

# Role of Sedges (Cyperaceae) in Wetlands and their Economic, Ethno-botanical Importance

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## Introduction

The sedge family, or Cyperaceae, is the third largest monocot family, consisting of an estimated 5000 species in 104 genera (Goetghebeur, 1998). They have a cosmopolitan distribution, with more concentration in tropics. The largest genera (approximate numbers of species) are *Carex*, 2000 spp.; *Cyperus*, 550 spp. (excluding *Kyllinga* and *Pycnus*); *Fimbristylis*, 300 spp.; *Rhynchospora* and *Scleria*, 250 spp. each; *Eleocharis*, 200 spp.; and *Bulbostylis*, *Pycnus* and *Schoenus*, 100 spp. each (Goetghebeur, 1998). Sedges are grass-like flowering plants with linear leaves, parallel venation, and small, mostly wind-pollinated flowers. Monocot plants with small, inconspicuous flowers and linear leaves are grouped informally as graminoids (sedges,

grasses, rushes). With some exceptions, the anonymous rhyme “*sedges have edges, rushes are round, grasses are hollow right up from the ground*” provide general differences in vegetative structure among these families (Table 1).

Although most sedges have three angled stems, but some like *Eleocharis* species are round in cross section. Common names can be confusing and are often derived uncritically, especially for grasses, rushes and sedges. The so-called bulrushes (*Scirpus* spp., *Schoenoplectus* spp.) and spike-rushes (*Eleocharis* spp.), are actually sedges. Likewise, the umbrella grasses (*Fuirena* spp.), and saw grass (*Cladium jamaicense* Crantz) are sedges, and the nutsedges (*Cyperus esculentus* L., *C. rotundus* L.) are often called “nut-grasses.”

**Table 1.** A comparison of the families *Cyperaceae*, *Poaceae* and *Juncaceae*.

<i>Cyperaceae</i> (Sedge Family)	<i>Poaceae</i> (Grass Family)	<i>Juncaceae</i> (Rush Family)
Usually three-angled stems (sometimes terete, quadrangular, or lenticular)	Stems terete	Stems terete
Stems usually with solid pith	Stems with solid nodes and hollow internodes	Stems with solid pith
Leaf sheaths closed	Leaf sheaths open	Leaf sheaths open
Inflorescence a complex of spikelets (simple spikelet in <i>Eleocharis</i> )	Inflorescence a complex of spikelets	Inflorescence a complex of cymes

<b><i>Cyperaceae</i></b> (Sedge Family)	<b><i>Poaceae</i></b> (Grass Family)	<b><i>Juncaceae</i></b> (Rush Family)
Perianth of 1–many bristles or hairs, or absent	Perianth hardly evident, apparently reduced to scale-like palea and tiny lodicule (inner series)	Perianth of six scale-like parts in two series
Stamens 3 (1-2, rarely 6)	Stamens 3 or 6 (rarely 1-2)	Stamens 6 (rarely 3)
Pistil of 2-3 fused carpels	Pistil of 2(3) fused carpels	Pistil of 3 fused carpels
Fruit an achene	Fruit a caryopsis (grain)	Fruit a capsule

## Role of Sedge Vegetation in Wetlands

Sedges are predominant plants in many wetlands, with some species forming nearly pure stands over large areas. The sedges are not only diagnostic of different wetland types but also serve as the preferred food for many wetland animal species and provide important hydrologic and landscape modifying functions. Knowing the sedges and being able to identify them is, therefore, fundamental in the identification of wetlands as well as for understanding the functioning and importance of wetland ecosystems. They are adapted to live in both wet and dry environments.

Characteristic attributes of a wetland, including vegetation, water (hydrology and water quality), soils (nutrient regime, pH, and organic content), and wildlife use, are functionally interconnected. For example, wetland vegetation supports food webs, create habitats for faunal diversity, remove sediments and toxic compounds from storm water, and stabilize river and stream banks and provide erosion control. These functions are useful for wetland restoration, creation, and enhancement. Sedges also play an important role in supporting food webs by recycling nutrients and using energy for photosynthesis to produce biomass for primary consumers and, ultimately, also decomposers (Sather and Smith 1984). Sedges function under both aerobic conditions (above and within the water and air columns) and anaerobic conditions (rooted in wet soil or muck). They provide the opportunity for nutrient cycling between these extremes and create an energy flow in wetland ecosystems pumping nutrients to other organisms as they grow, die and provide detritus to other

plants and animals inhabiting wetland ecosystems. Sedges serve to cycle nutrients faster than most masses characterizing these systems (Damman and French 1987).

