species & 06 infraspecific) in India (Kumari and Singh, 2020). Taxonomically, grasses are different from sedges in that the stem of sedges is not appeared to be divided into nodes and internodes and it is triangular in cross section. However, in the grasses the stem is divided into visible node and internode and it is circular in cross section. A large number of worker did floristic work in different part of India including Bhopal (Oommachan, 1977); Delhi (Maheshwari, 1966); Gorakhpur (Srivastava, 1976); Himachal Pradesh (Chowdhery *et al.*, 1984; Sekar and Srivastava, 2010; Malik and Mohammad, 2015; Mohammad and Malik, 2018); India (Hooker, 1973; Kellogg *et al.*, 2020); Indian desert (Bhandari, 1978); Jharkhand (Mukherjee and Ghosh, 2015); Madras

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(Gamble and Fischer, 1934); Madhya Pradesh (Kapoor and Yadav, 1962); Maharashtra (Prasad *et al.*, 2011); Presidency of Bombay (Cooke, 1967); Rajasthan (Sharma and Tiagi, 1979); Simla (Collett, 1971); Tamilnadu (Pattnayak *et al.*, 2019); Telangana (Reddy, 2018); Upper gangetic plain (Singh, 1971); Uttarakhand (Kumar , 2012; Chandra Sekar *et al.*, 2016); Uttar Pradesh (Singh, 2007; Malik et al., 2012; Malik & Mohammad, 2014; Malik, 2015; Malik, 2017; Garg and Singh, 2019) & Union territory (Rao, 1986). In United states and Canada (Gleason and Cronquist, 1963) & Burma, Ceylon, India and Pakistan (Bor, 1960) did comprehensive work on Poaceae across the world. The flora of Western Uttar Pradesh including sedges and grasses have been studied by several worker (Murty and Singh, 1959; Murty and Singh, 1960a; Murty and Singh, 1960b; Murty and Singh, 1961; Singh, 1969; Tayal and Bhasin, 1970; Sharma and Dhakre, 1995; Ali, 1999; Vardhana, 2007; Agarwal, 2009; Prachi *et al.*, 2009; Kumari, 2010; Ahmed and Gupta, 2010; Malik *et al.*, 2010; Kumar and Saxena, 2012; Chaudhary *et al.*, 2012; Malik *et al.*, 2012; Chaudhary and Kumar, 2015; Malik, 2015; Ansari *et al.*, 2016; Prakash *et al.*, 2017; RajKumar and Kumari, 2017; Khanna, 2018; Kumar *et al.*, 2018; Singh and Kumari, 2018; Singh and Kumari, 2019; Rajkumar and Kumari, 2019; Kumar *et al.*, 2019; Kumar, 2020; Rajkumar, 2020; Singh, 2020; Kumari *et al.*, 2021; Singh *et al.*, 2022). Name changes of common Indian plants have been published by several Indian workers including Kumar and Malik, 2024; Jain, 1950; Rao and Jain, 1979; Chandra and Gaur, 1988; Jain, 2003a; Jain, 2003b; Rawat *et al.*, 2015 & Dash *et al.*, 2015. Since then, several of these names have changed and there is no single document that includes all updated name changes. In this way much confusion exists with regard to correct nomenclature of the plant's names published in several documents. Due to frequent changes in the binomial of several well-known taxa, scientists, research scholars and students face considerable difficulties on the usage of correct and accepted binomial. Several papers have been published in which plants have been enumerated with their synonym instead of correct names (Vardhana, 2007; Rajkumar and Kumari, 2017; Rajkumar, 2020). Besides, some publications mention the name as *Dendrocalamus* spp. (Murty and Singh, 1960b; Murty and Singh, 1961); *Axonopus* spp (Kumar *et al.*, 2019) without any reference to herbarium sheet. Such publications create confusions. This is why the idea came in mind of authors to publish a revision and updating of binomials listed in the publication of Western Uttar Pradesh. This study is the first report on updated name changes of grasses in the floristic component of Western Uttar Pradesh. This manuscript covers the accepted name, synonym and type addresses. In this study, we have observed that there are total of 248 grasses (Supplementary Table-1) in the study area. Of these, 90 names have been changed (Table-1). In this study, current corrected name has been given first, followed by basionym & synonym. Accepted name are given in bold. Besides, for the sake of convienence and easy to get easy reference, the names of taxa have been arranged alphabetically. Review of literature reveals that in Western Uttar Pradesh, there is no comprehensive report on grasses after 1959, except publication on terai region of Uttar Pradesh (Khanna, 2018). In the present paper, 248 grasses have been enumerated with updated nomenclature published after 1959. Of these 189 generic and specific epithets along with author citations have changed (Supplementary Table-2). Such names need corrections. Keeping iners in minds this study has been carried out in Western Uttar Pradesh covering17 districts.

