

# Macrophytes of Tehri Dam Reservoir, Garhwal Himalaya, India

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## ABSTRACT

One hundred and seventy six species of macrophytes (154 herb, 14 shrub and 8 tree species) belonging to 58 families of angiosperms were recorded in the present study on macrophytes of Tehri Dam reservoir in Garhwal Himalaya during 2003-2005. All species were herbs. The family Asteraceae was the most dominant among the macrophytes consisting of 25 species. The second largest family was Papilionaceae with 16 species followed by Poaceae with 14 species. The largest genus was *Ageratum* with 4 species. *Cyperus*, *Euphorbia*, *Sida*, *Crotalaria* and *Ranunculus* had 3 species each. Twenty genera consisted of 2 species each and all other genera had one species each. Comparatively, fewer macrophytes appeared in July and August, showing thinner growth, while maximum growth was recorded in December and January.

**Keywords:** macrophytes, Tehri dam reservoir, aquatic ecosystem, Garhwal Himalaya

## INTRODUCTION

Macrophytes are large plants including aquatic angiosperms, water ferns, mosses and large algae e.g., *Chara* and *Enteromorpha*. They are sensitive indicators of water quality and conditions of their habitats. They are affected by a wide variety of environmental factors including geology, land form and pollution. Careful study of macrophyte community can provide valuable information about the habitat conditions and conversely, a first hand knowledge of the habitat can enable reasonable prediction of the expected type of vegetation.

Rech *et al.* (2006) and Sand-Jensen and Søndergaard (2006) described the distribution and production of aquatic macrophytes in Southern Michigan Marl Lake, USA and Lake Kølgaard, Denmark respectively. The macrophytes are well known to antagonise the planktonic population of a lake by either shade effect due to surface area coverage or by high growth rate, resulting in nutrient deficiency. The floating and emergent vegetation in the lake results due to successional changes and relishes a higher nutrient status (Sharma and Singhal 1988). Oosterberg *et al.* (2000) described the ecological gradients in Danube Delta, Romania. They concluded that the concentration of various chemical characteristics increased in shallow water region and in proximity with the salt water. Aquatic macrophytes act as indicators of various physical and chemical characteristics in an aquatic body (Seddom 2006).

Macrophytes determine the overall ecosystem physiology, indicating the degree of pollution, hence they are responsible for their immense role in biogeochemical cycling of nutrients (Hutchinson 1975; Wetzel 1983). Species richness, temperature, resource quality and environmental perturbations affect the development of aquatic macrophytes (De Stasio *et al.* 2009; Hladyz *et al.* 2009; McKie *et al.* 2009)

The large multipurpose Tehri Dam has two main catchments of the rivers Bhagirathi and Bhilangana draining into its reservoir. Both these rivers originate in the glaciers of the higher Himalayan region and flow through deep gorges, dense forests and habitation alike. The source of river Bhagirathi is Gaumukh, while the Bhilangana originates from the comparatively smaller Khatling glacier. It is a fresh water reservoir on the course of Bhagirathi and Bhilangana

rivers. The Tehri dam, after completion, has a height of 260.5 m, which is the highest earth rockfill dam in Asia.

The present study was conducted with the objective of recording the macrophytes along the banks of the Tehri dam to study their flowering and fruiting periods.

## MATERIALS AND METHODS

The study area is located at 30° 23' N latitude, 78° 29' E longitude and 635 m altitude. The collection of plant samples was done up to 5 m width from the banks of the Tehri dam reservoir. The climate of the study area is tropical monsoon with three distinct seasons. The atmospheric temperature ranged between a minimum of 5°C in December and January, and maximum of 37°C in June during the study period. The maximum rainfall (230 mm) occurred in July whereas the humidity ranged from 47% (May) to 92% (January).

