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Monocotyledonous plant diversity of wetlands in kurkheda taluka, District Gadchiroli, Maharashtra

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Abstract
The wetlands serve as transitional zone in between aquatic and terrestrial ecosystem. Wetlands cover 6% area of total earth surface but they support vast variety of floral and faunal diversity. It also serves as source of economy to native peoples by providing natural resources. Wetland bodies in study site locally known as Boli, Tala or Talav. The aquatic monocotyledons flora of 16 selected perennial lakes in Kurkheda Tehsil were studied for a period of 3 years. Altogether 56 plant spa. belonging to 39 genera and 14 families were recorded from the study site. Further macrophytes are divided into five growth forms. Out of which free floating hydrophytes (FFH) represent 04 species, suspended hydrophytes (SH) represent 02 species, attached submerged hydrophytes (ASH) represent 06 species, attached hydrophytes with floating leaves (AHF) represent 09 species and wetland hydrophytes (WH) which are most dominant growth form represent 35 species.

Keywords: wetlands, macrphytes, growth forms monocotyledones, kurkheda

1. Introduction
Wetlands constitute a subject of prime global importance. It covers only six percent of total earth surface [11] but they support about twenty percent of earth's total biological diversity [4]. India has a total of 105, 64.899 ha of wetlands, the total annual ecosystem services value of wetlands is estimated to be 75.04 lakh crores [17]. There are many internationally accepted definitions of wetlands. The most accepted and important definitions in Indian situations are given by IUCN & IBP. Accordingly Wetlands are define as "All the submerged or water saturated lands, natural or manmade, inland or costal, permanent or temporary, static or dynamic, vegetated or non-vegetated, which necessarily have a land water interface [12]." Wetlands generally support diverse aquatic vegetation, also called hydrophytes, and are plants those have adapted to live in aquatic environments. Hydrophytes comprises diverse group of Algae, Bryophytes, Pteridophytes and Angiospermic vegetations. Those hydrophytes which are large enough to see by naked eyes termed as Macrophytes. It is important component of aquatic ecosystem. It plays a major role in primary productivity. Wetlands not only provide natural habitats for aquatic flora & fauna but also it provides socioeconomic benefits to the peoples around it. Wetlands maintain ecological balance by nutrient recycling also some aquatic macrophytes designated as pollution indicators [13, 17]. macrophytes comprises a diverse group of macrophytic organisms including angiosperms, ferns, mosses, liverworts and some fresh water macro algae that occur in seasonally or permanently wet environment [7].
The aquatic vegetation can be broadly classified into the following growth forms adopted with modification after Maheshwari (1960).

1. **Free floating hydrophytes (FFH)**: These are plants that are in contact with water & air.
2. **Suspended hydrophytes (SH)**: These are rootless, submerged hydrophytes that are in contact with water only.
3. **Attached submerged hydrophytes (ASH)**: These are entirely or at least to the most part, in contact with soil & water.
4. **Attached hydrophytes with floating leaves (AHF)**: These are in contact with soil, water as well as air.
5. **Wetland hydrophytes (WH)**: These are rooted in soil that is usually saturated with water, at least in early part of their life.

The first comprehensive work on the wetland flora of India and Burma was presented by Biswas and Calder [1] later on major contribution to the knowledge of aquatic vegetation in India was done by K. Subramanyam [16], they deal with 117 taxa belonging to 32 families while C. D. K. Cook [2] prepare a reference book & identification manual for the vascular plants found in permanent or seasonal fresh water in the subcontinents of India south of the Himalayas. As for as Maharashtra are concerned the major contributors of aquatic vegetation are Karthikeyan *et al.* [6], they prepared an inventory of hydrophytic flowering plants & reported 279 species, 4 subspecies & 12 varieties. A concentrated work around Nagpur district in Vidarbha region was done by Mirashi [8, 9, 19]. Studies on aquatic and wetland vascular plants in and around Gadchiroli and Chandrapur district was done by Tijare [19], Rohankar et.al. [14], Harney [5], Dhore & Lachure [3] and others but no such work carried out on Monocotyledones diversity of wetlands in Kurkheda tehsil of Gadchiroli district in Maharashtra, an attempt has been

made to study them.

