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SALINITY EFFECT CHLOROPHYLL SIGNIFICANTLY

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Abstract

A study was conducted to investigate the impact of salinity on the chlorophyll-a- concentration from winter 2016 to autumn 2017. The maximum salinity during summer and have positive correlation with chloride, calcium and magnesium which effect significantly on it ($P_{t\text{-test}} < 0.001$, =0.010and= 0.008 respectively). Seasonal variation in chl-a- was highest during winter and lowest during autumn, On the other hand the variance in total nitrogen (TN) and total phosphorus (TP) concentrations was highest in autumn and summer respectively. Correlation coefficient showed that chl-a-, TN and TP have positive correlation with salinity. ($Pt_{\text{-test}} = 0.002, < 0,001$ and< 0.001 respectively).

Key words: Bahr Al-Najaf, Salinity, Chlorophyll, Correlation analysis

Introduction

Environmental stresses including salinity and temperature affect nearly every aspect of the physiology and biochemistry of plants and significantly diminish the yield. At present, about 20% of the world's cultivated land and approximately half of all irrigated land are affected by salinity (Zhu, 2001). High concentrations of soluble salts occur in terrestrial environments or in aquatic environments, which may happen naturally or anthropogenically (Larcher, 1995). Salinity increase in aquatic ecosystems affects most plants and causes ionic and osmotic stresses (Owens, 2001). Several biochemical and morphological alterations as well as nutrient imbalance (Muhammed *et al*., 1987; Jampeetong and Brix, 2009).

The most important process that is affected in plants, growing under saline conditions is photosynthesis. Increase in salinity immediately reduced rates of net carbon fixation and affects photosynthetic pigments, chlorophyll and carotenoids (Stepien and Klobus, 2006). Which chlorophyll is the principal agent responsible for photosynthesis and under adverse conditions chlorophyll level is a good indicator of photosynthetic activity (XinWen *et al*., 2008). Several studies that indicated the effect of salinity on chlorophyll such as: Ali *et al.*, (2004), Hakanson and Eklund (2010), Amuthavalli and Sivasankaramoorthy (2010), Chakraborty *et al.*, (2011), Heidari (2012), AlMaarofi *et al.*, (2012) and Ayal and Karim (2017). The key question for this work is does salinity influence chlorophyll concentrations.

Bahr Al-Najaf is a depressed area, composed of a lake or marsh-like area with limited cultivated orchards beyond surrounded by vast desert or semi desert areas, located to the west and south-west of Holy Najaf city (Mohammed *et al.*, 2013) . It extends at north west-south east direction of an area about 360-750 Km^2, of coordinates longitude 43° 40 - 44^{0}C 25 E and latitude 31^{0}C) 40 - 32^{0}C 10 N and altitude elevation of about 11 m a.s.l. (Benni and Al-Tawash, 2011) (fig. 1). Recently,decline in local rainfall, lack of inflow, evaporation and low water level all combine to make the water salty significantly. Bahr Al-Najaf has been studied by ecologists (Taheer, 2015; Juda, 2016; Al-Shammary, 2017and Al-Taee, 2017).

Material and Methods

Surface water samples from Bahr Al-Najaf were collected seasonally from winter 2016- Autumn 2017 (Fig, 1). The measurement of water quality parameters was according to (Vollen Weider, 1974; Parson *et al.*, 1984 and APHA, 2003).

These parameter included Calcium (Ca), Magnesium (Mg), Chloride(Cl), Total phosphorus (TP), Total nitrogen (TN) and Chlorophyll. The exact salinity of the water

samples were measured by using Multimeter (WTW-350i). T- test analysis used to find the significant differences between season.

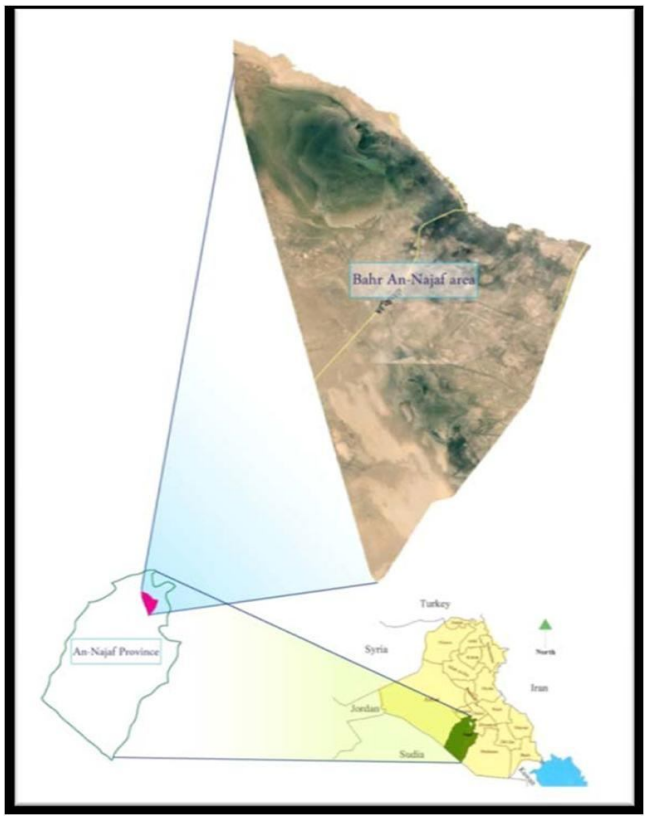

Fig. 1: The site of study in Bahr Al-Najaf.