Flowering plants constituted exclusively the category of macrophytes in the present study. Macrophytes were observed and collected monthly. They were pressed, dried and mounted on herbarium sheets by standard methods and were deposited in the herbarium of the Department of Botany, Government Post Graduate College, Rishikesh (Jain and Rao 1977). Details about their growth habit and flowering and fruiting periods were recorded. The identification of plants was done by consulting regional floras (Gaur 1999) and by consulting the herbaria of the Forest Research Institute (FRI) and Botanical Survey of India (BSI), Northern Circle, Dehradun.

## RESULTS AND DISCUSSION

Macrophytes recorded in the present study included mainly herbs. One hundred and seventy six species (154 herb, 14 shrub and 8 tree species) of angiosperms belonging to 58 families were recorded along the banks of the Tehri dam reservoir. The Asteraceae family was dominant among macrophytes, consisting of 25 species. The second largest family was Papilionaceae with 16 species followed by Poaceae with 14 species; Scrophulariaceae and Lamiaceae had 10 and 8 species, respectively. Brassicaceae had 6 species. The families Acanthaceae, Amaranthaceae, Cyperaceae, Malvaceae, Solanaceae consisted of 5 species each and the family Polygonaceae had only 4 species. Caryophyllaceae, Euphorbiaceae, Ranunculaceae, Rubiaceae, Urticaceae had