2. Material & Methods

Study Site

Fig 1: Map of Maharashtra state

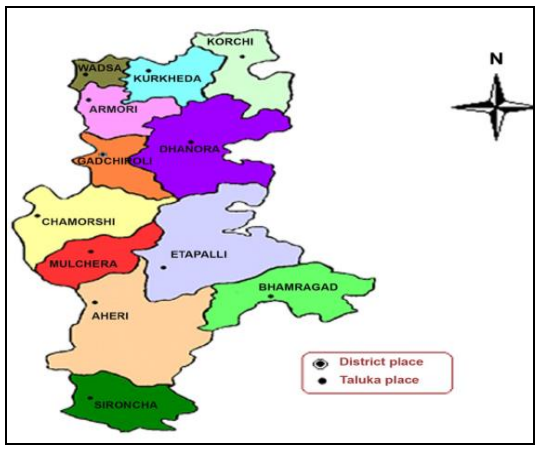

Fig 2: Map of Gadchiroli district Showing Gadchiroli Showing Kurkheda

Kurkheda is Town and Tehsil in Gadchiroli District in Indian State of Maharashtra. This area has thick forests locally known as Zadipatti area. It has total forest cover of 39827.72 Sq. km with total of 128 villages. It is located on the 20.370 North 80.120 Eastern side of the State, covering an area of 68230.64sq.km. It has average elevation of 240 meters (790 ft.) from sea level. Kurkheda tehsil is bounded by Desaiganj (Wadsa) & Armori Tehsil towards south west. Korachi taluka towards East, Arjuni Morgaon (Dist-Gondia) Tehsil towards North and Dhanora Tehsil towards South. Average relative humidity is 62 percent while average annual rainfall is 1063 mm. The dominant crop is rice cultivated throughout the tehsil with leguminous crop in some extent.

Kurkheda tehsil is blessed with large number of temporary and perennial water bodies. A total of 268 water bodies locally known as Tala, Talav or Boli found present in tehsil out of these 16 Perennial wetland bodies are undertaken for the present study located in Kharakada, Angara, Khairi, Bijapur, Gewardha, Shirpur, Ramgadh, Kasari, Dhamaditola, Uradi, Ghati, Wakdi, Kadholi, Sawalkheda, Sonsari & Wadegaon. Majority of wetlands in study site are partially disturb state because of anthropogenic activities like grazing, washing of clothes, bathing of domesticated animals, renovation under government scheme. These wetland bodies are also principally exploiting for fishing and irrigation practices.

Monocotyledones wetland plants were recorded through a survey of study area for two year (2016 to 2018) during which regular excursion were made to collect and photograph the plants. on collection submerged & floating vegetation were thoroughly washed, excess water soaked with filter paper, kept in polythene bags lined with filter paper and brought to the laboratory and preserved in 10% formalin and observed. Plants were identified with the help of available literature of K. Subramanyam [16], Flora of Nagpur district by N. R. Ugemuge [20], C. D. K. Cook [2], Flora of Maharashtra State Monocotyledones by B. D. Sharma *et al*. [15], Know your grass genera through hand lens by S. R. Yadav [21] and relevant published literature.

3. Result & Discussion

During the study it was found that selected region bleshed with large number of water bodies which belongs to perennial category. In present study 56 macrophytes species were identified belonging to 39 genera and 14 families. Out of which free floating hydrophytes (FFH) represent 04 species, suspended hydrophytes (SH) represent 02 species, attached submerged hydrophytes (ASH) represent 06 species, attached hydrophytes with floating leaves (AHF) represent 09 species and wetland hydrophytes (WH) which are most dominant growth form represent 35 species. The most dominant families are Cyperaceae represent 09 genera and 22 species followed by family Poaceae with 10 genera and 10 species. Other quit dominant families are Commelinaceae (05 species), Hydrocharitaceae (05 species), Lemnaceae (03 species) and Najadaceae (03 species) while 08 families namely Alismataceae, Amaryllidaceae, Aponogetonaceae, Araceae, Butomaceae, Pontederiaceae, Typhaceae and Xyridaceae representing 01 species each.