Sedge-dominated wetlands occupy a unique position in a transitional zone between aquatic and terrestrial system. Sedges provide the dominant source of energy during critical stages in the life cycles of many species of birds and mammals. They provide feeding, breeding, nesting, escape and staging habitat for waterfowls, Cranes and other migratory birds. In addition to these roles, sedges also provide habitat structure for production of macro invertebrates (invertebrates, crustaceans, insect larvae) that many other species of animals are dependent upon. Most wetland sedge species produce a large crop of water-dispersed fruits. These are eaten by a variety of animals, such as insects, water birds, passerines, and some mammals. The leaves are often used as nesting material, and some mat forming species provide shelter and nesting sites (Cooke 1997). Sedge and graminoid meadows (a mixture of sedges and grasses) provide critical habitat for nesting sites and protection from mammalian predators. Fish also rely on sedge dominated wetlands. Marshes provide spawning grounds, escape and feeding habitat for many important freshwater species. (Figure-1)

Sedges improve water quality by acting as filters to remove pollutants and sediments (Sather and Smith 1984); some (e.g. *C. echinata*) have even been documented to remove heavy metals by plant uptake.

Wetlands, particularly sedge-dominated types at



**Figure 1:** Sedge dominated wetland vegetation serving as habitat for birds (isolated patches serve as nesting ground).

the interface between open water and more closed upland habitats, concentrate wildlife use and provide for extensive nonconsumptive uses of wildlife such as bird watching, wildlife photography and education. Sedges also have social, economic and ethno-botanical roles or values for humans. In general, sedges contribute to the diversity and aesthetics of wetlands. Their importance is often at a regional or local level and the family plays a vital part in many local economies. It is probably due to their localized use that they have generally been overlooked as plants of economic importance. The aim of present work is, to bring together the scattered data in the form of a checklist and to increase awareness about the economic value of taxonomically difficult but highly interesting sedge family. This checklist has been compiled from a survey of relevant literature and our own project work. The checklist comprises the accepted name, basionym and important synonyms where these are considered necessary (if a species is often recognized in another genus), general distribution and economic/ethno-botanical importance.

## Checklist of Sedges

### ***Bolboschoenus maritimus* (L.) Palla- (Figure 2a)**

Almost cosmopolitan

**Materials:** The leaves and culms are used for weaving.

**Animal food:** Delivers poor quality forage but can be used as hay if cut early.

### ***Bulbostylis barbata* (Rottb.) C. B. Clarke in Hook.**

Old World tropics and subtropics, SE U.S.A.

**Animal food:** Unspecified part: grazed by sheep and goats, but poor value (Kulhari & Joshi 1992).

### ***Carex cernua* Boott.**

India, China, Japan.

**Vertebrate poisons:** **Mammals:** cattle, causes lack of appetite, loss of milk and nervous symptoms (Cauis & Banby 1935).

### ***Carex filicina* Nees in Wight.**

India and Sri Lanka to China and Taiwan, Malesia.

**Food:** **Nutlets:** eaten raw (Pal 1992b).

### ***Carex nivalis* Boott.**

Himalayas; open areas at high altitude.

**Medicines:** **Injuries:** paste of powdered leaves applied as antiseptic on open wounds (Navchoo & Buth 1992).

### ***Cyperus articulatus* L.**

**Medicines:** Tubers tonic and stimulant; they are fragrant and used for perfuming clothing. Yields an essential oil.

**Materials:** Culms are woven into mats.

### ***Cyperus arenarius* Retz.**

South and SW Asia.

**Animal food:** Unspecified part grazed by sheep, goats etc (Kulhari & Joshi 1992).

**Environmental uses:** Erosion control: live plant drought resistant, used in dune stabilization (Mathur & Govil 1987).

### ***Cyperus brevifolius* (Rottb.) Hassk. Syn. *Kyllinga brevifolia* (Rottb.) Hassk.**

Paleotropic and subtropics.

**Medicines:** Roots and rhizome aromatic. Leaves used in Diarrhoea.

**Animal food:** Readily eaten by cattle.

### ***Cyperus bulbosus* Vahl**

Paleotropic and subtropics.

**Food:** Roasted tubers have the flavor of potatoes; baked into bread or cooked into puddings

### ***Cyperus compressus* L.**

Pantropical

**Food:** **Rhizomes:** cooked and uncooked vegetable. **Animal food:** Unspecified part: grazed cattle and buffalo (Burkill 1935; Burkill 1985); grazed by asses but poor value (Kulhari & Joshi 1992).

**Medicines:** Infections/infestations: roasted tubers made into paste and mixed with coconut oil for killing lice (Deokule & Magdum 1992).

### ***Cyperus corymbosus* Rottb.**

Tropical Africa, Madagascar, India to Indo-China, northern Australia, West Indies and tropical S America; cultivated in N Africa, Asia.