**Table 1** Habit, flowering and fruiting periods of various macrophytes.

No. Identified	Family	Species	Habit	Flowering Period	Fruiting Period
1	Acanthaceae	<i>Adhatoda zeylamica</i> Medikus	Herb	November-March	April-July
2	Acanthaceae	<i>Barleria cristata</i> L.	Herb	September-December	January-March
3	Acanthaceae	<i>Dicliptera roxburghiana</i> Nees	Herb	April-August	September-November
4	Acanthaceae	<i>Justicia procumbens</i> D.Don	Herb	February-June	July-October
5	Acanthaceae	<i>Peristrophe bicalyculata</i> (Retz.) Nees.	Herb	September-October	November-December
6	Alismataceae	<i>Alisma plantago-aquatica</i> L.	Herb	April-June	July-August
7	Amaranthaceae	<i>Amaranthus viridis</i> L.	Herb	January - June	March - November
8	Amaranthaceae	<i>Celosea argentea</i> L.	Herb	August- November	September- December
9	Amaranthaceae	<i>Achyranthes aspera</i> L.	Herb	March-July	August-November
10	Amaranthaceae	<i>Alternanthera sessilis</i> (L.) DC.	Herb	Whole Year	Whole Year
11	Amaranthaceae	<i>Amaranthus spinosus</i> L.	Herb	Whole Year	Whole Year
12	Anacardiaceae	<i>Rhus parviflora</i> Roxb.	Shrub	May-July	October-December
13	Apiaceae	<i>Apium leptophyllum</i> Pers. f.	Herb	February- June	April-August
14	Apiaceae	<i>Centella asiatica</i> (L.) Urban	Herb	March-May	October-December
15	Apocynaceae	<i>Vallisneria spiralis</i> (L.) O. Kuntze.	Shrub	January-March	April-May
16	Asclepiadaceae	<i>Calotropis procera</i> (Willd.) Dryand .	Herb	March-June	July-November
17	Asteraceae	<i>Artemisia capillaris</i> Thunb.	Herb	July-October	August- November
18	Asteraceae	<i>Bidens bipinnata</i> L.	Herb	March-August	April-September
19	Asteraceae	<i>Bidens biternata</i> (Lour.) Merrill	Herb	March-August	May-October
20	Asteraceae	<i>Gnaphalium affine</i> D.Don	Herb	January-August	March-October
21	Asteraceae	<i>Gnaphalium purpureum</i> L.	Herb	November-December	December-January
22	Asteraceae	<i>Parthenium hysterophorus</i> L.	Herb	Whole Year	Whole Year
23	Asteraceae	<i>Ageratum conyzoides</i> L.	Herb	May-August	September-November
24	Asteraceae	<i>Ageratum houstonianum</i> Mill.	Herb	Whole Year	Whole Year
25	Asteraceae	<i>Ageratum busua</i> Buch.-Ham. ex G.Don	Herb	August-September	October-December
26	Asteraceae	<i>Ageratum indica</i> Willd.	Herb	August-September	October-December
27	Asteraceae	<i>Conyza japonica</i> (Thunb.) Less. ex DC.	Herb	March-May	September-November
28	Asteraceae	<i>Eclipta prostrata</i> L.	Herb	September-October	November-December
29	Asteraceae	<i>Emilia sonchifolia</i> (L.) DC.	Herb	March-May	September-November
30	Asteraceae	<i>Erigeron karvinskianus</i> DC.	Herb	August-October	April-June
31	Asteraceae	<i>Eupatorium adenophorum</i> Spreng.	Herb	March-April	May-June
32	Asteraceae	<i>Galinsoga parviflora</i> Cav.	Herb	May-July	September-October
33	Asteraceae	<i>Inula cappa</i> (Buch.-Ham.ex D.Don) DC.	Herb	August-September	October-November
34	Asteraceae	<i>Siegesbeckia orientalis</i> L.	Herb	March-July	August-November
35	Asteraceae	<i>Sonchus asper</i> (L.) Hill.	Herb	February-April	April-May
36	Asteraceae	<i>Sonchus brachyotus</i> L.	Herb	February-March	April-May
37	Asteraceae	<i>Tagetes minuta</i> L.	Herb	August-September	October-November
38	Asteraceae	<i>Tridax procumbens</i> L.	Herb	March-April	May-June
39	Asteraceae	<i>Veronia cinerea</i> (L.) Less.	Herb	April-September	September-December
40	Asteraceae	<i>Xanthium strumarium</i> L.	Herb	July-August	September-October
41	Asteraceae	<i>Youngia japonica</i> (L.) DC.	Herb	March-April	May-June
42	Balsaminaceae	<i>Impatiens balsamina</i> L.	Herb	July-August	October-November
43	Balsaminaceae	<i>Impatiens scabrifolia</i> DC.	Herb	July-August	September-October
44	Begoniaceae	<i>Begonia picta</i> Smith	Herb	July-August	September-November
45	Bombacaceae	<i>Bombax ceiba</i> L.	Tree	December-February	April-June
46	Brassicaceae	<i>Coronopus didymus</i> (L.) Smith	Herb	March-June	August-December
47	Brassicaceae	<i>Arabidopsis thaliana</i> (L.) Heynh.	Herb	July-September	October-December
48	Brassicaceae	<i>Capsella bursa-pastoris</i> (L.) Medikus	Herb	December-March	June-October
49	Brassicaceae	<i>Cardamine flexuosa</i> With.	Herb	December-February	March-May
50	Brassicaceae	<i>Lepidium sativum</i> L.	Herb	December-January	March-May
51	Brassicaceae	<i>Rorippa nasturtium-aquaticum</i> (L.) Hayek.	Herb	December-February	March-June
52	Caesalpinaceae	<i>Bauhinia retusa</i> Buch.-Hem. ex Roxb.	Tree	July-September	October-December
53	Caesalpinaceae	<i>Cassia tora</i> L.	Herb	May-August	November-December
54	Cannabaceae	<i>Cannabis sativa</i> L.	Shrub	June-August	September-November
55	Caryophyllaceae	<i>Stellaria media</i> (L.) Vill.	Herb	January-May	April-June
56	Caryophyllaceae	<i>Arenaria serpyllifolia</i> L.	Herb	May-July	August-November
57	Caryophyllaceae	<i>Silene conoidea</i> L.	Herb	December-February	March-May
58	Chenopodiaceae	<i>Chenopodium murale</i> L.	Herb	November-February	December-March
59	Chenopodiaceae	<i>Chenopodium ambrosioides</i> L.	Herb	January-November	February-December
60	Cleomaceae	<i>Cleome gynandra</i> L.	Herb	June-August	October-December
61	Commelinaceae	<i>Commelina benghalensis</i> L.	Herb	July-August	September-November
62	Commelinaceae	<i>Murdannia nudiflora</i> (L.) Brenan.	Herb	August-September	October-November
63	Convolvulaceae	<i>Ipomoea pes-tigridis</i> L.	Herb	September-October	November-December
64	Convolvulaceae	<i>Ipomoea purpurea</i> (L.) Roth.	Herb	July-August	September-October
65	Cucurbitaceae	<i>Coccinea grandis</i> (L.) Voigt	Climber	July-August	October-December
66	Cuscutaceae	<i>Cuscuta reflexa</i> Roxb.	Climber	September-October	November-December
67	Cyperaceae	<i>Cyperus compressus</i> L.	Herb	July-October	July-November
68	Cyperaceae	<i>Cyperus niveus</i> Retz.	Herb	April-July	July-August
69	Cyperaceae	<i>Cyperus rotundus</i> L.	Herb	Whole Year	Whole Year
70	Cyperaceae	<i>Eleocharis atropurpurea</i> (Retz.) Kuntz.	Herb	August-September	October-November
71	Cyperaceae	<i>Eriophorum dichotoma</i> (L.) Vahl.	Herb	July-September	October-November
72	Dioscoreaceae	<i>Dioscorea belophylla</i> (Prain) Voigt ex Haines.	Climber	July-August	September-October

