



Research Article

Ecology of Aquatic Plant *Myriophyllum spicatum* L. New record to Kurdistan, Erbil, Iraq

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Abstract: This work deals with the study of aquatic plant Eurasian watermilfoil, *Myriophyllum spicatum* L. new record to Kurdistan, It is submersed aquatic weed that can easily become excessive in growth and maybe a completely choked small shallow pond. The ecological habitats, distribution, growth characteristic, species description, taxonomical status, economically important and other information, including their control in the aquatic ecosystem, are given in the text. In Kurdistan this plant found in several small and shallow ponds, at the edge of the Greater Zab River behind Kapran village near Gwer sub-district, this area is free from ecological and biological studies. Ecologically the waters are natural, hard, alkaline, rich in nutrients and Cl^{-1} ions. And contain a certain amount of heavy metal such as (Mg^{+2} , Zn^{+2} , Cu^{+2} , Fe^{+2} , Cr^{+2} , Cd) but lead (Pb) was not detected.

Keyword: Ecological factors, heavy metals, *Myriophyllum spicatum* L., Gwer, Erbil.

1. Introduction

The growth of Eurasian watermilfoil requires completely aquatic environment to support their stems, leaves that grows underwater in shallow lakes, pond and may be at the edge of slow running streams and rivers (Aiken, 1975). *Myriophyllum spicatum* watermilfoil is a genus of about 69 species of freshwater aquatic plant, cosmopolitan in distribution the center of diversity is Australia (37 endemic species). Its name comes from Latin "Mario" meaning too many to count and phylum meaning leaf (Ceska, 1985). *Myriophyllum spicatum* is a species native to Europe, Asia, and North Africa. It is growing well in standing or slow moving water (Nichols, 1999). *Myriophyllum spicatum*, was likely first found in North America in 1990, the Eurasian plant can quickly speed as an aquatic nuisance species, it creates dense mats of vegetation that shade out other native aquatic plants, making a good habitats and food resources for fish and birds while decreases dissolved oxygen concentration in the water when the plant decays (Ceska and Ceska, 1985).

In Iraq, the genus *Myriophyllum spicatum* L. and *Myriophyllum verticillatum* are reported by (AL-Saadi and Al-Mayah, 1983) as an aquatic plant in Iraqi found

in the southern part of Iraq, also described by Al-Mayah and Al-Hemeim (1991).

Environmental pollution is a worldwide problem, heavy metals belonging to most important pollutants. The progress of industry with human population increases have led to increased emission of pollutants into ecosystems, Greater Zab River in the south part of Erbil received an influents discharge from heavily populated settlements with increasing man-made ponds through sand collection for building purposes of seven heavy metals Zinc (Zn), Manganese (Mn), Iron (Fe), Copper (Cu), Chromium (Cr), Cadmium (Cd), Lead (Pb).

The aim of this study is to define this aquatic plant in Kurdistan giving their description of ecological habitats, economically important, with their reproductive system. And to determine certain heavy metal in this plant as an indicator of such aquatic ecosystem and determine potentially hazardous levels of heavy metal concentration that adversely affect human health.

2. Materials and methods

Air and Water temperature were measured *in situ* using a precision glass mercury thermometer (0-50°C)

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graduated up to 0.1°C intervals; the measurement was taken after the temperature was established for few minutes. Some of the physical and chemical water properties were determined as described by APHA (1998) and Srivastava (2010). Hydrogen ion concentration (pH) was determined by pH meter; EC determined by EC meter; DO, total alkalinity, total acidity, total hardness, total dissolved solids, Cl^{-1} , Ca^{+2} and K^{+1} were determined by titration methods.

The digestion of *Myriophyllum spicatum* was determined by adding 10ml of H_2SO_4 and 10ml of H_2O_2 to 0.3g of dry sample, then putting on the heat until becoming colorless. Then after the concentration was measured by atomic absorption spectrometer (APHA, 1998). Heavy metal determination has done at the University of Sulaimani Research Center.

2.1 Area Description

The ponds that found the genus *Myriophyllum spicatum* L. is located at the south-west Erbil city and north-west Gwer district, between, 36° 10', 45" E to 36° 03', 29" E and longitude 43° 56', 11" N to 43° 30', 29" N by using portable global positioning satellite (GPS) German type. These ponds are thought to be originated from mechanical sand washing position before may be going back to 50 years ago, that far from the river by about 200-300m distance at an altitude of 392 m.a.s.l.

