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## **EXOTIC SEDGES IN MAHARASHTRA STATE (INDIA): AN ASSESSMENT AND IMPLICATIONS**

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### **ABSTRACT:**

Biological invasion of exotic species is thought as the second worst threat after habitat destruction. A wide knowledge gap in invasion biology exists especially in developing nations like India. This knowledge is vital for scientific and systematic management of biodiversity and environment of a region. The present author, therefore, draw attention to the exotic sedges, a much neglected group of plants, as occurring in the state of Maharashtra. A total of 25 exotic species belong to nine genera of the family Cyperaceae. Maximum exotic species pertain to genera *viz.*, *Cyperus* (07), *Fimbristylis* (05), and *Eleocharis* (04). This is the first exclusive report on exotic sedges in the state of Maharashtra. A dire necessary is pointed out to have inventory nation-wide for this much overlooked group of plants as they also invade in agricultural lands and are responsible for economic loss.

**KEYWORDS:** *Plant Invasion, Cyperaceae, Exotic species, Maharashtra.*

### **INTRODUCTION:**

Members of the family Cyperaceae generally called sedges, are grass-like herbs. They often inhabit marshy or aquatic habitats. They bear minute flowers and are economically insignificant (Lawrence, 1951).

Although they are distributed throughout the world and commonly available, they are generally bypassed in botanical teachings. Current estimations projected total 18043 species of angiosperms in India (Singh *et al.*, 2015). Total angiospermic species account for 3025 in the state of Maharashtra (Singh *et al.*, 2000). Later studies have added some more. The family Cyperaceae stands third in Maharashtra state based on number of species (Singh *et al.*, 2000). As far as India is concerned, Cyperaceae contains endemic 148 species belonging to 15 genera (Singh *et al.*, 2015). However, estimates of exotic cyperacean taxa do not appear on record to date. This indicates that Indian botanists have paid a cursory attention to the exotic status of sedges. Vital information is scattered and hence the present authors intended to draw attention to this neglected group of plants. Invasion by sedges have not been carefully attended or they have been largely ignored on this line in ancient or even modern period (Patil, 2020, 2021). This attempt communicates exotic sedges from the state of Maharashtra.

### **METHODOLOGY:**

Floristic surveys have been carried out in the present boundary of the state of Maharashtra. These surveys have resulted in publications of regional and state floras (Cooke, 1958; Naik, 1998; Sharma *et al.*, 1996). Exotic status have been deciphered consulting relevant taxonomic literature as mentioned against each species and presented in the Table-I. Nomenclature is also updated.

### **RESULT AND DISCUSSION:**

#### **Plant Invasion In India And Maharashtra:**

Exotic species are non-native or alien organisms which inhabit outside their natural adapted habitat and dispersal potential. Convention for Biological Diversity (1992) visualize 'biological invasion of exotic species as the second worst threat after habitat destruction' (UNEP, 1992). It is worth to note that the wide knowledge gaps in invasion biology research that exist in the developing nations like India are crucial impediments to the scientific management and global policy-making on biological invasions (Khurro, *et al.*, 2012). Inventory on exotic flora of India constitutes 8.5% of the total Indian vascular flora. The Asian region is poorly represented in the scientific literature on biological invasions (Khurro *loc.cit.*). An inventory of exotic species assumes an urgent priority as it represents a critical starting point for the understanding of scientific and systematic management of biological invasions at various levels. The present author, therefore, extended research on this line in the state of Maharashtra (Patil, 1990, 1995, 2017). The present communication attempts at focusing a much neglected group of exotic cyperacean taxa in the state.

### **Floristic Composition:**

This census of exotic sedges revealed a total of 25 species belonging to nine genera. Maximum species are shared by the genera *viz.*, *Cyperus* (07), *Fimbristylis* (05) and *Eleocharis* (04). The genera such as *Pycneus*, *Scirpus*, *Juncellus* contributed two species each. However, the rest of the genera *viz.*, *Scleria*, *Fuirena*, *Schoenoplectus* shared a single species each. Source regions either continents or countries belongs to both Old and New Worlds.

### **Nativity of Exotic Sedges:**

Their nativity belong to total ten source regions. Various plants of Asia contributed maximum species (11), which is then followed by America (06), Africa (05) and Europe (04). Afghanistan shared two exotic species, whereas the rest others *viz.*, Eurasia, Austro-Asia, Australia and Eastern Hemisphere contributed a single species each. It is interesting to note that American continent shared fairly well although it is a distant one.

### **Dispersal:**

Dispersal of plant species is affected intentionally by mankind, by his negligence or naturally. Intentional introduction of plants is generally for the sake of useful ones. The members of the family are economically not significantly beneficial. Out of 25 exotic species of the present account only a single taxon *viz.*, *Cyperus flabelliformis* Rottb. is ornamentally important. Majority of the cyperacean taxa (except one) all are wild, naturalized and presently form an integral part of the Indian biodiversity. They are usually constituents of marsh wetland flora in India. Dispersal of plants do take place either biotically, abiotically or due to certain modifications of plant parts or adaptations to a given habitat or geographical regions (Patil, 2006).

### **Impact:**

Majority of sedges in general and also exotic sedges in particular are weedy in nature. They invade agricultural lands, gardens, parks and waste lands, road sides, irrigation canals, etc. They potentially change ecosystem structure and function. The floral parts are seeds (propagules) are light in weight and easily carried away by various agencies or vectors (Patil, 2020b). Even their germinability is usually high and hence spread rapidly. They are thus obstacles in biodiversity management and are largely responsible for severe economic losses in respect of production. This group of plant species have been largely neglected in view of invasion in India and therefore need a special inventory nation-wide.