Materials and Methods

Study area

This study has been carried out in different districts of Western Uttar Pradesh (Figure-1). The districts are shown in the map by red round circle.

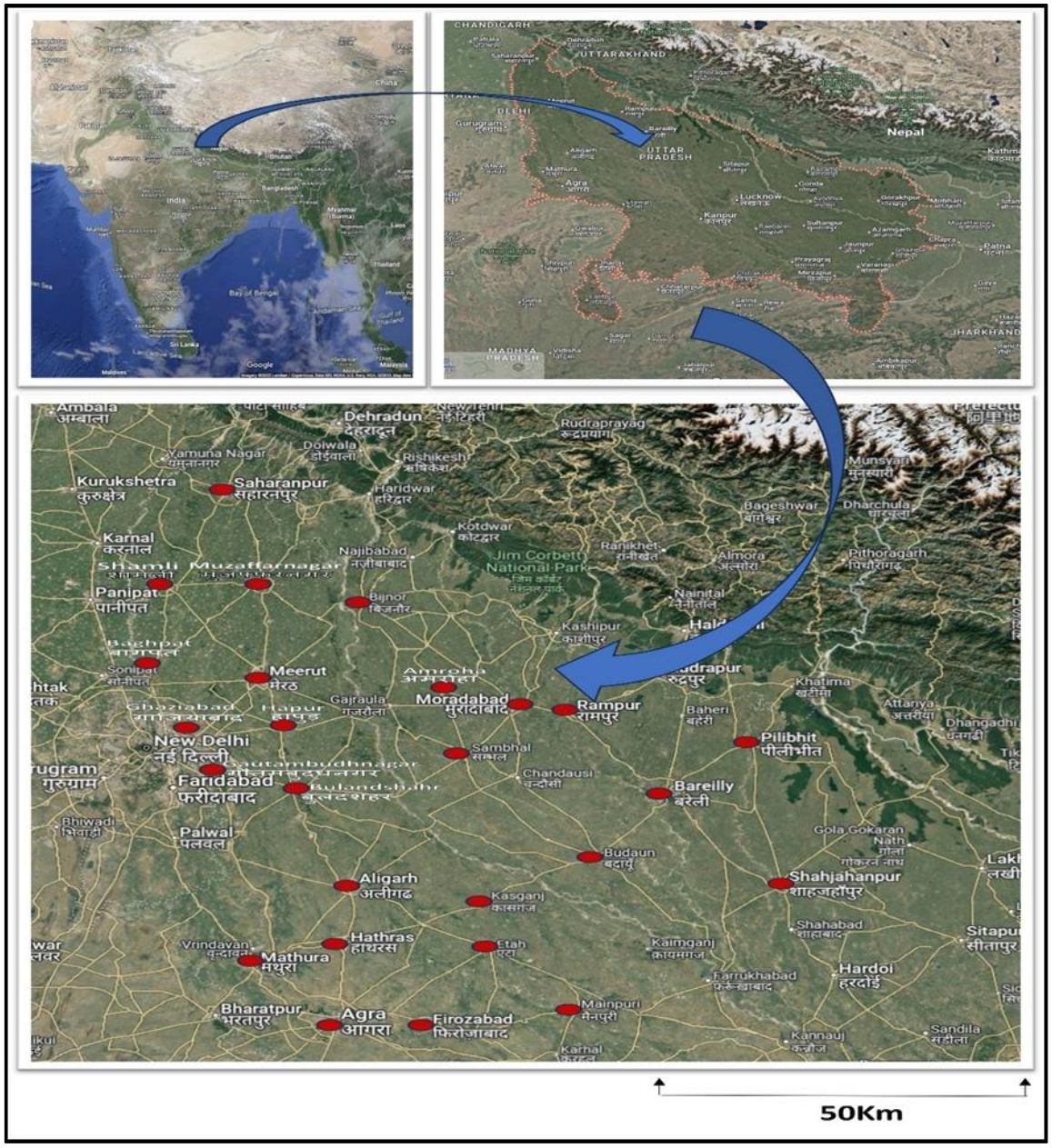

Figure 1: Map showing all the districts of Western Uttar Pradesh. The red circle show the districts.

