Plant Archives Vol. 18 No. 2, 2018 pp. 1767-1770 **e-ISSN:2581-6063 (online), ISSN:0972-5210**

EFFECT OF ADDING DIFFERENT LEVELS OF FERMENTED NILE FLOWER PLANT (ORGANIC FERTILIZER) IN SOME SOIL CHEMICAL PROPERTIES, NUTRIENTS CONTENTS AND WHEAT PLANT GROWTH

Abdallah sh. Al-Gasimi[1], Ameer Kh. Yeaser[2], Mahdy W. Soheep[3], Karim M. Bhiah[2]

[1]Dhi Qar Agricultural Directorate
[2]University of Kufa - Faculty of Agriculture - Department of Soil Science and Water Resources, Iraq
[3]University of Wasit - Faculty of Agriculture - Department of Soil Sciences and Water Resources, Iraq

Abstract

This experiment was undertaken in 2017 at Dhi Qar province, Iraq. Five levels of fermented plant, Nile flower, (0, 2, 4, 6 and 8 t ha^{-1}) were applied before planting with three replications in wooden boxes (48 cm length × 28 cm width). Wheat was ormally planted for 60 days after fertilization by N, P and K. Finally the plants were cut to determine the dry weight, concentration and uptake of N, P, K and Ca by plant, and soil EC. Results reveal that the adding of different levels of fermented organic fertilizer has significantly affected in some chemical properties of soil, and its content of nutrient elements and wheat growth. Results also showed that the high N, P, K and Ca content in Nile flower, which were 1.25, 0.45, 0.78 and 1.38 % respectively. The level 4 t ha^{-1} was better in dry weight, concentration and absorption of N, P, K and Ca compared to other levels (0 , 2,6 and 8 t ha^{-1}) .

Key word: Nile flower, soil properties, nutrient elements, wheat plant.

Introduction

The Nile flower plant (*Eichhorniacrassipes*), in the family Pontederiaceae, is an aquatic plant that may rise above the surface of the water as much as 1 meter in height, increase very quickly, consumes huge amounts of water, absorbs large amounts of dissolved oxygen in the water, changes the taste of the water and makes it smell foul, thus polluting the environment and posing a real threat to the water wealth of the countries including Iraq (Tayeh *et al*. 2007; Gannon, 2014). The original habitat of this plant is the basin of the Amazon River in the continent of South America and it has spread to many countries of the world, especially in the tropical and sub-tropical regions. It is one of the weeds prevalent in the basin of Nile, especially Egypt, Kenya, Uganda, Tanzania, Benin and Sudan and is also spread in the United States of America, the island of Java and Australia, and recently arrived to Iraq, (Wikipedia 2018).

Nile flower is one of the fastest growing plants. It is a free-floating perennialaquatic plant, with broad, thick, glossy, ovate leaves. Plants also consist of root systems under water and shoot systems above the surface of water. The leaves are 10–20 cm across on a stem which is floating by means of buoyant bulb like nodules at its base above the water surface. They have long, spongy and bulbous stalks. The feathery, freely hanging roots are purple-black. An erect stalk supports a single spike of 8–15 conspicuously attractive flowers. Plant has mass of roots used to absorb water and other materials and it also makes own food by photosynthesis, (Villamagna and Murphy 2009).

Mechanical pulling out of Nile flower plant widely spread in the Iraqi rivers

Plants must have enough water to live, grow, and reproduce. Vegetative reproduction is more important, so the plant grows and spreads rapidly under favorable temperature and nutrient conditions, for this reason water lost by a plant and the environment. The period of reproduction for the plant is from April to October, (Taeh *et al.*, 2007). The recent studies in Egypt (Chai *et al.*, 2013) that the plants have been able to evaporate 3 billion cubic meters of water, which is sufficient to cultivate a large area of land. The studies indicated that it contains a high percentage of raw protein up to 13.6% and contains many different nutrients such as fiber (24.8%), potassium (0.30%), calcium (1.43%), magnesium (1.16%), iron (0.17% In addition, 1.5% fat is a very useful ingredient.