### **CONCLUSION:**

Florets, inflorescence (spikelets) or fruits (nuts) are tiny, light and easily carried away to distant localities by air currents, winds or storms. Their dispersal is also possible visiting birds to aquatic bodies or marshy places wherein the sedges generally inhabit. River floods can also play a role in their dispersal (Patil, 2020). A literary survey indicates that studies on exotic sedges are further needed to reveal their invasion in Indian subcontinent (Patil, 2021). Only four species belonging to two Cyperacean taxa are recorded as exotic ones in the state Maharashtra (Sen, 1981). Further studies are obviously needed on Indian landmass as they invade agricultural lands.

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**Table-1: Exotic floral elements of Cyperaceae**

Sr. No.	Plant Species	Native Region or Country
1.	* <i>Cyperus difformis</i> L.	Tropical America: Reddy, 2008; Patil, 2017; Debnath & Debnath, 2017. Africa & Europe: Reshi, 1984.
2.	<i>Cyperus flabelliformis</i> Rottb. [Syn. <i>C.alternifolius</i> L. subsp. <i>flabelliformis</i> (Rottb.) Kuekenth]	Madagascar & South-West Asia: Gaikwad & Garad, 2015. Tropical Africa: Backer & Brink, 1963. Africa: Bailey, 1949; Stewart, 1972.
3.	<i>Cyperus globosus</i> All.	Afghanistan & Europe: Reshi, 1984.
4.	* <i>Cyperus iria</i> L.	Tropical America: Reddy, 2008; Patil, 2017; Debnath & Debnath, 2017. Asia (Excl.India) & Africa: Kaul, 1986.
5.	* <i>Cyperus rotundus</i> L.	Tropical Africa: Debnath & Debnath, 2017. Europe: Panda <i>et al.</i> , 2018; Kaul, 1986.
6.	<i>Cyperus sanguinolentus</i> L.	North & South America: Kaul, 1986.
7.	<i>Cyperus tenuispica</i> Steud.	Africa & Asia (Excl. India): Kaur <i>et al.</i> , 2014. East Asia: Titiek <i>et al.</i> , 2015.
8.	<i>Eleocharis acutangula</i> (Roxb.) Schult.	South-East Asia: Titiek <i>et al.</i> , 2015.
9.	<i>Eleocharis atropurpurea</i> J. & K. Presl.	Tropical Asia: Titiek <i>et al.</i> , 2015.
10.	<i>Eleocharis dulcis</i> (Burm.f.) Trin. ex Henschel [Syn. <i>E.plantaginea</i> (Retz.) R. & S.]	South-East Asia & Polynesia: Kaur <i>et al.</i> , 2014.
11.	<i>Eleocharis retroflexa</i> (Poir.) Urb.	South-East Asia: Titiek <i>et al.</i> , 2015.
12.	<i>Fimbristylis albiviridis</i> C.B.Clarke	South-East Asia: Titiek <i>et al.</i> , 2015.
13.	<i>Fimbristylis dichotoma</i> (L.) Vahl	Asia (Excl.) India & Africa: Reshi, 1984.
14.	* <i>Fimbristylis miliacea</i> (L.) Vahl	South America: Gupta, 2001. Tropical America: Titiek <i>et al.</i> , 2015.
15.	<i>Fimbristylis schoenoides</i> (Retz.) Vahl	South-East Asia: Titiek <i>et al.</i> , 2015.
16.	<i>Fimbristylis tomentosa</i> Vahl [Syn. <i>F.dichotoma</i> subsp. <i>podocarpa</i> (Nees) T.Koyama]	South-East Asia: Titiek <i>et al.</i> , 2015.
17.	<i>Fuirena ciliaris</i> (L.) Roxb.	Tropical America: Debnath & Debnath, 2017; Chandra Sekar, 2012.
18.	<i>Juncellus alopecuroides</i> (Rottb.) C.B.Cl. (Syn. <i>Cyperus alopecuroides</i> Rottb.)	Afghanistan: Gupta, 2001.
19.	<i>Juncellus pygmaeus</i> (Rottb.) C.B.Cl. [Syn. <i>Cyperus michelianus</i> (L.) Link]	Europe: Kak, 1990.



Sr. No.	Plant Species	Native Region or Country
20.	<i>Pycreus pumilus</i> L. (Syn. <i>Cyperus pumilus</i> L.)	Australia: Kak, 1990.
21.	<i>Pycreus sanguinolentus</i> (Vahl) Nees ex C.B.Cl.	Eastern Hemisphere: Titiek <i>et al.</i> , 2015.
22.	<i>Schoenoplectus articulatus</i> (L.) Palla (Syn. <i>Scripus articulatus</i> L.)	North America: Kaur <i>et al.</i> , 2014.
23.	<i>Scirpus maritimus</i> (L.) Lye. (Syn. <i>S.maritimus</i> L.)	Europe: Paul, 1977.
24.	<i>Scirpus mucronatus</i> (L.) Pallu	Eurasia: Lira <i>et al.</i> , 2008.
25.	<i>Scleria parvula</i> Steud. (Syn. <i>S.tesselata</i> Willd.)	Austro-Asian: Naik, 1998.

\* Weeds in cultivated fields.