



ISSN 1810-3030 (Print) 2408-8684 (Online)

Journal of Bangladesh Agricultural University

Journal home page: <http://baures.bau.edu.bd/jbau>, www.banglajol.info/index.php/JBAU

Reassessment of cyperaceous weed biodiversity at Bangladesh Agricultural University campus

Jannat-E-Tajkia, Ashaduzzaman Sagar and A.K.M. Golam Sarwar

Department of Crop Botany, Bangladesh Agricultural University, Mymensingh 2202, Bangladesh

ARTICLE INFO

Article history:

Received: 31 May 2018

Accepted: 09 August 2018

Keywords:

Climate change, diversity status, economic uses, sedges, weed management

Correspondence:

Jannat-E-Tajkia

(jetajkia@bau.edu.bd)

Abstract

A floristic survey has been carried out from January 2015 to January 2016 to investigate the species diversity of Cyperaceous weeds present at Bangladesh Agricultural University campus. A total of 48 species belonging to 11 genera has been collected and identified. Among these, the prominent genus was *Fimbristylis* (13 species) followed by *Cyperus* (12 species) and three genera *viz.* *Actinoscirpus*, *Bolboschoenus* and *Fuirena* were represented by single species. Result of the present study revealed that some of these species are major and common obnoxious weeds in different crop fields. A good number of these species have great medicinal uses, fodder, raw materials for small industries and other economic values. The detailed taxonomic studies of these weeds will be helpful for the management practices of Cyperaceous weeds at this campus as well as in the whole country. It might be concluded that development of improved cultivation procedures will be helpful for getting high economic benefits from Cyperaceous weeds without affecting our crop yield and agro-ecosystem. There is no direct evidence of climate change threatening or eliminating Cyperaceae taxa from this locality.

Introduction

Cyperaceae, commonly known as sedges, is one of the largest monocotyledonous families with 5,500 known species described in about 90 genera (Christenhusz and Byng, 2016). Many species of sedges have evolved as weeds (Bryson and Carter, 2008). Weeds of the cyperaceae family are widely distributed in tropical Asia and South America with various harmful, taxonomic, ethno-botanical and horticultural importance. These weeds can grow in diverse environments and compete with crop plants for space, food, water, light environment, etc. Weeds generally have no positive economic importance in agriculture/production system, though in some cases weeds also have some beneficial uses – forage, soil binder, medicinal, raw materials for small industries, etc.

The Bangladesh Agricultural University (BAU) campus is positioned under the Agro-Ecological zone 9 *i.e.*, Old Brahmaputra Floodplain; roughly the whole area can be divided into three main topographic types – basin-shaped low lying area, slightly undulated area and plain area. The campus exhibit diverse habitats, such as marshy land, wetland, crop fields, fallow lands, etc. which support abundance growth of sedges in this campus (Sarwar and Prodhan, 2011). Agricultural productivity, human health and livestock are adversely affected by weedy sedges due to competition for natural resources with crops; allergens & anti-nutrition compounds for human and livestock.

Weeds cost billions of dollars in agriculture, forestry, and urban areas and threaten diversity in natural communities worldwide. Of an estimated 8,000 species of weeds worldwide, only about 200 species cause 95% of the problems in production of food, feed, fibre, and livestock (Bryson and Carter, 2008). About 25% of the world's weeds are monocots (Bryson and Carter, 2008). In Bangladesh, the increase of population growth and the low yields of crops are the main reasons for severe food deficits every year. Through proper weed management practices, the production of food grains can be increased (Karim, 1998). An up to date knowledge on different weed species of Bangladesh is essential to manage them below threshold level for sustainable crop production and/or to use them for our economic benefit especially the sedges as their control is very difficult. The taxonomic study of this family is still unattended in the “Flora of Bangladesh”. Some information is available as a part of other Agronomic or Horticultural research (Huda *et al.*, 2017 and older references therein). Two significant research works were carried out on the sedges of BAU campus, one in early seventies (Anwer, 1971) and the other is originally a relatively older work (during 2000-2002) published recently (Sarwar and Prodhan, 2011). The objective of this present study to update our knowledge on biodiversity of sedges at the Bangladesh Agricultural University campus including their habitat, flowering times, and other uses; which may be helpful for the green management practices and for getting higher economic benefits from Cyperaceous weeds without affecting our crop yield and agro-

ecosystem. The other objective is to use Cyperaceae as a model family (Simpson *et al.*, 2011) for climate change work on biodiversity and conservation of this campus.