Retrieval of published literature from digital repositories

Research work, dissertations and Ph. D thesis (Agarwal, 2009; Rajkumar, 2020; Singh, 2020) related to sedges and grasses were downloaded using search engine like google chrome, Shodhganga, Google scholar, PeerJ, PubMed Central, and CLOCKSS etc. The description and names of all the published and unpublished taxa were studied from the journals, floras, books. Several research papers published for the sedges and grasses of Western Uttar Pradesh were also studied (Murty and Singh, 1959; Murty and Singh, 1960a; Murty and Singh, 1960b; Murty and Singh, 1961; Singh, 1969; Tayal and Bhasin, 1970; Sharma and Dhakre, 1995; Ali, 1999; Vardhana, 2007; Agarwal, 2009; Prachi *et al.*, 2009; Kumari, 2010; Ahmed and Gupta, 2010; Malik *et al.*, 2010; Kumar and Saxena, 2012; Chaudhary *et al.*, 2012; Malik *et al.*, 2012; Chaudhary and Kumar, 2015; Malik, 2015; Ansari *et al.*, 2016; Prakash *et al.*, 2017; RajKumar and Kumari, 2017; Khanna, 2018; Kumar *et al.*, 2018; Singh and Kumari, 2018; Singh and Kumari, 2019; Rajkumar and Kumari, 2019; Kumar *et al.*, 2019; Kumar, 2020; Rajkumar, 2020; Singh, 2020; Kumari *et al.*, 2021 & Singh *et al.*, 2022). A list of the plant was prepared from the published literature.

Nomenclature, citation and types of taxa

The nomenclature corrections were done according to latest ICN (Turland et al., 2025) guidelines. Further, every attempt has been made to check the identity of plants by typified material and evaluated the taxonomic status of the taxa concerned. The nomenclature of all taxa was studied with the help of the following authentic taxonomic websites such as Plants of the World Online (https://powo.science.kew.org/), International Plant Name Index (https://www.ipni.org/), Biodiversity Heritage Library (https://www.biodiversitylibrary.org/), World Flora Online (https://www.worldfloraonline.org/), Tropicos (https://www.tropicos.org/home), The Global Biodiversity Information Facility (GBIF) (https://gbif.org), Catalogue of Life (https://www.catalogueoflife.org/), Euro + Med (https://europlusmed.org/), African Plant Database (https://africanplantdatabase.ch/) and Kew name matching service (http://namematch.science.kew.org/).

Results & Discussion

During the nomenclature updates of grasses in this study, the authors included 17 districts of Western Uttar Pradesh, one can find 97 genera and 484 species. Of the 484 species published, 39.66% (192 species) were found as accepted species name (Supplementary Table-1). When the nomenclature of these published taxa was checked, it was found that most of the species' names have become synonyms (Table-1).

Table-1: Changes in the binomials of grass flora of Western Uttar Pradesh.