Table 1 (Cont.)

No. Identified	Family	Species	Habit	Flowering Period	Fruiting Period
73	Dioscoreaceae	<i>Dioscorea bulbifera</i> L.	Climber	August-September	October-November
74	Euphorbiaceae	<i>Euphorbia hypericifolia</i> L.	Herb	July-September	September-November
75	Euphorbiaceae	<i>Euphorbia geniculata</i> Ortega	Herb	June-July	August-September
76	Euphorbiaceae	<i>Euphorbia pepus</i> L.	Herb	July-November	December-February
77	Fumariaceae	<i>Fumaria indica</i> (Haussk.) Pugsley	Herb	December-February	March-May
78	Geraniaceae	<i>Geranium ocellatum</i> Camb.	Herb	January-March	October-November
79	Hydrocharitaceae	<i>Hydrilla verticillata</i> (L.f.) Royle	Herb	September-November	October-December
80	Hydrocharitaceae	<i>Vallisneria spiralis</i> L.	Herb	-	-
81	Juncaceae	<i>Juncus bufonius</i> L.	Herb	March-August	April-September
82	Lamiaceae	<i>Ajuga bracteosa</i> Wall. ex Benth.	Herb	Whole Year	Whole Year
83	Lamiaceae	<i>Ajuga macrosperma</i> Wallich ex Benth.	Herb	February-April	May-June
84	Lamiaceae	<i>Colebrookea oppositifolia</i> Smith	Shrub	January-March	April-May
85	Lamiaceae	<i>Leucas cephalotes</i> (Roth.) Sprengel.	Herb	July-August	September-November
86	Lamiaceae	<i>Leucas lanata</i> Benth.	Herb	May-August	September-October
87	Lamiaceae	<i>Micromeria biflora</i> (Buch.-Ham.ex D.Don) Benth.	Herb	March-August	September-October
88	Lamiaceae	<i>Nepeta hindostana</i> (Roth) Haines	Herb	March-April	May-June
89	Lemnaceae	<i>Spirodela polyrhiza</i> (L.) Schleiden	Herb	May-June	July-August
90	Linaceae	<i>Reinwardtia indica</i> Dumort.	Shrub	December-February	March-May
91	Lythraceae	<i>Woodfordia fruticosa</i> (L.) Kurz	Shrub	February-April	June-August
92	Malvaceae	<i>Malva parviflora</i> L.	Herb	July-August	October-November
93	Malvaceae	<i>Malvastrum coromandelianum</i> (L.) Garcke	Herb	December-March	July-November
94	Malvaceae	<i>Sida acuta</i> Burm.f.	Herb	July-September	May-July
95	Malvaceae	<i>Sida cordata</i> (Burm.f.) Borss.	Herb	Whole Year	Whole Year
96	Malvaceae	<i>Sida cordifolia</i> L.	Herb	Whole Year	Whole Year
97	Meliaceae	<i>Toona ciliata</i> Roemer	Tree	March-May	June-August
98	Menispermaceae	<i>Cissampelos pareira</i> L.	Climber	March-July	August-October
99	Mimosaceae	<i>Acacia catechu</i> (L.f.) Willd.	Tree	May-August	September-December
100	Mimosaceae	<i>Albizia lebbek</i> (L.) Willd.	Tree	April-August	October-December
101	Moringaceae	<i>Moringa oleifera</i> Lam.	Tree	March-May	June-August
102	Nyctaginaceae	<i>Boerhavia diffusa</i> L.	Herb	Whole Year	Whole Year
103	Nyctaginaceae	<i>Mirabilis jalapa</i> L.	Herb	August-September	October-November
104	Orchidaceae	<i>Epipactis veratrifolia</i> Boiss.	Herb	February-March	April-May
105	Oxalidaceae	<i>Oxalis corniculata</i> L.	Herb	Whole Year	Whole Year
106	Papaveraceae	<i>Argemone mexicana</i> L.	Herb	Whole Year	Whole Year
107	Papaveraceae	<i>Argemone ochroleuca</i> Sweet	Herb	December-February	March-June
108	Papilionaceae	<i>Abrus precatorius</i> L.	Herb	March-May	June-August