Materials and Methods

An intensive field survey of Cyperaceous weeds growing throughout the BAU campus was carried out during January 2015 to January 2016. Frequent visits were made to assess the flowering time of these species. The fresh plant samples/specimens were collected at the flowering stage and other relevant information e.g., location, date, habitat, crop/plant association, etc. were recorded. Plant samples were properly dried for making voucher specimens. The fresh and/or dried specimens were identified in the field or by matching with herbarium specimens and/or published literature or consulting with experienced taxonomist at the Bangladesh National Herbarium, Dhaka. All the specimens are preserved in Prof. Dr. Arshad Ali Herbarium at the Botanical Garden, Department of Crop Botany, Bangladesh Agricultural University. The major literature consulted was "Encyclopedia of Flora and Fauna of Bangladesh (Siddiqui *et al.*, 2007) and other taxonomy related books (Sarwar and Prodhan, 2011 for details).

Results and Discussion

The species collected and identified are presented in Table 1 with their botanical names, common & English name, habitat, flowering time and other uses. A total of 48 species belong to 11 genera were identified. Among them, the prominent genus was *Fimbristylis* (13 species) followed by *Cyperus* (12 species), *Pycneus* (6), *Eleocharis* (5) and *Kyllinga* (3); three genera viz. *Actinoscirpus*, *Bolboschoenus* and *Fuirena* were represented by single species (Fig. 1). Species reported in this paper occupy diverse habitat such as various crop fields, wetlands, open grasslands, waysides, marshy places, riverbank and the bank of other water reservoirs, etc. Most of them are very common in rice fields, especially the species of the genus *Fimbristylis*, *Pycneus*, *Cyperus*, *Eleocharis*, etc. (Table 1).

The control methods used for weedy sedges are much diversified such as cultural methods, mechanical tillage, chemical treatments, shading with cover crops or black plastic, etc. (Bryson and Carter, 2008). The knowledge of flowering period may play a very important role for the controlling of weedy sedges. For example, flowering period of collected species showed a wide range of variation like Rabi season, Kharif season or all the year around (Table 1). If we uproot sedges before attaining the flowering stage, their propagation and spreading will be reduced. Moreover, we can easily take the appropriate methods for controlling the weeds according to their habitat.

Comparing with the previous study of Sarwar and Prodhan (2011), the presence of seven species viz. *Eleocharis retroflexa*, *Fimbristylis falcata*, *Kyllinga brevifolia*, *K. cylindrica*, *Pycneus polystachyos*, *P. sanguinolentus* and *Scirpus triqueter* var. *segregatus*, has newly been identified (with * in Table 1, Fig. 2). The number of genera represented by single species decreased from five to three (Anwer, 1971) which might be due to the identification of new species for any of these genera, as the numbers of species have been increased. These may support Simpson *et al.* (2011) who concluded that some species of Cyperaceae appear to be vulnerable, although, as yet, there is no direct evidence of climate change threatening or eliminating taxa. The occurrence of new species may be for various reasons; first of all, it may exist in this locality but somehow unidentified/missed during the previous studies. Secondly, anthropogenic activities may act as a vector to introduce these species from other location with various crop seeds. Among these, *Kyllinga brevifolia*, *Scirpus triqueter* are edible and used as fodder, so they may be dispersed here through grazing animals. Cyperaceae are especially important forage genetic resources in cold, damp sites, *Carex* and *Cyperus* are locally common and *Kobresia* covers large areas of the closely grazed mountain meadow in Himalaya and China (Ruijun, 2003). Moreover, they may be introduced here due to winds, flying animals (birds), water currents, changing cropping pattern, etc.