S. No.	Old name	Corrected name
1	*Acrachne verticillata* (Roxb.) Chiov.	***Acrachne racemosa* (B. Heyne ex Roth) Ohwi**
2	*Andropogon tristis* Nees ex Hack.	***Andropogon munroi* C.B. Clarke**
3	*Apluda aristata* Linn.	***Apluda mutica* L.**
4	*Apluda mutica* subsp. *aristata* (L.) Babu	***Apluda mutica* L.**
5	*Avena sterilis* L. var. *culta* (*Avena sterilis* L. var. *culta* Raizada)	***Avena sterilis* subsp. *sterilis***
6	*Axonopus affinis* A. Chase	***Axonopus fissifolius* (Raddi) Kuhlm.**
7	*Bambusa arundinacea* Willd	***Bambusa bambos* (L.) Voss**
8	*Bothriochloa intermedia* (R.Br.) A. Camus	***Bothriochloa bladhii* (Retz.) S.T. Blake**
9	*Brachiaria brizantha* (Hochst. ex A. Rich.)	***Urochloa brizantha* (A. Rich.) R.D. Webster**
10	*Brachiaria deflexa* (Schumach.) C.E. Hubb. ex Robyns	***Urochloa deflexa* (Schumach.) H. Scholz**
11	*Brachiaria eruciformis* (Sm.) Griseb.	***Moorochloa eruciformis* (Sm.) Veldkamp**
12	*Brachiaria kurzii* (Hook. f.) A. Camus	***Urochloa kurzii* (Hook.f.) T.Q. Nguyen**
13	*Brachiaria mutica* (Forsk.) Stapf.	***Urochloa mutica* (Forssk.) TQNguyen**
14	*Brachiaria paspaloides* (Presl)C.E. Hubb.	***Urochloa glumaris* (Trin.) Veldkamp**
15	*Brachiaria ramosa* (L.) Stapf	***Urochloa ramosa* (L.) T.Q. Nguyen**
16	*Brachiaria reptans* (L.) C. A. Gard. & C. E. Hubb.	***Urochloa reptans* (L.) Stapf**
17	*Brachiaria setigera* (Retz.) C. E. Hubbard	***Urochloa setigera* (Retz.) Stapf**
18	*Brachiaria subquadripara* (Trin.) Hitch.	***Urochloa distachyos* (L.) T.Q. Nguyen**
19	*Brachiaria villosa* (Lamk.) A. Camus	***Urochloa villosa* (Lam.) T.Q. Nguyen**
20	*Cenchrus barbatus* Schum.	***Cenchrus biflorus* Roxb.**
21	*Chionachne gigantea* (J.Koenig) Veldkamp	***Polytoca gigantea* (J. Koenig) Mabb.**
22	*Chloris dolichostachya* Lagasca.	***Enteropogon dolichostachyus* (Lag.) Keng**
23	*Chloris inflata* Link.	***Chloris barbata* Sw.**
24	*Chloris pallida* Hook. f.	***Schoenefeldia gracilis* Kunth**
25	*Coix gigantea* Koenig ex Roxb.	***Coix aquatica* Roxb.**
26	*Cymbopogon parkeri* Stapf	***Cymbopogon commutatus* (Steud.) Stapf**
27	*Digitaria adscendens* Henr.	***Digitaria adscendens* (Kunth) Henrard**
28	*Digitaria biformis* Willd.	***Digitaria bicornis* (Lam.) Roem. & Schult.**
29	*Digitaria granularis* (Trin.) Henr.	***Digitaria abludens* (Roem. & Schult.) Veldkamp**
30	*Echinochloa frumentacea* Link	***Echinochloa colonum* subsp. *edulis* (Honda) Banfi & Galasso**
31	*Eleusine compressa* (Forssk.) Asch. &	***Chloris flagellifera* (Nees) P.M. Peterson**