Results and Discussion

Salinity level in the Bahr Al-Najaf has been significantly increased (fig. 2). The seasonal variation of the salinity was increased, especially during summer this may be related to evaporation, low water levels significantly almost to the level of drought, or due to the nature of Bahr Al-Najaf being closed water body, rain was the main source of its water and characterized by high concentrations of chlorides, and sulphate significantly (Al-Taee, 2017), as well as increase in the average salinity level due to the re dissolve of the accumulated salts on the surface sediment in to the system such as chloride, calcium and magnesium (Sama *et al.*, 2012) This is confirmed by the positive correlation between these ions and salinity (Coefficien: 4140, 174, 226; $P_{t\text{-}test} < 0.001$, 0.01, 0.008 respectively). Statistical analysis showed significant differences (p=0.05) between winter and spring ($P_{t\text{-}test} = 0.024$) , spring and summer ($P_{t\text{-}test} = 0.026$) as summer season affects significantly on salinity .

The photosynthetic pigments are some of the most important internal factors, which in certain cases can limit the photosynthesis rate. Seasonal variations in chl-a-concentration showed that high concentration during

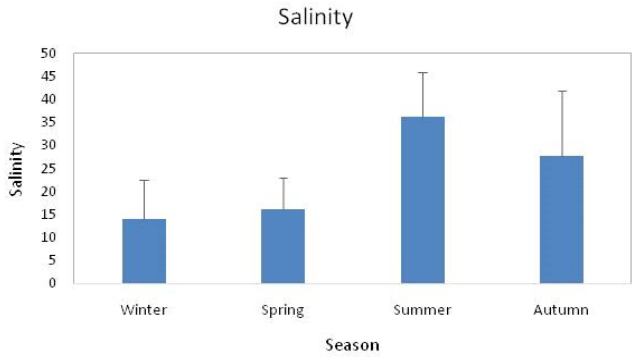

Fig. 2 : Seasonal variation for salinity in Bahr Al-Najaf

winter while low concentration during spring and autumn could probably be a result from dominance of blue green algae on other green which tolerate higher salinity and combat salinity stress by synthesizing more zeaxanthin (Chakraborty *et al.*, 2011). Statistical analysis showed significant differences (p=0.05) between winter and summer ($P_{t\text{-}test}$ =0,049), spring and summer ($P_{t\text{-}test}$ =0,009) as summer season affects significantly on chl-a- .Chl-a- concentration were positive correlated with salinity indicated that increase of salinity influence was accompanied by an increase of phytoplankton biomass (Coefficient:15,45, $P_{t\text{-}test}$: 0,002). (Castel,1995).

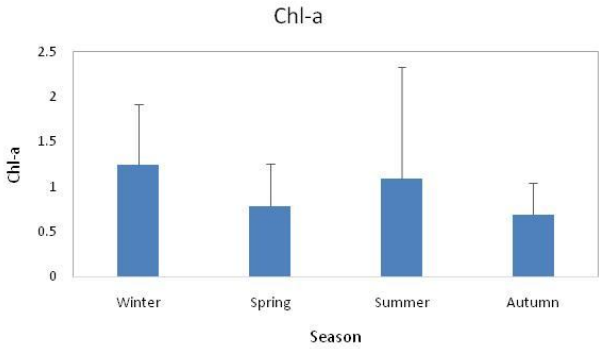

Fig. 3 : Seasonal variation for Chlorophyll in Bahr Al-Najaf

Salinity is considered to be one of the major factors responsible for N and P low availability in the environment (Debouba *et al*., 2006), due to influencing the distribution coefficient between the dissolved (bioavailable) fractions of phosphorus and nitrogen. The current results showed that high total nitrogen and total phosphor concentration during Autumn and summer respectively. (Fig. 4 and 5). Statistical analysis showed significant differences (p=0.05) for total phosphor between winter and (spring, summer) ($P_{t\text{-}test}$ =0,001, 0.008) as well as between Autumn and (spring, summer) ($P_{t\text{-}test} = 0.001$, 0.008) respectively. Total phosphor was positive correlation with salinity due to salinity stimulates phosphate release from sediments (Clavero *et al.*, 1990).

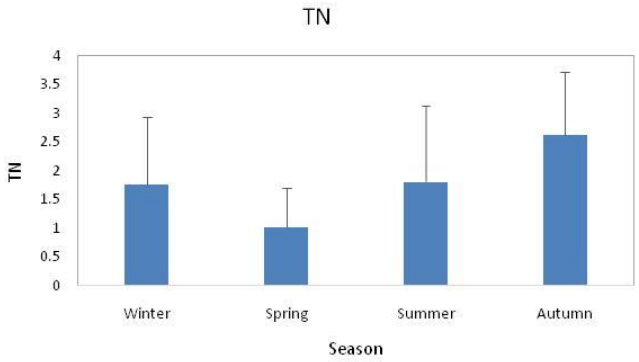

Fig. 4 : Seasonal variation for Total nitrogen in Bahr Al-Najaf

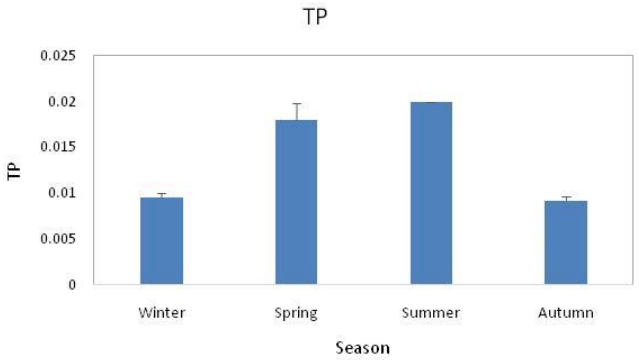

Fig. 5 : Seasonal variation for Total phosphor in Bahr Al-Najaf

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