The first time that plant appeared in Iraq in the mid-eighties of the last century and was due to the entry decorative sofas taken by some nurseries located on the banks of the army channel-east of Baghdad, which flows into the river Diyala near its outlet in the Tigris River-south of Baghdad and from this channel gradually moved to the Tigris and Euphrates river and in Marshes too. The main objective of the present study were to consider the effect of adding different levels of fermented Nile flower plant as organic fertilizer in some soil chemical properties, nutrients contents and wheat plant growth.

Materials and method

Materials

Fermented organic fertilizer: The material used in this study was Fermented Plant (Nile flower) as an organic fertilizer.

Soil study

The soilsamples werecollected fromDhiQar Governorate / Al-Nasr sub district, it's taken from surface soil area, at depth of 0-30 cm, then sample was passed through a 2 mm sieve (table 1).

Value of EC and pH is determined as follows:

Soil pH and electrical conductivity (EC), was measured from a 1:1 soil to water, as described in Page *et al*. (1982).

Dissolved calcium, magnesium, sodium, potassium, carbonates and bicarbonates were estimated according to Richard (1954).

Sulfates and chlorides were estimated as reported in Page *et al*. (1982). Dissolved phosphorus was estimated according to Murphy and Riley (1962). Bulk density and soil separators was estimated according to Black (1965).

Preparation of the soil

20 kg of air dry soil with clay loam texture was placed in boxes (48 cm length × 28 cm width) with three replicates. The plant (Nile flower) was fermented for 56 days. Five levels (0, 2, 4, 6 and 8 t ha $^{-1}$) admixed with soil before planting. On 23/11/2016, wheat seeds were grown by 20 seeds / box and then thinned to 10 plants after germination. Plants were irrigated with low salinity water at EC of 0.9 dS. m-1. Nitrogen (N) fertilizer (160 kg N ha^{-1}) was added in the form of urea (46% N). The phosphorus (P_2O_5) was added at the level of 120 kg P ha^{-1}. Potassium (K_2O) was added at level of 120 kg K ha^{-1}, (Awad 1987)

After 60 days of planting at (flowering period), the plants were taken off and then dried at a temperature of 70^{0}C. Nitrogen, phosphorus, potassium, calcium (table 2), and electrical conductivity were estimated according to the methods mentioned above. Data collected were subjected to Analysis of Variance (ANOVA) and mean separations were done using LSD at 1% significant level (Steel & Torrie 1980).

Results and discussion

Effect of addition of the fermented organic fertilizer in the electrical conductivity of the study soil

Iincrease the level of the fermented plants added to the soil, led to a significant increase in the rate of electrical conductivity, where it was 7.01, 9.94, 13.12 and 20.19 dS m^{-1} for levels 2, 4, 6 and 8 t ha^{-1}, respectively in comparison to the control level (5.60 dS m^{-1}), This may be attributed to increase the level of plant fertilizer added

Table 1: Soil chemical and physical properties of the study area.

Properties	Value	Unite
pH	7.60	-
EC	5.60	dS m^{-1}
Dissolved ions		
Ca^{+2}	7.20	Mmol L^{-1}
Mg^{+2}	6.30	
Na^{+1}	28.16	
K^{+1}	0.89	
$SO4^{-2}$	10.00	
Cl^{-1}	34.00	
CO_3^{-2}	Nil	
HCO_3^{-1}	0.90	
P	2.80	mg L^{-1}
B	0.98	
ρb	1.70	Mg m^{-3}
O.M	1.02	g Kg^{-1}
Clay	260	g Kg^{-1}
Slit	450	
Sand	290	
Soil texture	Clay Loamy	

Table 2: The EC and initial concentration of nutrients in the fermented organic fertilizer.

EC(1:5) dS m^{-1}	Nitrogen %	Phosphorus %	Potassium %	Calcium %
2.3	1.25	0.45	0.78	1.38

Table 3: Effect of addition of fermented organic fertilizer on electrical conductivity (EC) of soil study.