	Schweinf. ex C.Chr.	
32	*Eleusine verticillata* Roxb.	***Acrachne racemosa* (B. Heyne ex Roth) Ohwi**
33	*Eragrostis amabilis* (L.) Wight & Arn.	***Eragrostis viscosa* (Retz.) Trin.**
34	*Eragrostis ciliaris* (L.) R.Br. Var. *Clarkei* Stapf. ex Hook.	***Eragrostis ciliaris* (L.) R.Br.**
35	*Eragrostis chariis* (Schult.) Hitche.	***Eragrostis atrovirens* (Desf.) Trin. ex Steud.**
36	*Eragrostis megastachya* (Koel.) Link.	***Eragrostis cilianensis* (All.) Vignolo ex Janch.**
37	*Eragrostis tremula* Hochst. ex Steud.	***Eragrostis multiflora* Trin.**
38	*Eremopogon foveolatus* (Del.) Stapf	***Dichanthium foveolatum* (Delile) Roberty**
39	*Erianthus munja* (Roxb.) Jesweit	***Tripidium bengalense* (Retz.) H. Scholz**
40	*Erianthus procerus* (Roxb.) Raizada	***Tripidium procerum* (Roxb.) Welker, Voronts. & E.A. Kellogg**
41	*Erianthus ravennae* (L.) P. Beauv.	***Tripidium ravennae* (L.) H. Scholz**
42	*Eulalia contorta* (Brongn.) Kuntze	***Pseudopogonatherum contortum* (Brongn.) A. Camus**
43	*Eulalia trispicata* (Schult.) Henrard	***Pseudopogonatherum trispicatum* (Schult.) Ohwi**
44	*Isachne miliacea* Roth	***Isachne globosa* (Thunb.) Kuntze**
45	*Iseilema prostratum* (L.) Andersson	***Iseilema laxum* Hack. In DC.**
46	*Dinebra chinensis* (L.) P.M. Peterson & N. Snow	***Leptochloa chinensis* (L.) Nees**
47	*Lophochloa phleoides* (Vill.) Reichb.	***Rostraria cristata* (L.) Tzvelev**
48	*Leptochloa panicea* (Retz.) Ohwi	***Dinebra panicea* (Retz.) P.M. Peterson & N. Snow**
49	*Lolium remotum* Schrank var. *aristatum* (Doell) Aschers	***Lolium remotum* Schrank**
50	*Microstegium ciliatum* (Trin.) A. Camus	***Microstegium fasciculatum* (L.) Henrard**
51	*Panicum antidotale* Retz.	***Janochloa antidotalis* (Retz.) Zuloaga & Delfini**
52	*Panicum colonum* L.	***Echinochloa colonum* (L.) Link**
53	*Panicum maximum* Jacq.	***Megathyrsus maximus* (Jacq.) B.K. Simon & S.W.L. Jacobs**
54	*Panicum miliare* Lamk.	***Panicum antidotale* Retz.**
55	*Panicum paludosum* Roxb.	***Louisiella paludosa* (Roxb.) Landge**
56	*Panicum psilopodium* Trin.	***Panicum sumatrense* Roth**
57	*Panicum trypheron* Schult.	***Panicum curviflorum* Hornem.**
58	*Paspalidium flavidum* (Retz.) A. Camus	***Setaria flavida* (Retz.) Veldkamp**
59	*Paspalidium geminatum* (Forssk.) Stapf	***Setaria geminata* (Forssk.) Veldkamp**
60	*Paspalidium punctatum* (Burm. f.) A. Camus	***Setaria punctata* (Burm.f.) Veldkamp**
61	*Paspalum commersonii* Lamk.	***Paspalum scrobiculatum* L.**
62	*Paspalum compactum* Roth	***Digitaria compacta* (Roth) Veldkamp**
63	*Paspalum paspalodes* (Michx.) Scribn.	***Paspalum distichum* L.**
64	*Pennisetum americanum* (L.) Leeke	***Cenchrus americanus* (L.) Morrone**
65	*Pennisetum flaccidum* Griseb.	***Cenchrus flaccidus* (Griseb.) Morrone**
66	*Pennisetum glaucum* (L.) R.Br.	***Cenchrus americanus* (L.) Morrone**
67	*Pennisetum orientale* Rich.	***Cenchrus orientalis* (Rich.) Morrone**
68	*Pennisetum pedicellatum* Trin.	***Cenchrus pedicellatus* (Trin.) Morrone**
69	*Pennisetum polystachion* (L.) Schult.	***Setaria parviflora* (Poir.) Kerguélen**
70	*Pennisetum purpureum* Schumach.	***Cenchrus purpureus* (Schumach.) Morrone**
71	*Rottboellia exaltata* L.f.	***Rottboellia cochinchinensis* (Lour.) Clayton**
72	*Saccharum bengalense* Retz.	***Tripidium bengalense* (Retz.) H. Scholz**
73	*Saccharum arundinaceum* Retz.	***Tripidium arundinaceum* (Retz.) Welker, Voronts. & E.A. Kellogg**
74	*Saccharum narenga* (Nees ex Steud.) Hack.	***Narenga porphyrocoma* (Hance) Bor**
75	*Saccharum procerum* Roxb.,	***Tripidium procerum* (Roxb.) Welker, Voronts. &**