Most of the studied species are major and common weeds of various crop fields e.g., rice, jute, wheat, etc. and some of them act as obnoxious weeds. Some species have various medicinal values e.g., *Cyperus rotundus*, used in leprosy, thirst, fever, blood diseases, biliousness, dysentery, pruritus, pain, vomiting, urinary concertinas, stomach disorder and irritation of the bowels etc. Moreover, *Cyperus laxus*, *Scirpus articulatus* and some other species have also some important medicinal values. Some species are used as fodders in different countries such as *Cyperus difformis*, *Fimbristylis milliacea*, *Kyllinga brevifolia*, *K. monocephala*, etc. Some species of the genus *Pycneus*, *Cyperus flavidus*, etc. act as a soil binder. *Fimbristylis schoenoides* and some other species are used to make green manures. Some species have various ethno-botanical importances such as *Actinoscirpus grossus*, *Cyperus iria*, *C. babakan*, etc. These are used to make the mat, bags, various handicrafts, etc. (Table 1). Water treatments using Cyperaceae have demonstrated up to 92% removal of total nitrogen (Tanner, 1996) and significant sequestration of metals such as copper (Murray-Gulde *et al.*, 2005).

Table 1. Cyperaceous weeds in the Bangladesh Agricultural University campus

Botanical name	Common name	English name	Habitat	Flowering time	Harmful aspects and economic uses
<i>Actinoscirpus grossus</i> (L.f.) Goetgh. & D.A. Simpson	Kasari	Giant Bulrush	Swamps, ditches, rice fields	August-December	Making sleeping mats, bags and baskets. In some countries, used as fodder & medicinal, major weed in rice fields.
<i>Bolboshoenus maritimus</i> (L.) Palla subsp. <i>affinis</i> (Roth) T. Koyama	–	Purua grass	Rice fields and swamp lands.	March-August	Food (rhizome), Medicine, fibre, aquatic weed.
<i>Cyperus babakan</i> Steud.	–	–	Rice fields and swamp lands.	May-October	Acts as a weed of open marshy places.
<i>Cyperus compactus</i> Retz.	–	Compact Sedge	Wet grassy places, margin of pond and ditches and rice fields.	September-March	Considered a weed of rice fields
<i>Cyperus compressus</i> L.	Chanch	Poor land Flat-sedge	Open grasslands, waste places, waysides, cultivated grounds	Year around	Food (rhizome), A common weed of agricultural lands.
<i>Cyperus corymbosus</i> Rottb. var. <i>longispiculatus</i> (O. Ktze.) Kük.	Gola methi	Chinese matgrass	Wet, swampy and marshy fields	Year around	Its straight culm used for making a kind of rough mat, tuber used as a tonic and stimulant.