2.2 Habitats

The genus *Myriophyllum spicatum* L. usually living in shallow ponds, lakes and stream, river, and in

other water bodies that have experienced disturbances such as nutrient are loading intense plant management (Nichols, 1994). In Kurdistan *Myriophyllum spicatum* L. found inside of small and shallow ponds at the beginning of spring 2012 behind the Kapran village near Greater Zab-river edge (Figs. 1 and 2).

2.3 Description of the genus

It is a perennial dicotyledonous herb Eurasian watermilfoil has a slender stem up to 3m long; The submerged leaves 15–35mm long born in whorls of (3-6) pinnate leaves, with the numerous leaflet thread, feather-like 4-13mm long, plants are monoecious with flowers produced in the central axis of the leaf–midrib with 14-24 filiform segment at each side male above female. On a spike 5-20cm long held vertically above the water surface. These plants have 12-21 pairs of the leaflet. Leaves are olive-green; flowers are purple to reddish color that found above the water on spike. Submerged, rooted, perennial, herb consisting of 4-6mm long underwater stems that branch and produce many-whorled, The *Myriophyllum spicatum* L. by the overall shape of the leaf and then by the number of leaflets–leaves which are divided into thread-like a leaflet in pair more than 14 (Nichols, 1975) leaflet are uniformly tapered so that the leaf shape is more like an equilateral triangle with curved base. Leaflet stand at an acute angle of less than 45 degrees to the reaches and are parallel to each other (Ceska and Ceska, 1980).

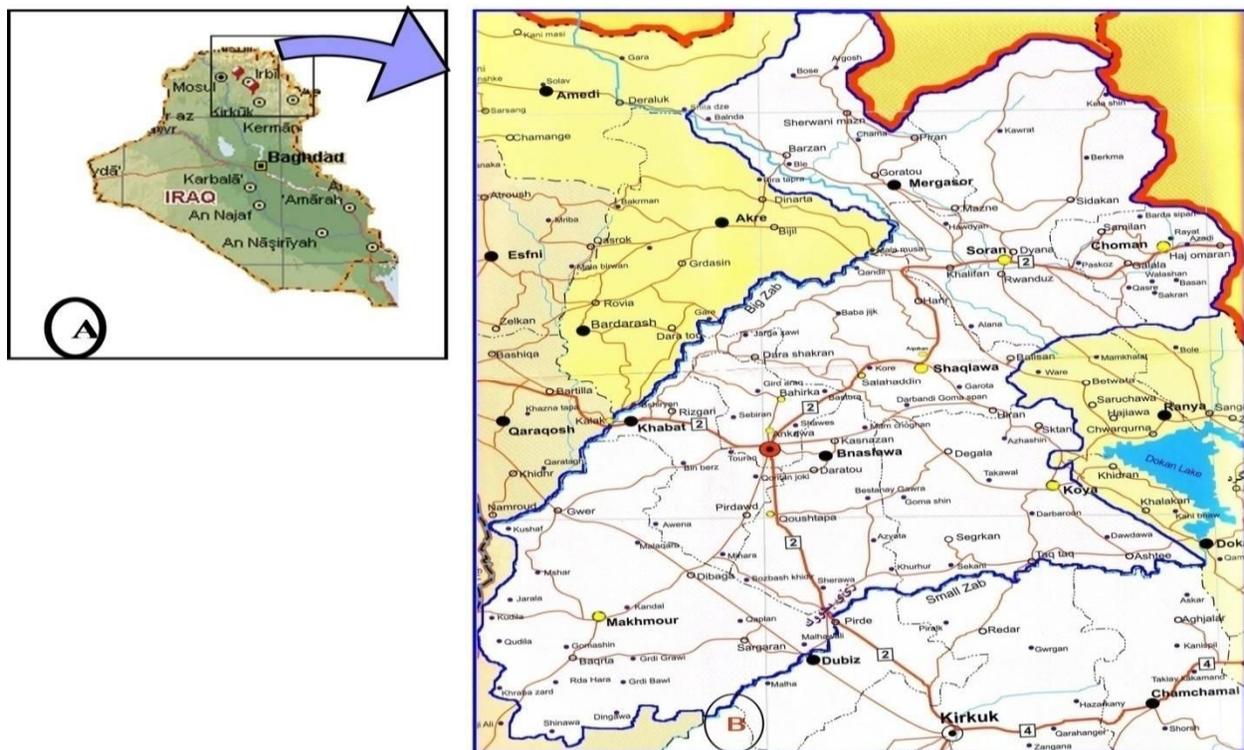


Fig. (1a). Map of Iraq showing studied area; Fig. (1b): Map of studied area in Gwer district, Erbil.



Fig. (2). Kapran pond of plant habitats.