		E.A. Kellogg
76	*Saccharum ravennae* (L.) L.	***Tripidium ravennae* (L.) H. Scholz**
77	*Setaria pallide-fusca* (Schumach.) Stapf & C.E. Hubb.	***Setaria pumila (Poir.) Roem. & Schult.***
78	*Setaria glauca* (L.) P. Beauv.	***Cenchrus americanus* (L.) Morrone**
79	*Setaria tomentosa* (Roxb.) Kunth.	***Setaria intermedia* Roem. & Schult.**
80	*Sorghum miliaceum* (Roxb.) Snowden	***Sorghum halepense* (L.) Pers.**
81	*Sorghum vulgare* Pers.	***Sorghum bicolor* (L.) Moench**
82	*Sporobolus marginatus* Hochst. ex A. Rich.	***Sporobolus ioclados* (Nees ex Trin.) Nees**
83	*Sporobolus tremulus* (Willd.) Kunth.	***Sporobolus virginicus* (L.) Kunth**
84	*Thysanolaena maxima* (Roxb.) O. Ktze.	***Thysanolaena latifolia* (Roxb. ex Hornem.) Honda**
85	*Tragus biflorus* (Roxb.) Schult.	***Tragus racemosus* (L.) All.**
86	*Tragus roxburghii* Panigrahi	***Tragus mongolorum* Ohwi**
87	*Triticum sphaerococcum* Percival.,	***Triticum aestivum* subsp. *sphaerococcum* (Percival) Mac Key**
88	*Vetiveria zizanioides* (L.) Nash/ *Vetiveria zizanioides* Nash*	***Chrysopogon zizanioides* (L.) Roberty**
89	*Vulpia octoflora* (Walter) Rydb.	***Festuca octoflora* Walter**
90	*Vulpia myuros* (L.) C. C. Gmel.	***Festuca myuros* L.**

As an example, Rajkumar (2020) in his study on grasses in Rohilkhand region included *Apluda mutica* L. & *Apluda mutica* subsp. *aristata* (L.) Babu as separate accepted binomials, while on studying nomenclature it was found that *Apluda mutica* subsp. *aristata* (L.) Babu is synonym of *Apluda mutica* L. This has been done by many other authors as well (Supplementary Table-1). Besides synonyms, several spelling mistakes and problems related to authorities of the taxon names were also encountered (Supplementary Table-2). It has been observed that there is a difference in documented genera and species published year-wise. Such differences can be seen in many publications inspite of the same study area (Table-2).

Table 2: Publication details from the study area.

Sr. No.	Authors	Study area	Genera	Species	Accepted name	Error	Synonym
1	Murty & Singh, (1959)	Hastinapur (Meerut)	22	24	12	10	2
2	Murty & Singh, (1960a)	Hastinapur (Meerut)	12	12	6	4	2
3	Murty & Singh, (1960b)	Hastinapur (Meerut)	57	87	52	17	18
4	Murty & Singh, (1961)	Hastinapur (Meerut)	57	87	48	23	16
5	Singh, (1969)	Bulandshahr	24	31	21	6	4
6	Tayal & Bhasin, (1970)	Muzaffarnagar	10	12	7	3	2
7	Sharma & Dhakre, (1995)	Agra	47	79	41	17	21
8	Ali, (1999)	Moradabad	3	3	3	0	0
9	Vardhana, (2007)	Ghaziabad	64	125	71	27	27
10	Agarwal, (2009)	Hastinapur (Meerut)	61	110	79	11	20
11	Prachi et al., (2009)	Muzaffarnagar	2	2	2	0	0
12	Kumari, (2010)	Moradabad	2	2	0	2	0
13	Ahmed & Gupta, (2010)	Baghpat	36	60	20	32	8
14	Malik et al., (2010)	Muzaffarnagar	4	4	2	1	1
15	Mohammad et al.,	Saharanpur	1	1	1	0	0