<i>Cyperus difformis</i> L.	Behua/sabuj nakphul	Small flower Umbrella plant	Wet, swampy and grassy fields and bamboo grooves.	Year around	Competes with the rice plants for nutrients, water and light. Occasionally the plant is eaten by cattle.
<i>Cyperus flavidus</i> Retz.	–	Yellow flatsedge	Open wet places, often as a weed of inundated rice fields.	Year around	A principal rice weed in Bangladesh, India, Indonesia, Sri Lanka and Vietnam.
<i>Cyperus iria</i> L.	Bara chucha	Umbrella sedge	Rice fields, cultivated grounds and way sides.	Year around	A common weed of cultivated lands, plant used for making mat.
<i>Cyperus laxus</i> Lamk. var. <i>laxus</i>	–	–	Wet lands and bamboo grooves.	Year around	In Mindanao, the roots used as medicine for diseased lips.
<i>Cyperus michelianus</i> (L.) Link.	Choto Gotubi	Michel sedge	Open, moist or rather dry grounds, grassy fields, roadsides and river banks.	September-February	A weed of rice fields.
<i>Cyperus pilosus</i> Vahl	–	Fuzzy flat sedge	Open wet places, grass land, rice fields	Year around	A weed of wet and waste places.
<i>Cyperus platystylis</i> R.Br.	–	–	Very wet places in swamps, margins of pools, wet rice fields.	November-February	A weed of rice fields, cattle fodder.
<i>Cyperus rotundus</i> L.	Mutha/ Nagar Mutha	Purple nutsedge	Road sides, waste places, open or slightly shaded grounds.	May-September	A serious pest in the cultivated lands. Young tubers eaten as food (sometimes), tubers used in leprosy, thirst, fever, blood diseases, biliousness, dysentery, pruritus, pain, vomiting, urinary concertinas, stomach disorder and irritation of the bowels.
<i>Eleocharis atropurpurea</i> Kunth	Pani chaise	Purple spike-rush	Wet areas, rice fields, bank of river and lakes.	November- January	–
<i>Eleocharis geniculata</i> (L.) Roem. & Schult.	–	Canada spike-sedge	Rice fields and swampy grasslands	November-February	A weed of rice fields.
<i>Eleocharis palustris</i> (L.) R.Br.	–	Common spike-rush	Wet grassy places, margin of pond and ditches and rice fields.	October-February	A minor weed of rice fields.
<i>Eleocharis plantaginea</i> R.Br.	–	Chinese water chestnut	Open swamps, wet floors and marshy places	May-December	Corms of the plants eaten as raw or cooked in China
* <i>Eleocharis retroflexa</i> (Poir.) Urb.	–	Coastal plain spike-rush	Wet grassy places, margin of pond and ditches and rice fields.	October to February	A minor weed of rice fields.
<i>Fimbristylis acuminata</i> Vahl	–	Pointed Fimbristylis	Open wet and muddy places.	October-March	A weed of rice fields.
<i>Fimbristylis aestivalis</i> (Retz.) Vahl	–	Summer Fimbristylis	Rice fields, Open wet places.	September-February	A weed of rice fields.