109	Papilionaceae	<i>Abrus vaginalis</i> (L.) DC.	Herb	July-August	September-December
110	Papilionaceae	<i>Campylotropis stenocarpa</i> (Klotzsch) Schindler	Shrub	December-March	August-November
111	Papilionaceae	<i>Crotalaria albida</i> Heyne ex Roth.	Herb	Whole Year	Whole Year
112	Papilionaceae	<i>Crotalaria calycina</i> Schrank	Herb	July-August	October-November
113	Papilionaceae	<i>Crotalaria medicaginea</i> Lam.	Herb	August-September	October-December
114	Papilionaceae	<i>Desmodium gangeticum</i> (L.) DC.	Herb	March-April	October-December
115	Papilionaceae	<i>Desmodium triflorum</i> (L.) DC.	Herb	March-April	August-September
116	Papilionaceae	<i>Erythrina suberosa</i> Roxb.	Tree	March-May	June-August
117	Papilionaceae	<i>Indigofera heterantha</i> Wall. ex Brandis	Shrub	March-May	June-August
118	Papilionaceae	<i>Lathyrus sativus</i> L.	Herb	February-April	May-July
119	Papilionaceae	<i>Lathyrus sphaericus</i> Retz.	Herb	February-March	April-June
120	Papilionaceae	<i>Medicago lupulina</i> L.	Herb	December-March	April-June
121	Papilionaceae	<i>Medicago polymorpha</i> L.	Herb	October-December	March-May
122	Papilionaceae	<i>Melilotus alba</i> Medikus ex Desr.	Herb	February-April	September-December
123	Papilionaceae	<i>Vicia sativa</i> L.	Herb	December-March	April-June
124	Poaceae	<i>Echinochloa colonum</i> (L.) Link	Herb	July-September	August-October
125	Poaceae	<i>Apluda mutica</i> L.	Herb	Whole Year	Whole Year
126	Poaceae	<i>Bothriochloa pertusa</i> (L.) A. Camus	Herb	March-June	July-September
127	Poaceae	<i>Chrysopogon serrulatus</i> Trin.	Herb	July-September	October-November
128	Poaceae	<i>Cynodon dactylon</i> (L.) Pers.	Herb	Whole Year	Whole Year
129	Poaceae	<i>Echinochloa colonum</i> (L.) Link	Herb	Whole Year	Whole Year
130	Poaceae	<i>Imperata cylindrica</i> (L.) Raeuschel.	Herb	March-June	July-September
131	Poaceae	<i>Lolium temulentum</i> L.	Herb	November-January	February-March
132	Poaceae	<i>Phalaris minor</i> Retz.	Herb	February-April	May-June
133	Poaceae	<i>Polypogon fugax</i> Nees ex Steud.	Herb	February-March	April-May
134	Poaceae	<i>Setaria glauca</i> (L.) P. Beauv.	Herb	Whole Year	Whole Year
135	Poaceae	<i>Setaria verticillata</i> (L.) P. Beauv.	Herb	July-August	September-October
136	Poaceae	<i>Poa annua</i> L.	Herb	January-May	March-June
137	Poaceae	<i>Digitaria setigera</i> Roth.	Herb	August-October	September-November
138	Polygalaceae	<i>Polygala arvensis</i> Willd.	Herb	March-July	August-October
139	Polygonaceae	<i>Rumex nepalensis</i> Sprengel.	Herb	April-August	August-October
140	Polygonaceae	<i>Persicaria capitata</i> Buch.-Ham.ex D.Don	Herb	April-July	August-October
141	Polygonaceae	<i>Persicaria hydropiper</i> (L.) Spach	Herb	June-August	September-October
142	Polygonaceae	<i>Polygonum plebium</i> R. Br.	Herb	November-February	March-June
143	Portulacaceae	<i>Portulaca oleracea</i> L.	Herb	June-August	October-December
144	Potamogetonaceae	<i>Potamogeton natans</i> L.	Herb	April-May	June-July