Table 1: List of Wetland bodies selected for study of macrophytes

Sr. No.	Name of the village	Name of the wetland	Area in hector	Total species
1.	Angara	Haveli talav	69.50	13
2.	Bijapur	Mothatalav	15.75	15
3.	Dhamaditola	Chichboli	8.86	20
4.	Gewardha	Hawelitalav	16.78	17
5.	Ghati	Gavboli	9.27	10
6.	Kasari	Umargaon	10.83	12
7.	Kadholi	Gavtalav	6.50	11
8.	Khairi	Nawtala	26.63	13
9.	Kharakada	Gavboli	72.90	16
10.	Malewada	Rajatolatalav	4.13	17
11.	Ramgad	Kamatboli	2.42	14
12.	Sawalkheda	Gavboli	3.90	05
13.	Shirpur	Gavboli	31.05	14
14.	Sonsari	Gavtalav	28.57	15
15.	Uradi	Lawariboli	4.37	19
16.	Wakdi	Labhanboli	17.30	11

During the present study, Out of 268 temporary and perennial wetland bodies in Kurkheda taluka, 16 wetlands are identified as perennial and covered in the present work (Table no. 1) with name of wetlands along with name of villages where they are situated, total catchment area in hector per wetlands with total no. of monocotyledons plant species.