**Figure 2:** Left to right: (top) **a-** *Bolboschoenus maritimus* (L.) Palla, **b-** Tubers of *Cyperus esculentus* L. ("Kashuru"), **c-** *Cyperus iria* L., **d-** *Cyperus eleusinoides* Kunth, **e-** *Cyperus rotundus* L., **f-** *Eleocharis dulcis* (Burm. f.) Hensch.

**Materials:** Fibres: culms cultivated, dried and used for basketry, hats, matting and rope work.

**var. scariosus (R. Br) Kilk.**

India to N Australia.

**Materials:** sweet-smelling rhizomes used in perfumery and cosmetics (Kukenthal 1935 - 1936).

**Medicines:** Unspecified medicinal disorders: useful in treatment of chest disorders and nasal discharge; blood enricher; Circulatory system disorders: useful in treatment of haemorrhoids; Digestive system disorders: useful in the treatment of biliousness, thirst relief, fatigue, flatulence, diarrhoea; Genito-urinary system disorders: rhizome diuretic, stimulates menstrual discharge, also checks abnormally profuse menstruation and urination; Infections/infestations: useful in the treatment of fever and dysentery; Metabolic system disorders: rhizome pungent, acrid and cooling, promoting the flow of milk; regulates body temperature by antipyretic and sedative action; Poisonings: useful in treatment of scorpion sting, (Cauis & Banby 1935).

**Cyperus cyperoides (L.) Kuntze**

Paleotropical and subtropics.

**Medicines:** Used as vermifuge.

**Cyperus esculentus L. (Figure 2b)**

Temperate and subtropical

**Food:** Tubers edible.

**Medicines:** stimulant and aphrodisiac properties. yield a fatty oil also known as chufa oil or Tiger nut oil, used for culinary purposes and for soap manufacture.

**Cyperus exaltatus Retz.**

Pantropical; wet or swampy places.

**Medicines:** Infections/infestations: rhizome used on infected skin swellings; rhizome used dressing scarifications over the spleen in chronic malaria (Burkill 1935).

**Materials:** Suitable for paper making. used for matting (Burkill 1935).

**Animal food:** Unspecified part eaten by elephant.

**Cyperus iria L., (Figure 2c)**

Pantropical; open wet places.

**Medicines:** Infections/infestations: drunk for fever, ground with *C. rotundus* tubers (Cauis & Banby 1935). Nervous system disorders: taken as a stimulant and tonic.

**Animal food:** Unspecified part. Cattle and other livestock, India (Burkill 1935; Mukhopadhyay & Ghosh 1992).

**Materials:** Fibres: matting (Mukhopadhyay & Ghosh 1992)

**C. longus L.**

Temperate and subtropical

**Medicines:** Rhizomes tonic, stimulant and astringent.

**Cyperus nutans Vahl**

India, Sri Lanka, Indo-China, S China and Malesia

**Materials:** Fibres: matting (Burkill 1935).

**Cyperus eleusinoides Kunth. (Figure 2d)**

Tropical Africa, India to Malesia and N Australia

**Materials:** Fibres, culms used for making rope.

**Cyperus rotundus L. (Figure 2e)**

Pantropical; open or slightly shaded areas; often in areas of cultivation.

**Food:** Rhizomes edible. **Medicines:** Unspecified medicinal disorders: Europe, India, China, Indo-China, Malaysia and Philippines (Cauis & Banby 1935; Kern 1974; Parsons & Cuthbertson 1992); used as a tonic (Shanmugasundaram *et al.* 1991); Digestive system disorders: widespread use for treating stomach and bowel disorders including diarrhoea, indigestion, nausea, dysentery (Cauis & Banby 1935; Deokule & Magdum 1992; Jain 1992; Kapur *et al.* 1992a; Kulkenthal 1935 - 1936; Mukhopadhyay & Ghosh 1992; Nguyen 1993; Shanmugasundaram *et al.* 1991; Tiwari *et al.* 1992; Vedavathy 1991); Endocrine system disorders: culm bases used in herbal treatment for diabetes (Reddy *et al.* 1991); Genito-urinary system disorders: culm bases used as a diuretic (Shanmugasundaram *et al.* 1991; Vedavathy 1991), Infections/infestations: widespread use of culm bases in reducing fever (Cauis & Banby 1935; Kukenthal 1935 - 1936; Parsons & Cuthbertson 1992; Reddy *et al.* 1991; Shanmugasundaram *et al.* 1991; Vedavathy 1991); culm bases used against parasitic worms (Pal 1992a;

