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EFFECTS OF BIOFERTILIZERS AND COMPOST APPLICATION ON LEAVES MINERAL CONTENT OF PLUM TRANSPLANTS

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Abstract

This study was conducted in a lath house, Dept. of Hort. and Landscape, College of Agricultural Engineering Sciences, Univ. Baghdad, Al-Jadriya during 2018 and 2019 growing seasons to investigate the influence of Biofertilizers and compost on leaf mineral content of one year's old trees of "Hollywood" plum cultivar. The first factor is the addition of biofertilizers (B) at four types are without addition (B_0) and the addition of *Azospirillum brasilemse* to soil (B_1), addition of *Bacillus megatherium* to soil (B_2) and the addition of *Azospirillum brasilemse* + *Bacillus megatherium* to soil (B_3). The second factor is the addition of compost, without adding (C_0) and the addition of compost prepared from palm leaves to soil (C_1) and the addition of compost prepared from the residues of wheat to soil (C_2). Treatments were replicated three times (three transplants in experimental unit) at factorial experiment in a RCBD. The results of the study were statistically analyzed and averages were compared according to the (L.S.D) at 0.05 and thus the number of transplants used was 108 transplants. The experimental results showed. The addition of biofertilizers, especially (B_3) treatment, showed significant superiority in most leaves mineral content and gave highest leaf nitrogen content of 1.530 and 1.592 %, highest leaf phosphor content of 0.438 and 0.445 %, leaf iron content of 184.1 and 198.7 ppm and highest leaf zinc content of 19.20 and 19.99 ppm for the two seasons, respectively. Addition of compost (C_2) treatment gave the highest leaf nitrogen content of 1.339 and 1.449 %, highest leaf phosphor content of 0.348 and 0.353 %, highest leaf iron content of 174.7 and 187.8 ppm and the highest leaf zinc content of 18.89 and 19.76 ppm for both seasons, respectively.

Key words: Plum, Biofertilizers, Compost.

Introduction

Plum *Prunus salicina* L. belongs to the Rosacea family and under the Prunoideae sub-family (Al-Essa and Batha, 2012). The history of the Japanese Plum tree dates back to 300 BC in China (Janick, 2005). In 2018, Estimated number of plum fruitful trees growing in Iraq, including nearly 146564 tree produces up to 4464 tons and the average production per tree about 30.46 kg (PCBS, 2018). While the acreage of plum in the world reached about 2619471 hectare, with production of 11758135 tons (FAO, 2017). The main producing countries are China then Romania, Serbia, USA and Iran (FAO, 2017). Perhaps the reason for the decline in the number of trees in Iraq is due to lack of care for trees and disease and insects, as well as the lack of horticultural treatment of trees well and fertilization with organic fertilizers and mineral fertilizers is very limited and pruning operations are not carried out properly as well as soil service and spraying against diseases and insects it is very few it rarely occurs (Alwan, 2017).

Biofertilizers are fertilizers that contain microscopic microorganisms that often increase the biological activity of the soil, the most important functions of these plants are to convert atmospheric nitrogen into forms that can be utilized by plants such as nitrates and ammonia, increase soil porosity and defend the plant against pathogens by depriving them of food sources (Ali, 2012). Several studies have been conducted to determine the role of biofertilizers in leaves mineral content of fruit trees, Torshiz *et al*., 2017, studied the effect of biofertilizer on pomegranate trees and found the biofertilizer caused significant increases in leaf NPK content compared with control treatment. Also Al-Hadethi, 2019 found the added *Azospirillum brasilense* + *Bacillus megatherium* gave the highest leaves NPK content when his studied on hawthorn transplants.

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Compost is one of the organic fertilizers that provide the plant with its nutrient needs without any negative impact on the environment, in addition to improving the physical, chemical and biological properties of the soil and can be used at high rates without leading to damage to the roots of the plant, which may occur when fertilization with mineral fertilizers in large quantities, as the addition of organic fertilizers to the soil increases the amount of organic matter and the activity and preparation of microorganisms in it as well as working to add nutrients to the soil, which leads to an increase in leaves mineral content (Hao *et al*., 2009, Baldi and Toselli, 2013). Some studies have been conducted on the effect of compost addition on the leaves mineral content of fruit trees, Al-Rawi *et al.,* (2016) found that the addition of four levels of compost prepared from palm fronds led to an increase in leaves nitrogen and potassium content of fig transplants. Due to the lack of studies on the role of organic and biofertilizers in the leaves mineral content of fruit transplants the present study aims to know the effect of the addition of biofertilizers and compost on leaves mineral content in plum transplants.