Table 1. Cont.

Botanical name	Common name	English name	Habitat	Flowering time	Harmful aspects and economic uses
<i>Fimbristylis dichotoma</i> (L.) Vahl subsp. <i>Dichotoma</i>	Bara nirbishi	Tall fringe-rush	Open wet places.	August-December	A weed of rice fields.
<i>Fimbristylis dipsacea</i> (Rottb.) Clarke	–	–	Moist riverbank, margin of lake and swamps.	Year around	A weed of waste land.
<i>Fimbristylis diphylla</i> (Retz.) Vahl	Mati chaise	Common fringe-sedge	Wet grassy places, margin of rice fields.	Year around	A weed of rice fields.
* <i>Fimbristylis falcata</i> (Vahl) Kunth	Bindi mathi	–	Open grassland	April-December	A weed of waste land, medicinal use in dysentery, skin diseases and ringworms.
<i>Fimbristylis hookeriana</i> Boeck.	–	–	Open wet places	Year around	Often as a weed of inundated rice fields.
<i>Fimbristylis milliaceae</i> Vahl	Joina/Bara Javani	Grass-like	Rice Fields and wet places	May-November	A common weed of paddy fields competing with paddy for nutrients and sunlight
<i>Fimbristylis monostachyos</i> Hassk.	–	Fimbristylis	Wet grass land	Year around	A weed of waste land.
<i>Fimbristylis polytrichoides</i> (Retz.) R.Br.	–	Marmari	Open places	August-January	Acts as a good soil binder
<i>Fimbristylis quinquangularis</i> Kunth	–	Grass like	Open wet grasslands, cultivated rice fields	June-November	A weed of rice fields, to make green manure, medicinal use in fever.
<i>Fimbristylis schoenoides</i> (Retz.) Vahl	Keshari	Fimbry	Wet open grassland and rice fields	July-November	The plant forms a fair proportion of the weeds of somewhat dry rice fields, sometimes used to make green manure.
<i>Fimbristylis squarrosa</i> Vahl	Jumka chaich	–	Shores of lakes and wet sandy soils	June-November	A weed of rice fields, medicinal use in sore throat.
<i>Fuirena ciliaris</i> (L.) Roxb.	Choto nolchok	Umbrella grass	Open wet or swampy places.	September-February	A weed of cultivated fields.
* <i>Kyllinga brevifolia</i> Rottb.	–	Green Kyllinga	Sunny and somewhat shaded places and grassy fields	March-September	Sometimes used as fodder for cattle and horses, has satisfactory food value with scanty yield.
* <i>Kyllinga cylindrica</i> Nees in Wight	–	Fragrant spike-rush	Open grass land	July-November	–
<i>Kyllinga monocephala</i> Rottb.	–	Whitehead spike-sedge	Sunny and somewhat shaded waste land, Road sides, Grassy fields.	June-September	Fodder for cattle and horses in drier areas, possesses satisfactory food value.
<i>Lipocarpus spacelata</i> Kunth	–	Half-chaff sedges	Open wet ground, margin of swamps	September- January	A weed of wet lands.
<i>Lipocarpus squarrosa</i> (L.) Goetgh.	Guri	Half-chaff sedges	Open wet sandy or clay soils at margins of pond	September- January	A weed of waste land.
<i>Pycnus capillaris</i> (Koen. ex Roxb.) Nees var. <i>stricta</i> Clarke	–	–	Open wet places, swamp, grassy fields and rice fields.	July-November	A weed of rice fields.
<i>Pycnus diaphanus</i> (Schhrad. ex Roem. & Schult.) Hooper & Koyma	–	–	Grasslands.	April-September	A weed of rice fields.
* <i>Pycnus polystachyos</i> Rottb.	–	Bunchy sedge/ Field sedge	Open, moist or rather dry grounds, grassy fields, roadsides and river banks.	June-October	A weed, act as a soil binder.
<i>Pycnus pumilus</i> (L.) Nees	–	Low flat-sedge	Open wet to semidry grassy and sandy fields	August-February	A weed of waste lands, acts as a soil binder.
* <i>Pycnus sanguinolentus</i> (Vahl) Nees	Satidhara	Louisiana flat-sedge	Wet grassy fields, ditches, margins of swamps and rice fields.	August-February	A weed of rice fields.
<i>Pycnus stramineus</i> Clarke	–	–	Wet grassy places and rice fields.	August-October	A weed of rice fields.
<i>Schoenoplectus juncooides</i> (Roxb.) Palla	Chisra	Hard-stem bulrush	Wet grassy places, margin of pond and ditches and rice fields.	Year around	A weed of rice fields.
<i>Schoenoplectus supinus</i> (L.) Palla	–	–	Open wet marshy lands	August-February	A weed of rice fields.
<i>Scirpus articulatus</i> L.	Putputi-Chechra	Bulrush	Open marshy places, rice fields.	October-March	Used as a purgative, considered as a weed of rice fields.
* <i>Scirpus triqueter</i> (L.) Palla var. <i>segregatus</i> C.B. Clarke	–	Triangular rush	Open marshes, freshwater swamps.	December-March	Edible seeds and roots.