Parsons & Cuthbertson 1992; Vedavathy 1991), paste made from culm bases used to remove lice (Deokule & Magdum 1992); Inflammation: stolon decoction used in ophthalmia; culm base used to improve memory (Shanmugasundaram *et al.* 1991); Nervous system disorders: culm bases have stimulant properties (Nguyen 1993), stolon and culm bases used in herbal treatment for epilepsy (Reddy *et al.* 1991; Shanmugasundaram *et al.* 1991); Nutritional disorders: culm base improves taste, acts as a nourisher and used in anorexia (Shanmugasundaram *et al.* 1991); Pain: culm base used in general pain relief (Cauis & Banby 1935), stolon and culm base used specifically to treat headache (Reddy *et al.* 1991); Poisonings: culm base used in treatment of scorpion stings and snake bite (Shukla *et al.* 1992); Pregnancy/birth/puerperium disorders: rhizomes and culm bases beneficial in assisting labour (Burkill 1935); culm bases used as a poultice to encourage flow of breast-milk (Shanmugasundaram *et al.* 1991); Respiratory system disorders: culm bases used to treat coughs, colds and bronchial asthma (Parsons & Cuthbertson 1992; Shanmugasundaram *et al.* 1991),

*Animal food:* Unspecified part. grazed by buffalo, cows, asses, sheep and goats, (Kulhari & Joshi 1992)

*Materials:* Other materials/chemicals: culm bases used for incense and perfumery (Parsons & Cuthbertson 1992).

*Environmental uses:* Erosion control: used to bind soil as protection against wind erosion (Parsons & Cuthbertson 1992).

***Eleocharis dulcis* (Burm. f.) Hensch. (Figure 2f)**

Pantropical; cultivated in Asia; open marshy places along coasts and inland.

*Food:* Corms: edible raw and cooked, palatable and nutritious, widely eaten, China, India, Japan, Philippines, U.S.A., flour made from corms, (Burkill 1935; Kern 1974).

*Animal Food:* Leaves/culms/aerial parts: promising plant for leaf protein concentrate extraction used as cattle fodder (Pandey & Srivastava 1991).

***Eriophorum comosum* Nees.**

India, Himalayan region; rocky crevices.

*Materials:* Fibres: much used for rope-bridges (Hooker 1857).

***Fimbristylis dichotoma* (L.) Vahl. (Figure 3a)**

Pantropical

*Animal food:* Unspecified part: grazed by cattle especially the young plant; Leaves/culms/aerial parts: leaves, forage with sufficient food-value.

*Materials:* Unspecified material type: rhizomes aromatic, collected for this. Fibres: culms used for inferior matting.

*Environmental uses:* Soil improvers: ploughed in as green manure.

***Fimbristylis falcata* (Vahl) Kunth.**

India and Sri Lanka to Thailand, Indo-China, Philippines, New Guinea

*Medicines:* Infections/infestations: Santals use rhizome to relieve dysentery (Cauis & Banby 1935).

***Fimbristylis miliacea* (L.) Vahl.**

Tropical and subtropical regions worldwide.

*Medicines:* Infections/infestations: leaves used for poulticing in fever. *Environmental uses:* Soil improvers: ploughed in as green manure.

*Animal food:* Unspecified part: cattle.

***Kyllinga brevifolia* Rottb.**

Pantropical and warm temperate regions.

*Medicines:* Digestive system disorders: leaves taken internally for diarrhoea; used for fistula, pustules, tumours and stomach and intestinal problems (Mukhopadhyay & Ghosh 1992); leaves crushed and juice taken for stomach problems (Kapur *et al.* 1992b); Skin/subcutaneous cellular tissue disorders (Cauis & Banby 1935); leaves crushed and juice is taken for skin problems (Kapur *et al.* 1992b).

***Schoenoplectus articulatus* (L.) Palla. (Figure 3b)**

Mediterranean region and Africa through India and Sri Lanka to SE China, Malesia and N Australia.

*Medicines:* Digestive system disorders: used as a purgative (Cauis & Banby 1935; Mukhopadhyay & Ghosh 1992); rhizomes purgative (Heywood 1993).

***Schoenoplectus corymbosus* (Roem. & Schult.) J. Raynal.**

Africa to India



**Figure 3:** **a-** *Fimbristylis dichotoma* (L.) Vahl, **b-** *Schoenoplectus articulatus* (L.) Palla

Vertebrate poisons: Mammals: poisonous to cattle (Causis & Banby 1935).

***Schoenoplectus lacustris* L.**

Pantropical and warm temperate regions

*Medicines:* astringent and diuretic.

*Materials:* Culms used for thatching, also woven into mats, seats of the chairs, and several other domestic articles. They are used for producing artificial silk and for paper manufacture.

*Animal food:* Considerable amounts of water soluble vitamins, particularly B-vitamins and vitamin C, are present in aerial parts of the plant; their use in feeds for stock is suggested.

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