Table 1 (Cont.)

No. Identified	Family	Species	Habit	Flowering Period	Fruiting Period
145	Ranunculaceae	<i>Ranunculus sceleratus</i> L.	Herb	February-November	October-December
146	Ranunculaceae	<i>Ranunculus muricatus</i> L.	Herb	December-February	March-May
147	Ranunculaceae	<i>Ranunculus arvensis</i> L.	Herb	December-February	March-May
148	Rhamnaceae	<i>Ziziphus mauritiana</i> Lam.	Shrub	May-July	September-December
149	Rubiaceae	<i>Galium aparine</i> L.	Herb	February-April	September-December
150	Rubiaceae	<i>Oldenlandia corymbosa</i> L.	Herb	March-May	October-December
151	Rubiaceae	<i>Spermadictyon suaveolens</i> Roxb.	Shrub	August-September	October-December
152	Rutaceae	<i>Murraya koenigii</i> (L.) Sprengel.	Shrub	March-May	August-November
153	Scrophulariaceae	<i>Buchnera hispida</i> Buch. Ham. ex D. Don.	Herb	July-October	August-November
154	Scrophulariaceae	<i>Lindernia crustacea</i> (L.) F.V. Mueller	Herb	March-August	September-November
155	Scrophulariaceae	<i>Mazus pumilus</i> (Burm.f.) van Steenis.	Herb	March-August	September-October
156	Scrophulariaceae	<i>Mazus surculosus</i> D. Don.	Herb	February-September	August-October.
157	Scrophulariaceae	<i>Veronica anagallis-aquatica</i> L.	Herb	February-September	August-October.
158	Scrophulariaceae	<i>Antirrhinum orontium</i> L.	Herb	December-March	April-May
159	Scrophulariaceae	<i>Bacopa monieri</i> (L.) Penell	Herb	June-August	September-October
160	Scrophulariaceae	<i>Lindenbergia indica</i> (L.) O. Kuntze.	Herb	September-October	November-December
161	Scrophulariaceae	<i>Lindenbergia parviflora</i> (Roxb.) Haines	Herb	October-December	January-March
162	Scrophulariaceae	<i>Scoparia dulcis</i> L.	Herb	Whole Year	Whole Year
163	Solanaceae	<i>Datura stramonium</i> L.	Herb	December-March	April-May
164	Solanaceae	<i>Nicotiana plumbaginifolia</i> Viv.	Herb	March-July	August-November
165	Solanaceae	<i>Physalis minima</i> L.	Herb	July-August	September-October
166	Solanaceae	<i>Solanum nigrum</i> L.	Herb	Whole Year	Whole Year
167	Solanaceae	<i>Solanum viarum</i> Dunal	Shrub	Whole Year	Whole Year
168	Tamaricaceae	<i>Tamarix dioica</i> Roxb. ex Roth.	Shrub	February-April	May-August
169	Tiliaceae	<i>Grewia optiva</i> J.R. Drumm.	Tree	Whole Year	Whole Year
170	Tiliaceae	<i>Triumfetta rhomboidea</i> Jacq.	Herb	May-July	October-December
171	Urticaceae	<i>Boehmeria playtyphnylla</i> D. Don	Herb	August-November	December-January
172	Urticaceae	<i>Urtica ardens</i> Link	Herb	August-September	October-November
173	Urticaceae	<i>Urtica dioica</i> L.	Herb	September-December	January-March
174	Verbenaceae	<i>Lantana camara</i> L.	Shrub	Whole Year	Whole Year
175	Violaceae	<i>Viola canescens</i> Wallich ex Roxb.	Herb	February-April	August-November
176	Zygophyllaceae	<i>Tribulus terrestris</i> L.	Herb	June-August	October-December