Materials and Methods

This study was conducted in a lath house, Dept. Of Hort. and Landscape, College of Agricultural Engineering Sciences, Univ. Baghdad, Al-Jadriya during 2018 and 2019 growing seasons to investigate the influence of Biofertilizers and compost on leaf mineral content of one year's old trees of "Hollywood" plum cultivar. The first factor is the addition of biofertilizers (B) at four types are without addition (B_0) and the addition of *Azospirillum brasilemse* to soil (B_1), addition of *Bacillus megatherium* to soil (B_2) and the addition of *Azospirillum brasilemse* + *Bacillus megatherium* to soil (B_3). The second factor is the addition of compost, without adding (C_0) and the addition of compost prepared from palm leaves to soil (C_1) and the addition of compost prepared from the residues of wheat to soil (C_2). Treatments were replicated three times (three transplants in experimental unit) at factorial experiment in a RCBD. The results of the study were statistically analyzed and averages were compared according to the (L.S.D) at 0.05 according to Elsahookie and Wuhaib, (1990) and thus the number of transplants used was 108 transplants. Leaves samples were collected for chemical analysis at the 3rd week of June. Each sample consisted of 10 leaves.transplants^{-1}. Leaves were washed with water, rinsed with distilled water and then dried at 70 cp until a constant weight, ground and digested according (Chapman and Pratt, 1978). The following leaf mineral content was determined in the two successive seasons:

1. Nitrogen was estimated by micro-kjeldahl method of (A.O.A.C, 1980).
2. Phosphorus was estimate the chromatic by using spectrophotometer by (Estefan *et al.*, 2013).
3. Potassium was determined using atomic absorption spectrophotometer "Perkin Elmer 1100B" after samples digested according to Estefan *et al*., (2013).
4. Magnesium estimated by the Flame photometer according to the method proposed by (Haynes, 1980).
5. Iron and Zinc were determined as ppm using atomic absorption according to Carter, (1993).

Table 1: Effect of biofertilizers and compost application on leaves N, P and K content of "Hollywood" plum transplants.

Season	2018				2019			
Biofertilizers (B)	Compost (C)				Compost (C)			
	C_0	C_1	C_2	mean	C_0	C_1	C_2	mean
N (%)								
B_0	1.202	1.230	1.236	1.223	1.246	1.270	1.316	1.277
B_1	1.236	1.274	1.295	1.263	1.390	1.477	1.522	1.463
B_2	1.243	1.257	1.269	1.256	1.260	1.313	1.332	1.302
B_3	1.501	1.536	1.554	1.530	1.524	1.625	1.627	1.592
mean	1.296	1.324	1.339		1.356	1.421	1.449	
L.S.D	B	C	Inter		B	C	Inter	
5%	0.030	0.026	0.052		0.042	0.036	0.072	
P (%)								
B_0	0.229	0.240	0.267	0.245	0.236	0.244	0.274	0.251
B_1	0.264	0.282	0.303	0.283	0.268	0.283	0.307	0.286
B_2	0.301	0.353	0.369	0.341	0.311	0.349	0.373	0.344
B_3	0.425	0.436	0.452	0.438	0.436	0.440	0.458	0.445
mean	0.305	0.328	0.348		0.313	0.329	0.353	
L.S.D	B	C	Inter		B	C	Inter	
5%	0.014	0.012	0.024		0.017	0.015	0.030	
K (%)								
B_0	1.527	1.535	1.569	1.544	1.623	1.653	1.667	1.648
B_1	1.663	1.666	1.691	1.673	1.738	1.773	1.809	1.773
B_2	1.594	1.601	1.622	1.606	1.688	1.742	1.773	1.720
B_3	1.773	1.817	1.928	1.839	1.845	1.918	2.034	1.932
mean	1.639	1.655	1.703		1.724	1.772	1.821	
L.S.D	B	C	Inter		B	C	Inter	
5%	0.046	0.040	0.079		0.043	0.037	0.074	

Table 2: Effect of biofertilizers and compost application on leaf Mg, Fe, Zn content of "Hollywood" plum transplants.