Table 2: List of Monocotyledonous species of wetlands in Kurkheda tehsil

Sr. No	Scientific name	Family	Fls. &Frts. season	Growth form	Serial no. of wetlands where occurring
1.	*Aponogeton natans* (L.) Engl. & Krause	Aponogetonaceae	July- Oct	AHF	4,8,14
2.	*Blyxa aubertii* Rich.	Hydrocharitaceae	Aug- Feb	ASH	6,15
3.	*Butomopsis latifolia* (D. Don.) Kunth.	Butomaceae	Sep- Mar	AHF	2,5,6,8,9,14
4.	*Caldesia oligococca* (F. v. Muell.) BuchHam.	Alismataceae	June- Oct	AHF	16
5.	*Coix lacryma-jobi* L.	Poaceae	Aug- Jan	WH	1,3,4,5,7,12,13,14,16
6.	*Commelina benghalensis* L.	Commelinaceae	June- Dec	WH	1,2,3,5,6,8,9,10,12,13,14,15,16
7.	*Commelina diffusa* Burm.	Commelinaceae	July- Feb	WH	4,7,8,10,15
8.	*Crinum viviparum* (Lam.) R. Ansari	Amaryllidaceae	June- Oct	AHF	1,2,4,6,8,11,15
9.	*Cyperus alulatus* Kern	Cyperaceae	July- Sep	WH	1,2,10,13
10.	*Cyperus difformis* L.	Cyperaceae	Aug- Jan	WH	1,2,3,10,13,15
11.	*Cyperus iria* L.	Cyperaceae	Aug- Jan	WH	1,2,3,5,6,7,15
12.	*Cyperus pangore*i Rottb.	Cyperaceae	July- Feb	WH	9
13.	*Cyperus tenuispica* Stend.	Cyperaceae	Sep- Feb	WH	2,10,11,15,16
14.	*Echinochloa colona* (L.) Link.	Poaceae	July- Feb	WH	1,2,3,7,8,13,15
15.	*Eleocharis acutangula* (Roxb.) J. A. Schult.	Cyperaceae	June- Nov	WH	3,10
16.	*Eleocharis atropurpurea* (Retz.) J. K. Presl.	Cyperaceae	Sep- Nov	WH	6,9,11,13
17.	*Eleocharis dulcis* (Burm. f.) Trin ex. Henschel	Cyperaceae	June- Sep	WH	5,9,10,14
18.	*Eleocharis geniculata* (L.) R. & S.	Cyperaceae	June- Oct	WH	3,14
19.	*Elytrophorus spikatus* (Willd.) A. Camus	Poaceae	Jan- Mar	WH	4
20.	*Fimbristylis argentia* (Rottb.) Vahl.	Cyperaceae	Oct- Nov	WH	4
21.	*Fimbristylis dichotoma* (L.) Vahl.	Cyperaceae	June- Nov	WH	3,8,11,15
22.	*Fimbristylis miliace*a (L.) Vahl.	Cyperaceae	Oct- Nov	WH	3,4
23.	*Fimbristylis tetragona* R. Br. Prodr.	Cyperaceae	Sep- Nov	WH	9,16
24.	*Fimbristylistomentosa*Vahl.	Cyperaceae	Sep- Oct	WH	10,13,16
25.	*Fuirena ciliaris* (L.) Roxb.	Cyperaceae	Sep- June	WH	1,2
26.	*Hydrilla verticillata* (L. f.) Royle.	Hydrocharitaceae	Aug- Feb	SH	2,3,9,13
27.	*Hygroryza aristata* (Retz.) Nees ex. Wight &Arn.	Poaceae	Nov- Mar	AHF	8
28.	*Juncellus alopecuroides* (Rottb.) C. B. Cl.	Cyperaceae	Aug- Nov	WH	1,2,11,15
29.	*Kyllinga tenuifolia* Stend.	Cyperaceae	July- Oct	WH	4,7,10,15
30.	*Lagerosiphon alternifolia* (Roxb.) Druce.	Hydrocharitaceae	Aug- Feb	SH	3,6,9
31.	*Leersia hexandra* Swartz.	Poaceae	Throughout years	WH	4,7,10,15
32.	*Lemna perpusilla* Torr.	Lemnaceae	May- Jan	FFH	3,5,7,10,11,15
33.	*Monochoria vaginalis* (Burm. f.) K. B. Presl	Pontederiaceae	May- Sep	AHF	14
34.	*Murdannia nudiflora* (L.) Brenan.	Commelinaceae	July- Nov	WH	1,2,3,4,5,7,8,9,10,11,13,14,15,16
35.	*Murdannia spirata* (L.) Brueck.	Commelinaceae	Aug- Nov	WH	3,4,11
36.	*Najas graminea* Del.	Najadaceae	June- Oct	ASH	6,9
37.	*Najas indica* (Willed.) Cham.	Najadaceae	Aug- Jan	ASH	2,6
38.	*Najas marina* L.	Najadaceae		ASH	9
39.	*Oryza rufipogon* Griff.	Poaceae	Aug- Dec	WH	3,4,5,7,10,11,13,14,16
40.	*Ottelia alismoides* (L.) Pers.	Hydrocharitaceae	Sep- April	ASH	9,14
41.	*Paspalum scrobiculatum* L.	Poaceae	Oct- Dec	WH	1,2,3,4,5,7,8,9,10,11,13,14,15,16
42.	*Pistia stratiotes* L.	Araceae	Apr- June	FFH	12
43.	*Pseudoraphis spinescens* (R. Br.) Vickery	Poaceae	Aug- Jan	AHF	4,8,11
44.	*Pycreus sanguinolentus* (Vahl.) Nees.	Cyperaceae	Sep- Nov	WH	11,15
45.	*Rhynchospora weghtiana* (Nees.) Steud.	Cyperaceae	Oct- Dec	WH	3,6,9
46.	*Sacciolepis interrupta* (Willd.) Stapf.	Poaceae	Throughout years	AHF	4,6,15,16
47.	*Schoenoplectus articulates* (L.) Palla.	Cyperaceae	Sep- Dec	WH	14
48.	*Schoenoplectus grossus* (L. f.) Palla.	Cyperaceae	Sep- Dec	WH	3
49.	*Schoenoplectus lateriflorus* (Gmel.) Lye.	Cyperaceae	Sep- Oct	WH	1,2,5,8,10,11,14
50.	*Spiorodela polyrhiza* (L.) Schleid.	Lemnaceae	Sep- Apr	FFH	12
51.	*Tonningia axillaris* (L.) O. Ktze.	Commelinaceae	July- Dec	WH	1,2,3,4,5,7,8,9,10,11,13,14,15,16
52.	*Typha angustifolia* L.	Typhaceae	Mar- Dec	AHF	10,13,14
53.	*Vallisneria spiralis* L.	Hydrocharitaceae	Oct- Apr	ASH	9
54.	*Vetiveria zizaniodes*	Poaceae	Oct- Nov	WH	3,4,13,15
55.	*Wolffia arrhiza* (L.) Horkel ex. Wimmer	Lemnaceae	June- Oct	FFH	12
56.	*Xyris indica* L.	Xyridaceae	Oct- Jan	WH	6

FFH- Free floating hydrophytes, SH- Suspended hydrophytes, ASH- Attached submerged hydrophytes, AHF- Attached hydrophytes with floating leaves, WH- Wetland hydrophytes

During study it was found that selected sites are rich in monocotyledones flora. A total of 56 species belonging to 39 genera and 14 families were reported (Table no.2), with flowering and fruiting seasons, growth forms and serial no. of wetlands bodies where the spa occur during the study.