3 species each. Apiaceae, Balsaminaceae, Caesalpiniaceae, Chenopodiaceae, Commelinaceae, Convolvulaceae, Dioscoreaceae, Hydrocharitaceae, Mimosaceae, Nyctaginaceae, Papaveraaceae and Tiliaceae each had 2 species. The remaining 29 families were monotypic showing the presence of only one species each in the study area.

The largest genus recorded was *Ageratum* consisting of 4 species, whereas the second largest genus with 3 species each were *Cyperus*, *Euphorbia*, *Sida*, *Crotalaria* and *Ranunculus*. The genera consisting of 2 species each were *Bidens*, *Gnaphalium*, *Sonchus*, *Impatiens*, *Chenopodium*, *Ipomoea*, *Dioscorea*, *Ajuga*, *Leucas*, *Argemone*, *Abrus*, *Desmodium*, *Lathyrus*, *Medicago*, *Stelaria*, *Persicaria*, *Mazus*, *Lindenbergia*, *Solanum* and *Urtica*. All other genera were monospecific. The habit and periods of flowering and fruiting of macrophytes appear in **Table 1**. There was variation in these periods for different species.

The reservoir ecosystem is a highly integrated ecologically complex system where the role of macrophytes is important in maintaining the ecological balance. During the present investigation the macrophytes growing along the banks of the reservoir were studied. Since the reservoir is newly created, free-floating macrophytes are absent. Aquatic macrophytes play a pivotal role in the primary productivity of a river ecosystem. Bilgrami and Dutta Munshi (1979) observed that biomass was directly related to productivity. They also observed that biomass was maximum at the centre where primary productivity was greater and it was maximum where productivity was lower. The sampling of macrophytes was year round to record macrophytes of all seasons. Comparatively, fewer macrophytes appeared in July and August with thinner growth; most appeared in December and January (**Table 1**).

The successful growth and distribution of the important macrophyte species which are distributed regularly throughout the year may be attributed to a number of interacting physico-chemical characters of water and sediments. The effect of seasonality and plant diversity on the productivity

of some freshwater macrophytes has been established by DeBusk *et al.* (1981). They described that productivity of some macrophytes increased with more plant diversity and during the months showing maximum litter. Fitzsimons and Vallejos (1986) recorded the growth of water hyacinth, *Eichhornia crassipes* in middle Parana River, Argentina. In a stream field experiment, McKie *et al.* (2009) showed that pollutants and other environmental perturbations and species richness affected the development of aquatic macrophytes in lakes; more the environmental perturbations and species richness, more is the growth and productivity of aquatic macrophytes. The litter decomposition in a stream increased with the increase in functional leaf traits and biodiversity (Schindler and Gessner 2009). Lakes and reservoirs show high decomposition of organic matter and release of carbon dioxide and methane into the atmosphere causing regulation of carbon cycling and climate of ecosystems (Tranvik *et al.* 2009).

The present reservoir is a newly formed one; therefore, biomass accumulation is still in the initial stage. After accumulation and degradation of biomass in coming decades, macrophytes, particularly submerged, rooted and free-floating ones, may start to grow on it.

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