

CHLOROPHYLL AND PROTEIN CONTENTS OF *UTRICULARIA* L.

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Abstract

Chlorophyll and protein contents of three species of an aquatic plant, *Utricularia* L., in Rajshahi, Bangladesh have been estimated from July, 1999 to June, 2000. The highest content of chlorophyll a and b of *U. aurea*, *U. stellaris* and *U. gibba* were recorded in the month of August, and the highest content of protein was found in September. Whereas, minimum chlorophyll a and b, and protein were recorded in the months of April and May. The resultant data showed that these species of *Utricularia* have different amount of protein and chlorophyll content, although they grow in the same aquatic environment.

Introduction

Species of the genus *Utricularia* L. are carnivorous plants belonging to the Family Lentibulariaceae. According to Basak (1975) and Rahman (2005), there are 214 species of *Utricularia* distributed world-wide, and they are commonly known as bladderwort. The bladders occur on the leaves and stems. Khan and Halim (1987) mentioned that four species of aquatic *Utricularia* are present in Bangladesh but according to Rahman (2005) the total number of species of *Utricularia* in Bangladesh is 8 but no information is available on the chlorophyll and protein contents of aquatic *Utricularia*. So, the present study was undertaken to determine the chlorophyll and protein contents of aquatic *Utricularia* in and around Rajshahi, Bangladesh.

Materials and Methods

Monthly experiment was carried out from July, 1999 to June, 2001. *Utricularia aurea*, *U. stellaris* and *U. gibba* were used for the present study. Plant samples were collected from different natural water bodies of Rajshahi district.

Chlorophyll: Randomly selected 1g fresh foliar parts of each *Utricularia* species were harvested in triplicate from the habitat; and chlorophyll was extracted with 80% aqueous acetone by grinding the samples using a mortar and pestle. The decanted suspension was centrifuged for 3 minutes at 13200 rpm. After centrifugation, the upper clear green solution was decanted from the colorless residue and then made up to 10 ml with 80% acetone. The optical density of this solution was determined against 80% acetone as blank using a spectrophotometer at wavelengths of 645 and 663 nm. The chlorophyll a and b (chl. a, chl. b) were determined according to Mackinney (1941). The results were expressed as mg/g fresh weight of leaf.

Protein: For this purpose after collection of fresh *Utricularia* plant biomass, the old and new parts were separated and dried in room temperature. The dried biomass was then powdered separately by grinding the tissues using mortar and pestle. More than 90 and 20% bladders of old and new parts, respectively of *Utricularia* contain trapped zooplankton. So, the protein contents were studied separately by using old and new parts. After grinding the tissues the powder was sieved by using a silk bolting cloth (mesh size 0.76 mm). One gram sieved fine powder was taken to determine the protein content by the micro-Kjeldahl method according to Jayaraman (1981). The results are expressed as mg/g dry weight.

Results and Discussion

Chlorophyll contents of three *Utricularia* species are presented in Table 1 and protein contents in Table 2.

During the period of study the content of chl. a of *U. aurea*, *U. stellaris* and *U. gibba* was found to vary from 1.15 - 1.27, 1.16 - 1.30 and 1.06 - 1.19 mg/g fresh weight, respectively. Highest content of chl. a of all species of *Utricularia* was recorded in the month of August, whereas, the minimum was recorded in the months of April and May.

Chl. b content of *U. aurea*, *U. stellaris* and *U. gibba* was found to vary from 1.56 - 1.89, 1.59 - 1.93 and 1.49 - 1.73 mg/g fresh weight, respectively. Highest chl. b content of all the species of *Utricularia* was also recorded in August but the lowest were in April and May. Both chlorophyll a and b fluctuated during the investigation period.

Table 1. Chlorophyll a and b contents of three species of *Utricularia* during the study period.

Species	Chl. (mg/g f.w.)	1999						2000					
		July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
<i>U. aurea</i>	Chl. a	1.23	1.27	1.26	1.24	1.22	1.20	1.19	1.17	1.16	1.15	1.15	1.18
	Chl. b	1.76	1.89	1.84	1.79	1.73	1.68	1.64	1.61	1.58	1.56	1.56	1.65
<i>U. stellaris</i>	Chl. a	1.27	1.30	1.28	1.25	1.23	1.21	1.20	1.19	1.17	1.16	1.16	1.23
	Chl. b	1.80	1.93	1.89	1.82	1.77	1.73	1.68	1.64	1.61	1.59	1.59	1.69
<i>U. gibba</i>	Chl. a	1.15	1.19	1.18	1.16	1.13	1.12	1.10	1.08	1.07	1.06	1.06	1.09
	Chl. b	1.65	1.73	1.68	1.64	1.61	1.59	1.56	1.53	1.51	1.49	1.49	1.56

During the period of study it was found that the chl. b content was always higher than that of chl. a in all the species of *Utricularia*. Similar pattern was also recorded by Arber (1972) in *Hydrilla verticillata*.

The protein content of growing parts of *U. aurea*, *U. stellaris* and *U. gibba* varied from 3.16 - 3.49, 2.78 - 3.13 and 1.51 - 1.84 mg/g d.w., respectively during the period of study. The highest content of protein of growing part of all species of *Utricularia* was recorded in the month of September, whereas the lowest protein content were recorded in the months of April and May. The fluctuations in the concentration of protein was almost regular.

The protein content of old part of *U. aurea*, *U. stellaris* and *U. gibba* was found to vary from 3.47 - 3.81, 2.94 - 3.29 and 1.51 - 1.84 mg/g d.w., respectively. The highest protein content of old part of all the three species of *Utricularia* was recorded in the months of September, while the minimum was in April and May.

During the period of study the protein content of old part of *Utricularia* was always found to be higher than that of the growing parts except in *U. gibba* (Table 2). Chowdhury *et al.* (2001) and DeWit (1964) mentioned that a bladder can capture preys only once, and it turns black in about three days following the digestion of captured individuals in it. The used bladder is persistent. The old part of all species of *Utricularia* contain more number of used bladders with digested and undigested preys; whereas growing part contains less number of used bladders. The difference of protein content of old and growing parts of *Utricularia* thus may depend on the protein contents of preys. The protein content of old and new parts of *U. gibba* was same, may be due to the number of bladder of this species is less than those of two other species.

Table 2. Protein content of *Utricularia* spp. during the study period.

Species (d.w.)	Protein (mg/g)	1999						2000					
		July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
<i>U. aurea</i>	New part	3.36	3.42	3.49	3.41	3.45	3.38	3.31	3.26	3.20	3.16	3.16	3.25
	Old part	3.67	3.75	3.81	3.77	3.66	3.69	3.61	3.58	3.52	3.47	3.47	3.55
<i>U. stellaris</i>	New part	2.96	3.07	3.13	3.09	3.02	2.95	2.89	2.85	2.81	2.78	2.78	2.88
	Old part	3.15	3.23	3.29	3.21	3.12	3.15	3.09	3.03	2.97	2.94	2.94	3.06
<i>U. gibba</i>	New part	1.69	1.77	1.84	1.78	1.71	1.66	1.68	1.60	1.55	1.51	1.51	1.62
	Old part	1.69	1.77	1.84	1.78	1.71	1.66	1.68	1.60	1.55	1.51	1.51	1.62

The present study indicates that three species of *Utricularia* contain different amount of protein and chlorophyll although they grow in the same aquatic environment, but their highest and lowest values were recorded in the same month.

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