*indicates newly identified species

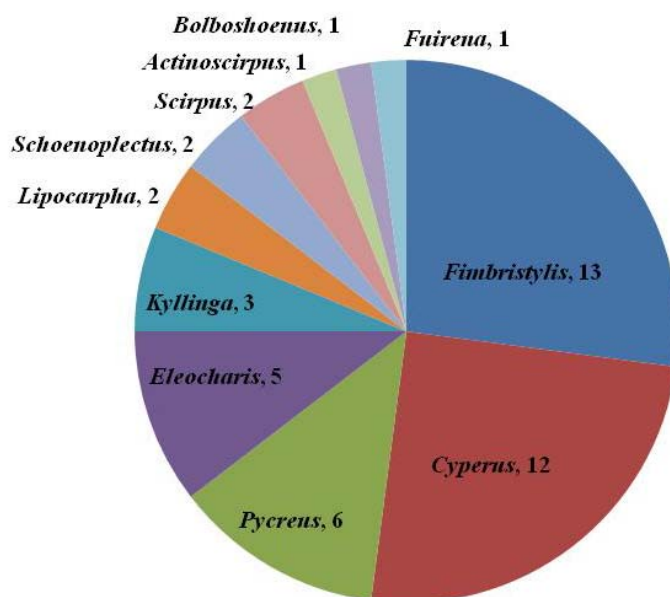


Fig. 1. Cyperaceous weed genera (number of species) present in Bangladesh Agricultural University Campus

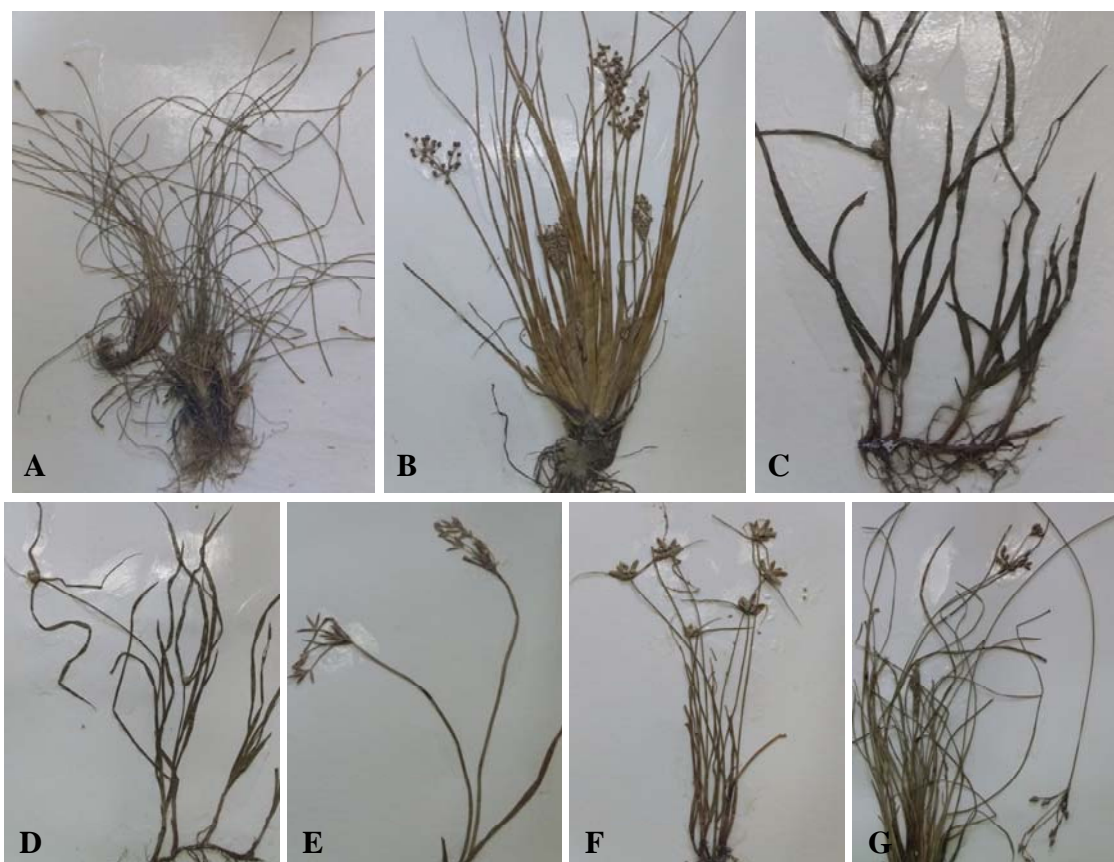


Fig. 2. Newly identified species apart from Sarwar and Prodhan (2011). A. *Eleocharis retroflexa*, B. *Fimbristylis falcata*, C. *Kyllinga brevifolia*, D. *Kyllinga cylindrica*, E. *Pycnus polystachyos*, F. *Pycnus sanguinolentus*, G. *Scirpus triqueter* var. *segregatus*