Taxonomical classification

Kingdom: Plantae (Plants)

Subkingdom: Tracheobionta (Vascular plants)

Superdivision: Spermatophyta (Seed plants)

Division: Magnoliophyta (Flowering plants)

Class: Magnoliopsida (Dicotyledons)

Subclass: Rosidae

Order: Haloragales

Family: Haloragaceae (Watermilfoil family)

Genus: *Myriophyllum* L. (Watermilfoil)

Species: *Myriophyllum spicatum* L.
(Eurasian watermilfoil)

Synonyms: *Myriophyllum spicatum* L. var. *muricatum* Maxim.

Common name: Eurasian watermilfoil (spike watermilfoil).

2.4 Economical and biological important

Eurasian watermilfoil is example of submerged aquatic weeds: provide dissolved oxygen to other aquatic organisms, shelter for fishes and aquatic birds, (general feeders for aquatic vertebrates and host for specific organisms and these plant can degrade the diverse habitat structure required for survival of fish and wildlife eggs and offsprings. While the disadvantages of this species, are rapidly spreading and encroachment in areas of shallow water and wetland) that is become difficult to reclaim and restore.

This phenomenon of invasive or nuisance vegetation will alter the structure of aquatic ecosystem and result in ecosystem degradation changes in water quality and changes in habitat for fish and wildlife population with other biological and ecological water characteristic (AERF, 2005; Nichols, 1994; Smith and Barko, 1990). This genus produces ellagic, gallic and pro gallic acids and (+) catechin allelopathy polyphenols inhibiting the growth of *Microcystis aeruginosa* decreasing aquatic productivity (Nakai et al., 2000) and toxicity because theirs algal-produced

toxicant microcystin which is harmful to human and animal health (Barsanti and Gualtieri, 1995).

The control of Eurasian watermilfoil carries out by 2,4-D herbicide which is type of water pollutant or and by fungus *Mycoleptodiscus* which is terrestriis (Aiken, 1979).

3. Results and Discussion

In Kurdistan, less attention was paid to identification and problem of aquatic plant (Al-Saadi and Al-Mayah, 1983). While in the world more efforts have done in this field of science. The genus Eurasian watermilfoil (*Myriophyllum spicatum* L.) for the first time found in Erbil, Gwer district in saline ponds rich in chlorides ion. In this study, more attention was paid to general plant characteristics (Aiken and Nichols, 1975; Ceska and Ceska, 1980), economical importance, advantage, and disadvantage, their control [chemically by herbicide 2,4-Dichlorophenoxyacetic acid and biologically by fungus *Mycoleptodiscus terrestris* (Aiken, 1979)] as mentioned in the text.

Table (1). Physicochemical water properties of two ponds of *Myriophyllum spicatum* L. in Gwer sub-district.

Parameters	Time in months			
	Jan	Feb	March	Mean
Air temperature (°C)	0.19	2.15	21.0	18.40
Water temperature (°C)	7.19	5.15	20.2	18.46
pH	77.8	38.7	7.82	7.69
EC $\mu\text{s.cm}^{-1}$	975	892	966.0	944
TDS mg.l^{-1}	1.602	8.511	565.2	559.7
Turbidity NTU	5.1	7.3	6.2	6.2
T. Alkalinity mg.l^{-1}	270.7	6370.	252.2	297.8
T. Acidity mg.l^{-1}	25.1	116.	12.4	17.87
T. hardness mg.l^{-1}	204.6	202.2	230.2	212.3
Ca ⁺² mg.l^{-1}	89.4	79.2	80.4	83
NO ₃ mg.l^{-1}	2.5	2.1	2.7	2.43
Cl ⁻¹ mg.l^{-1}	132	132	154.3	139.4
Do mg.l^{-1}	1.6	5.6	5.5	

Physical and chemical water characteristic are presented in Table (1). The results revealed that the

water was clean, non-turbid (6.2 NTU). pH indicated the natural toward alkaline condition (7.69 units). Both total dissolved solids DO and EC values are high; the water is alkaline, hard, rich in Calcium and Potassium and nutrients rich in chloride (Cl^{-1}) which is 139.4. Cl^{-1} indicating salty water conditions which is the first water body found in Erbil governorate. Finally, according to DO and BOD5 the water is relatively clean, but not potable (Table 2).

Table (2). Heavy metal content in *Myriophyllum spicatum* L.

Heavy metal	Concentration ($\mu\text{g}/\text{kg}$)
Zn	302.4
Mn	412.88
Fe	7954.95
Cu	61.82
Cr	98.13
Cd	0.9
Pb	N.D

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