Level of fertilization (t ha^{-1})	EC (dS m^{-1})
Zero	5.60
2	7.01
4	9.94
6	13.12
8	20.19
RLSD 0.01	1.35

Table 4: Effect of adding different levels of Nile flower plant on the amount and absorption of nitrogen in wheat plant.

Fertilizer level	Properties		
	Dry weight	Nitrogen concentration	Amount of Nitrogen absorbed
t ha^{-1}	g pot^{-1}	g kg^{-1} dry matter	mg N pot^{-1}
Zero	1.20	12.00	14.040
2	2.40	16.20	38.88
4	3.70	19.34	71.56
6	3.10	19.38	60.08
8	1.00	10.00	10.00
LSD 0.01	0.58	2.50	2.50

Table 5: Effect of adding different levels of Nile flower plant on the amount and absorption of phosphorus in wheat plant.

Fertilizer level	Properties		
	Dry weight	Phosphorus concentration	Amount of Phosphorus absorbed
t ha^{-1}	g pot^{-1}	g kg^{-1} dry matter	mg N pot^{-1}
Zero	1.20	0.69	0.83
2	2.40	2.02	4.85
4	3.70	2.25	8.33
6	3.10	2.15	6.67
8	1.00	0.61	6.61
LSD 0.01	0.58	0.85	2.25

to the soil up to 6 t ha^{-1} led to a significant increase in the release of nutrients in the soil, especially positive ions (cations) such as calcium (Ca^{2+}) and magnesium (Mg^{2+}) which combine with negative ions (anions) such as sulfate (SO_4^{2-}) and chlorides (Cl^-) and thus causing salts to raise the electrical conductivity value, which negatively affects plant growth.

Table 6: Effect of adding different levels of Nile flower plant on the amount and absorption of potassium in wheat plant.

Fertilizer level	Properties		
	Dry weight	potassium concentration	Amount of potassium absorbed
t ha^{-1}	g pot^{-1}	g kg^{-1} dry matter	mg N pot^{-1}
Zero	1.20	5.26	6.31
2	2.40	8.18	19.63
4	3.70	11.36	42.03
6	3.10	10.85	33.63
8	1.00	4.53	4.53
LSD 0.01	0.58	1.65	4.86

Table 7: Effect of adding different levels of Nile flower plant on the amount and absorption of calcium in wheat plant.

Fertilizer level	Properties		
	Dry weight	calcium concentration	Amount of calcium absorbed
t ha^{-1}	g pot^{-1}	g kg^{-1} dry matter	mg N pot^{-1}
Zero	1.20	15.80	18.96
2	2.40	23.61	56.66
4	3.70	29.60	109.52
6	3.10	27.29	84.60
8	1.00	13.28	13.28
RLSD 0.01	0.58	2.28	10. 68

Effect of addition of the fermented organic fertilizer in the amount and absorption of nitrogen in wheat plant

The results showed that increase the level of fermented organic fertilizer from (2 to 4) t ha^{-1}, led to significant increase (16.20 and 19.34) g N kg^{-1} dry matter, of nitrogen concentration in wheat plant (table 4). The table is also showed that increasing the amount of fermented organic fertilizer to 6 t ha^{-1} had no significant deference in N concentration (19.38 g kg^{-1} dry matter) in wheat plant. However, the applying of 8 t ha^{-1} of fermented organic fertilizer, had significant effect in N concentration in wheat plant, This result is in agreement with similar observations by Sullivan and Rod (2012). The level of 8 ha^{-1} achieved a significant decrease in the average of N content relative to the level of 4 ha^{-1}, which achieved a significant increase in nitrogen concentration in the plant, and this is because the increase in the level of fertilization to 8 t ha^{-1} has led to increase the value of EC (20.19 dS m^{-1}) to the limits unsuitable for plant growth (table 3), compared to the levels of 2, 4 and 6 t ha^{-1}, which led to a drop in the dry weight of that level, reaching 1.00 g pot^{-1} comparison with the level of 4 t ha^{-1} (3.70 g pot^{-1}), this may be due to the lower uptake of N.