Season	2018				2019			
Biofertilizers (B)	Compost (C)				Compost (C)			
	C_0	C_1	C_2	mean	C_0	C_1	C_2	mean
N (%)								
B_0	0.225	0.251	0.233	0.236	0.227	0.249	0.236	0.237
B_1	0.241	0.233	0.232	0.235	0.241	0.234	0.230	0.235
B_2	0.249	0.245	0.220	0.238	0.249	0.248	0.223	0.240
B_3	0.234	0.238	0.235	0.236	0.238	0.239	0.232	0.236
mean	0.237	0.242	0.230		0.239	0.243	0.231	
L.S.D	B	C	Inter		B	C	Inter	
5%	N.S	N.S	N.S		N.S	N.S	N.S	
Fe (ppm)								
B_0	154.7	159.1	164.5	159.4	164.2	168.1	173.5	168.6
B_1	165.7	170.8	177.4	171.3	176.2	181.1	189.0	182.1
B_2	159.1	162.8	166.7	162.9	170.1	168.4	178.8	172.4
B_3	177.5	184.4	190.4	184.1	190.0	196.6	209.6	198.7
mean	164.3	169.3	174.7		175.1	178.6	187.8	
L.S.D	B	C	Inter		B	C	Inter	
5%	4.873	4.220	8.440		5.904	5.113	10.23	
Zn (ppm)								
B_0	17.93	18.12	18.31	18.12	18.11	18.28	18.78	18.39
B_1	18.46	18.72	18.96	18.71	18.75	19.29	19.90	19.31
B_2	18.22	18.40	18.52	18.38	18.49	18.64	19.24	18.85
B_3	18.62	19.21	19.78	19.20	19.31	19.71	20.95	19.99
mean	18.31	18.62	18.89		18.67	19.03	19.76	
L.S.D	B	C	Inter		B	C	Inter	
5%	0.22	0.19	0.38		0.36	0.31	0.62	

Results and Discussion

Effect of biofertilizers and compost application on leaves N, P, K content of plum transplants

Data concerning the effect of treatments on nitrogen, phosphor and potassium during 2018 and 2019 seasons are listed in table 1. The data cleared that, biofertilizer (B_3) treatment gave the highest leaf nitrogen content of 1.530 and 1.592%, highest leaf phosphor content of 0.438 and 0.445% and highest leaf potassium content of 1.839 and 1.932% for both seasons, respectively. Table 1 also shows that compost application especially compost prepared from the residues of wheat to soil (C_2) gave the highest leaf nitrogen content of 1.339 and 1.449%, highest leaf phosphor content of 0.348 and 0.353% and the highest leaf potassium content of 1.703 and 1.821% for both seasons, respectively. The interaction between biofertilizers and compost significantly affected all studied leaves content.

Effect of biofertilizers and compost application on leaf Mg, Fe, Zn content of plum transplants: Data concerning the effect of treatments on leaves magnesium, iron and zinc content during two seasons are listed in table 2. The data cleared that, biofertilizer (B_3) treatment gave the highest leaf iron content of 184.1 and 198.7 ppm and highest leaf zinc content of 19.20 and 19.99 ppm for both seasons, respectively. Table 1 also shows that compost application especially (C_2) treatment gave the highest leaf iron content of 174.7 and 187.8 ppm and the highest leaf zinc content of 18.89 and 19.76 ppm for both seasons, respectively. Whereas, the experiment treatments did not affect the leaf magnesium content for the two study years. Seen from the results shown in the table 2 the interaction between biofertilizers and compost are affected significantly on leaf iron and zinc content. The reason for these results is attributed to the addition of biofertilizers to the soil, which led to an increase in elements concentration in the soil solution and then an increase in their readiness, thus increasing the amount absorbed by the roots of trees and increasing their transmission and thus increasing the concentration of these elements in the leaves (Mosa *et al*., 2018) these results are in harmony with those reported by Al-Hadethi, (2015) on apricot trees, (Al-Hadethi, 2019) on hawthorn trees. The increase in leaf mineral content due to the addition of compost is attributed to its role in increasing the proportion of organic matter in the soil, then improving soil composition and increasing the amount of available elements of the plant that absorb and increase its concentration in it, as Wang and Wang, (2016) indicated the addition of composts to orchards cultivated with peaches led to an increase in the organic content and elements in the soil, thus increasing the content of the elements in the leaves. These results agree with Mansour, (2018) on the pomegranate trees.