Conclusion

Results of the present study revealed that weeds of the family Cyperaceae are widely distributed in Bangladesh Agricultural University campus. Some species are major and common obnoxious weeds for rice and other crop fields. A good number of these species have various medicinal and other values. It may be concluded that knowledge generated from the present research would be helpful for the management practices of weed sedges as well as for getting benefits from other uses of different species. The micro-site (BAU campus) climate change has little or no effect on Cyperaceous weed biodiversity of this campus.

Acknowledgement

We indebted to Dr S Nasir Uddin, Principal Scientific Officer, Bangladesh National Herbarium for identification of some of the specimens, and acknowledge the National Science and Technology Fellowship (to 1st & 2nd author), the Ministry of Science and Technology, Government of the People's Republic of Bangladesh.

References

Anwer, S.K. 1971. The Sedges of East Pakistan Agricultural University Campus. M.Sc. thesis, Department of Crop Botany, Bangladesh Agricultural University, Mymensingh. pp. 1–74.

Bryson, C.T. and Carter, R. 2008. The significance of Cyperaceae as weeds. *Monograph Systematic Botany Missouri Botanical Garden*, 108: 15–101.

Christenhusz, M.J. and Byng, J.W. 2016. The number of known plants species in the world and its annual increase. *Phytotaxa*, 261: 201–217.

Huda, M., Begum, M., Rahman, M.M. and Akter, F. 2017. Weed composition study on wheat and boro rice in research and farmers' fields. *Journal of the Bangladesh Agricultural University*, 15: 148–157.

Karim, S.M.R. 1998. Relative yields of crops and crop losses due to weed competition in Bangladesh. *Pakistan Journal of the Scientific and Industrial Research*, 41: 318–324.

Murray-Gulde, C.L., Huddleston, G.M., Garber, K.V. and Rodgers, J.H. 2005. Contributions of *Schoenoplectus californicus* in a constructed wetland system receiving copper contaminated wastewater. *Water, Air and Soil Pollution*, 163: 355–378.

Ruijun, L. 2003. Yak nutrition – a scientific basis. In: Wiener, G., Jianlin, H. and Ruijun, L. (eds). *The Yak*. 2nd ed. FAORAP Publication 2003/06, Bangkok.
http://www.fao.org/documents/show_cdr.asp?url_file=/DOC/REP/006/AD347E/ad347e07.htm

Sarwar, A.K.M. Golan and Prodhan, A.K.M.A. 2011. Study on the Cyperaceous weeds of Bangladesh Agricultural University campus. *Journal of Agroforestry and Environment*, 5: 89–91.

Siddiqui, K.U., Islam, M.A., Ahmed, Z.U., Begum, Z.N.T., Hassan, M.A., Khondker, M., Rahman, M.M., Kabir, S.M.H., Ahmad, M., Ahmed, A.T.A., Rahman, A.K.A. and Haque, E.U. (eds) 2007. *Encyclopedia of Flora and Fauna of Bangladesh*, Vol. 11. Angiosperms: Monocotyledons (Agavaceae–Najadaceae). Asiatic Society Bangladesh, Dhaka, pp. 1–399.

Simpson, D.A., Yesson, C., Culham, A., Couch, C.A. and Muasya, A.M. 2011. Climate change and Cyperaceae. In: Hodkinson, T., Jones, M., Waldren, S. and Parnell, J. (eds.). *Climate Change, Ecology and Systematics*. Cambridge University Press, pp. 439–456. Available at <http://centaur.reading.ac.uk/20419/>

Tanner, C.C. 1996. Plants for constructed wetland treatment systems: a comparison of the growth and nutrient uptake of eight emergent species. *Ecological Engineering*, 7: 59–83.