The results of table 5, 6 and 7 indicate an increase in the concentration of dry weight with increasing levels of Fermented organic fertilizer addition, and then decrease at the addition level of 6 and 8 t ha^{-1}. This is due to the increase in additive levels followed by an increase in salinity level (table 3). The negative effect occurs because of the excessive increase of nutrients. There is also a significant increase in the levels of P, K and Cain the wheat plant as well as their concentration in the soil at the levels of fermented organic fertilizer addition (2 and 4 t ha^{-1}). This indicates that the fermented fertilizer has a good content of nutrients as it lives in the water environment, which it has an almost a neutral chemical properties, compared to the soil environment (Yasir and *et al.* 2014).

Table 5, 6 and 7 also showed a clear gradual decrease in the concentration of nutrients (P, K and Ca), this is because the increase in the level of the added fermented organic fertilizer (6 t ha^{-1}) resulted in a negative effect on plant growth, as well as the low concentration of these elements in the soil. But this case was not observed in the concentration of nitrogen absorbed in the soil and plant. The level of 6 t ha^{-1} also led to an increase in the concentration of N within the plant. So the plants looked good because of the role of N in the production of proteins, acids, vitamins, hormones and cell construction of microorganisms and carry out its activity in the soil as well as other functions. However, the concentration of N began to decrease within the plant at the added level of 8 t ha^{-1} due to the increased level of salinity (Yasir and *et al.* 2014).

References

Awad, K.M. (1987). Soil Fertilization and Fertility, Directorate of Dar Al Kutb for Printing and Publishing-Basrah University - Ministry of Higher Education and Scientific Research.

Black, C.A. (1965). Method of soil analysis. Part 1. Physical properties, Amer .Soc. Agron. Inc. Pub Madison, Wesconsin U.S.PA770.

Chai, T., J.C. Ngoi, and F.C. Wong (2013). Herbicidal potential of *Eichhorniacrassipes* leaf extract against Mimosa pigra and Vignaradiata". *International Journal of Agriculture and Biology,* **15(5)**: 835-842.

Gannon, M. (2014). Water Hyacinth – In and Out of Your Water Garden". Full Service Aquatics.

Murphy, T. and J.R. Riley (1962). A modified single solution method for the determination of phosphate in natural waters. *Anal. Chem. Acta.,* **27**: 31-36.

Page, A.L., R.H. Miller and D.R. Keeney (1982). Methods of soil analysis. Part 2. 2nd ed. ASA. Inc. Madison, Wisconsin, U.S.A.:13-250.

Pavinato, P.S, M. Alexandre and A.R. Ciro (2008). Organic compounds from plant extracts and their effect on soil phosphorus availability. *Pesq. Agropec. Bras., Brasília,* **43(10)**: 1379-1388.

Richards, L.A. (1954). Diagnosis and improvement of saline and alkali soils.Agric. Handbook No. 60. U. S. Dept. Agric. Washington, D.C.

Steel, R. and J. Torrie (1980). Principles and Procedures of Statistics. McGraw Hill, New York.

Sullivan, P. and R. Wood (2012). Water hyacinth (*Eichhorniacrassipes*) seed longevity and the implications for management. 18th Australasian Weeds Conference. Melbourne.

Tayeh, M.N., A.I. Mohamed, S.H. Ahmed and H.O. Majed (2007). Nile Flower Plant. A report published in the site of the Directorate of Agriculture of Karbala. www.agr-karbala.com

Yasir,Ameerkhaleel, Manssorabdabohana, Nuhad Sh. Mutlak (2014). Fertilizer Effect of(*Ceratophyllumdemersum* L.) , Super Tri-phosphate , Uerea and Animal Fertilizer in some growth indictor of wheat plant (*Triticumaestivum* L.). *Euphrates Journal of Agriculture Science,* ISSN: 38752072 Year: 2014 Volume: 6 Issue: 4ãáÍÞ Pages: 360-368.

Villamagna, A. and B. Murphy (2009). "Ecological and socio-economic impacts of invasive water hyacinth (*Eichhorniacrassipes*): *A review". Freshwater Biologym,* **55(2)**: 282–298.

Wikipedia (2018). https://en.wikipedia.org/wiki/Eichhornia_crassipes.