	(2010)						
16	Kumar & Saxena, (2012)	Saharanpur	27	29	18	8	3
17	Chaudhary et al., (2012)	Gautambudhnagar	37	38	23	9	6
18	Malik et al., (2012)	Muzaffarnagar	14	22	12	4	6
19	Chaudhary & Kumar, (2015)	Ghaziabad	1	1	1	0	0
20	Malik, (2015)	Saharanpur	74	142	80	29	33
21	Ansari et al., (2016)	Gautambudhnagar	28	31	25	0	6
22	Prakash et al., (2017)	Western Uttar Pradesh	2	2	1	1	0
23	RajKumar & Kumari, (2017)	Sambhal	34	41	16	18	7
24	Khanna, (2018)	Tarai region of UP	69	135	99	14	22
25	Kumar et al., (2018)	Moradabad	3	3	1	2	0
26	Singh & Kumari, (2018)	Amroha (JP Nagar)	38	46	36	3	7
27	Singh & Kumari, (2019)	Rampur	2	2	2	0	0
28	Kumar & Kumari, (2019)	Bijnor	21	23	17	4	2
29	Kumar et al., (2019)	Agra	14	14	0	14	0
30	Singh, (2020)	Rampur	30	37	28	4	5
31	Rajkumar, (2020)	Rohilkhand region	75	154	113	16	25
32	Kumar, (2020)	Gautambudhnagar	1	1	0	1	0
33	Kumari et al., (2021)	Moradabad	1	1	1	0	0
34	Singh et al., (2022)	Rampur	1	1	0	1	0

The accepted names of the binomials, along with their type address are given in Supplementary Table-3. A new species or variety created by some researchers becomes a synonym for the following reasons: misidentification, lack of knowledge; adventently to increase the number of papers; minor seasonal variations have been recognized by several author and utilized them for taxon publication; probably, matching with type is not proper. This lead to increase in number of synonyms etc. After conducting a taxonomic study of 248 grasses found in western Uttar Pradesh, it was found that the names published by many Indians have also become synonyms of these 248 names today (Supplementary table-6).

Based on the findings, we can say that out of the 484 binomials recorded in 17 districts of Western Uttar Pradesh by different authors in different years, only 192 (39.66%) binomials are accepted. This is because during the course of time 18.59% binomials have become synonyms, while the binomials published with error are 41.75%. Thus, after nomenclature analysis, today 248 binomials are present in 99 genera of grasses in Western Uttar Pradesh. Even today, taxonomical problems are found in many research articles, such as writing the name of the genus or completely missing the specific epithet or authority from the binomial (Supplementary table 2). Review of literature reveals that Poaceae include 99 genera in Western Uttar Pradesh with *Eragrostis* Wolf as the largest genus. The status of different genera is given in supplementary table-4. The grass diversity is more or less different in all the parts of study area. Saharanpur region has the highest grass diversity while Bulandshahr has the lowest. District wise decreasing order of grasses diversity is as follows: Saharanpur > Pilibhit > Meerut > Bijnor > Ghaziabad > Shahjahanpur > Agra > Moradabad > Badaun > Gautambudhnagar > Amroha > Bareilly > Sambhal > Rampur > Muzaffarnagar > Baghpat > Bulandshahr. Based on the above study, we can say that all the species of grasses have unequal distribution in all the districts (Figure-2).