Table 3: List of top six families with number of genera and species

Sr. no.	Top dominant families	Genera	Species
1.	Cyperaceae	09	22
2.	Poaceae	10	10
3.	Hydrocharitaceae	05	05
4.	Commelinaceae	03	05
5.	Lemnaceae	03	03
6.	Najadaceae	01	03

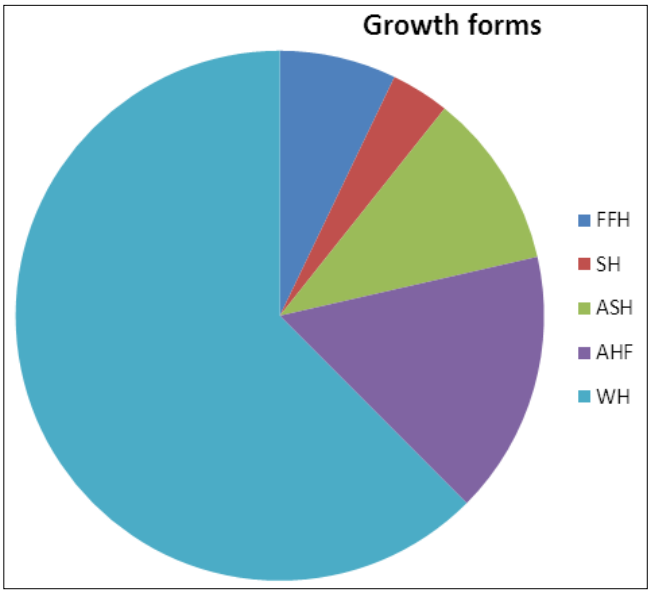

Fig 3: Shows the growth forms of macrophytes

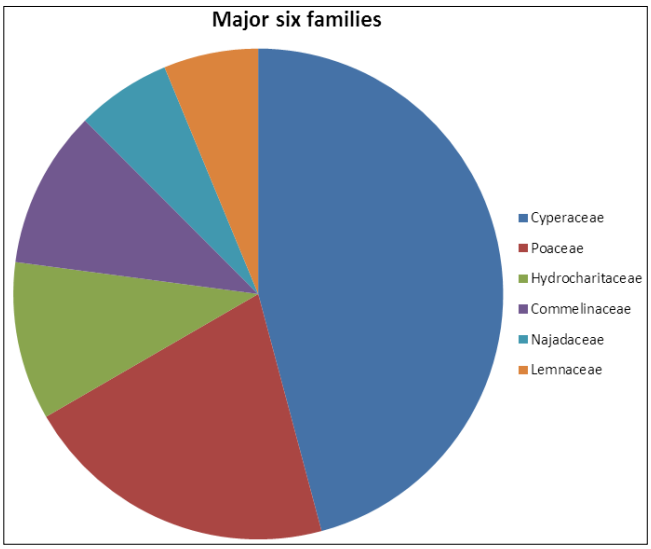

Fig 4: Six Dominant families

4. Conclusion

Present paper reveals that, the selected study site harbour rich aquatic monocotyledones flora having a total of 56 plant spa belonging to 39 genera and 14 families. Cyperaceae are major dominent families followed by poaceae, Hydrocharitaceae, Commelinaceae, Najadaceae and Lemnaceae. The maximum monocotyledones plannt diversity were recorded from Lawariboli of Uradi village while only 05 spa were recorded from Gavboli of Sawarkheda village. Out of 56 plant spa., 13 spa shown their apearance in single wetland bodies. These are *Caldesia oligococca*, *Elytrophorus spikatus*, *Fimristylis argentia*, *Hygrorhiza aristata*, *Monochoria vaginalis*, *Najas marina*, *Pistia stratiotes*, *Schenoplectus articulats*, *S. grossus*, *Spirodela polyrhiza*, *Vallisneria spiralis*, *Wolffia arrhiza* and *Xyris indica while Commelina benghalensis*, *Murdania nudicaulis*, *Paspalum scrobiculatum and Tonningia axillaris are common monocoteledones spa found in majority of wetlands of selected site.* The wetland hydrophytes are dominent growth form which indicate wetlands of selected study site are gradually transform into eutrophic state due to saveral anthropogenic causes such as domesticate activities, agricultural activities, bricks manufacturing practices, introduction of exotic plant spa degrade the wetland biodiversity in faster rate in studt site which are dangerous for the local wetland flora and fauna. For better conservation of wetland flora and fauna it is necessary to undertake urgently conservation measures with the support of local peoples which conserve and sustain ecological and economical important macrophyte diversity of selected sites.

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