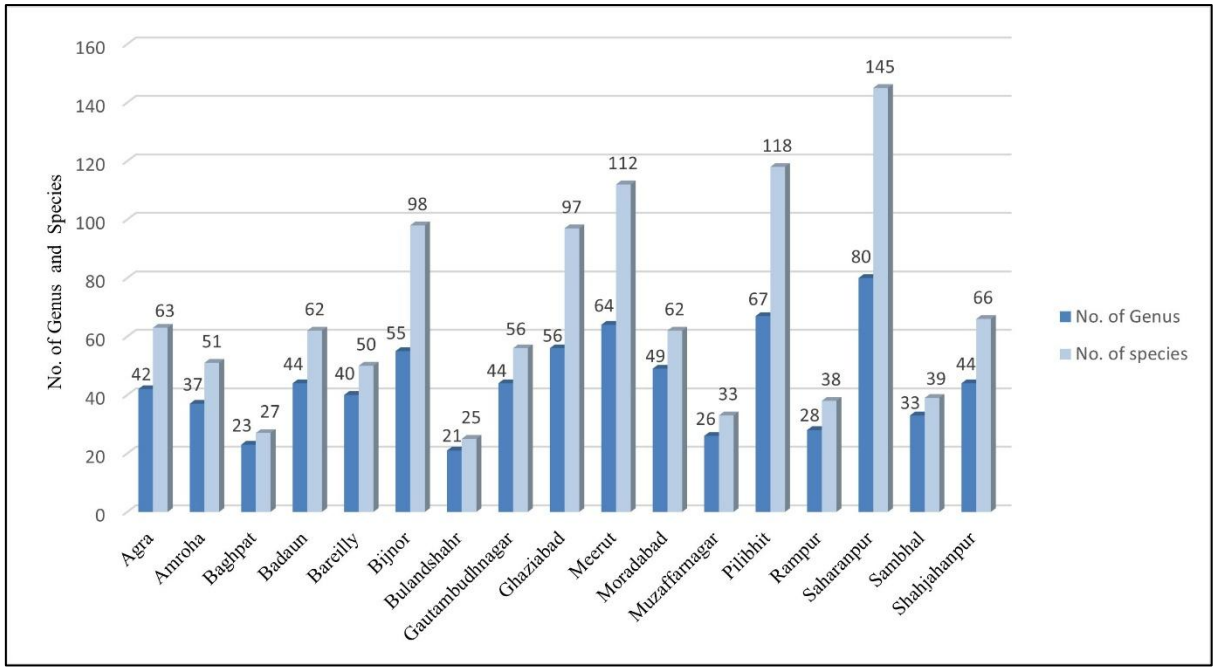

Figure 2: District-wise distribution of grass genera

Here, we were able to locate the type addresses of 134 names out of 248 names, which are given along with their herbarium links in Supplementary Table-3 & 5. Thus, in this way we have been able to locate the type addresses of 54.03% of grasses found in Western Uttar Pradesh along with their validation.

Conclusion

Taxonomic names change due to modern molecular phylogenetics has resulted a state of confusion among plant growers, gardeners, designers, consumers, land managers, ecologists, conservationists, home decorators and students. Plant producers feel panic due to name changes. Such professional remains in fear that the consumer will no longer recognize the name and consumer will not purchase plant due to which there are chances in reduction of market value of such plants. Name changing is also a problem for those who write book on plant gardening. Name changing also affect phytochemical, toxicological & clinical publications. During the last few years, large amount of literature has been published. This literature includes error in binomials and their authority. Many of the published literature related to phytochemicals mention the name of the taxon without authority. Such publications create confusions among students, research scholars & teachers. Authors have observed a concerning trend among research scholars who submit their research work or Ph. D theses without verifying the accepted names, instead accepting synonyms as the accepted names. From a scientific perspective, this poses a significant issue, as future generations may inadvertently rely on inaccuracies in the accumulated information as references for their own work. In Western Uttar Pradesh, there is no comprehensive report on grasses except a few deed (Murty and Singh, 1959, 1960a, 1960b, 1961; Khanna, 2018; Rajkumar, 2020). Keeping this all-in mind a comprehensive study for solving and updating nomenclature issues have been carried out. We updated the nomenclature of all the publication on grasses of Western Uttar Pradesh published after 1959. During this study, the authors reported that several names mentioned in the publish literature are not accepted. Such publication includes synonym as accepted name, as well as errors in authorities. According to our finding, there are 99 genera and 248 species rather than 97 genera and 484 species in the study area. This is because, of the 484 species published from 1959-2022, 90 names have become synonym. Of the above mention 189 names, (Supplementary Table-2) have errors in binomials such as spelling mistakes in authority, spelling error in generic and specific epithet. Four binomial was not found in taxonomic databases for correct identity. Besides, the accepted names are given here with type and protologue address and accepted name with herbarium link (Supplementary Table-3). In this study, the authors were able to locate the type addresses of 134 names out of 248 names, which are given along with their herbarium links in Supplementary Table-3. Thus, in this way the authors have been able to locate the type addresses of 54.03 of grasses found in western Uttar Pradesh along with their validation. The authors could not locate type address of 114 names which need to be traced out and typified for correct application of names.

##Supplementary materials:

Supplementary Table 1. Grasses Diversity of Western Uttar Pradesh

Supplementary Table 2. Error in the binomials of grass flora of western Uttar Pradesh

Supplementary Table 3. Nomenclatural details of Grasses

Supplementary Table 4. Status of taxa after nomenclature analysis

Supplementary Table 5. Type address details of Western Uttar Pradesh Grasses

Supplementary Table 6. Taxa published due to misidentification

Supplementary material is available with first author (vivekkumarph.d2021@gmail.com).

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