References

AOAC (1980). Official Methods of Analysis. 13th ed. Association of Official Analytical Chemists. Washington, D.C.

Al-Essa, E. and M. Batha (2012). Production of deciduous fruit. First edition. Damascus University Publications. Syria.

Al-Hadethi, E.A. Mustafa (2015). Effect of Different Fertilization sources and the growth regulator (Brassinosteroids) on growth and yield of Apricot trees. Ph.D. Dissertation, Coll.

of Agric., Univ. of Baghdad. 153.

Al-Hadethi, E.A. Mustafa (2019). Response of hawthorn transplants to biofertilizers and poultry manure. *Iraqi Journal of Agricultural Sciences*., **50(2):** 734-740.

Ali, N.S. (2012). Fertilizer Technology and Uses. Ministry of Higher Education and Research. Univ. Baghdad. 202.

Al-Rawi, W.A.A, N.A, Jasim and M.E.A, Al-Hadethi (2016). Effect of date palm leaves compost (DPLC) and licorice roots extract spray on vegetative growth of "Aswad Diyala" fig trees. *Journal of Agricultural and Veterinary Sciences, Qassim University*., **9(1):**95-105.

Alwan, J.M. (2017). Deciduous fruit technology. Propagation - cultivation - care and production (Part II). Al Wadah Publishing House. Amman. The Hashemite Kingdom of Jordan.

Baldi, E. and M. Toselli (2013). Root growth and survivorship in cow manure and compost amended soils. *Plant Soil Environ*., **29(5):** 221-226.

Carter, M.R. (1993). Soil sampling and Methods of Analysis, Canada Soc., Soil Sci. Lewis, London, Tokyo. 204.

Central Organization for Statistics and Information Technology (PCBS). The Ministry of Planning and Development Cooperation. Report production of summer fruit trees for the year 2018. Baghdad. Iraq.

Chapman, H.D. and P.E. Pratt (1978). Methods of analysis for soils, plants and waters. Univ. of Calif., *Div. Agric. Sci., Priced Pub*., **4034:** 150.

Elsahookie, M.M. and K.M. Wuhaib (1990). Design and Analysis of experiments. Univ. Of Bag. Dar al hekma. 488.

Estefan, G., R. Sommer and J. Ryan (2013). Methods of soil, plants and water analysis, ICARDA, International for Agriculture Research in the dry areas, third edition. www.icarda.org.

FAO (2017). FAO STAT Agricultural statistics database. http: D D www. Fao. Org.

Hao, X.H., S.L. Liu, J.S. Wu, R.G. Hu, C.L. Tong and Y.Y. Su (2008). Effect of long-term application of inorganic fertilizer and organic amendments on soil organic matter and microbial biomass in three subtropical paddy soils. *Nutr. Cycling in Agroeco System*., **81(1):** 17-24.

Haynes, R.J. (1980). A comparison of two modified Kjedhal digestion techniques for multi elements plant analysis with conventional wet and dry ashing Methods. *Commune in. soil sci. Plant Analysis*., **11(5):** 459-467.

Janick, J. (2005). The origin of fruits, Fruit growing and fruit breeding. *Plant breeding. Rev*., **25:** 255-230.

Mansour, N.A.I. (2018). Promising impacts of humic acid and some organic fertilizers on yield, fruit quality and leaf mineral content of Wonderful pomegranate (*Punica granatum* L.) trees. *Egypt. J. Hort*., **45(1):** 105-119.

Mosa, W.F.A., L.S. Paszt, M. Frąc, P. Trzciñski, W. Treder and K. Klamkowski (2018). The role of biofertilizers in improving vegetative growth, yield and fruit quality of apple. *Hort. Sci. (Prague),*. **45(4):** 173-180.

Torshiz, A.O., S.H. Goldansaz, B. Motesharezadeh, M.A. Asgari and A. Zarei (2017). Effect of organic and biological fertilizers on pomegranate trees: yield, cracking, sun burning and infestation to pomegranate fruit moth Ectomyelois ceratoniae (Lepidoptera: Pyralidae). *J. Crop Prot.,* **6(3):** 327-340.

Wang, Y. and P. Wang (2016). Effect of organic compost mulching on orchard soil property. *Chemical Engineering Transactions*., **55:** 379-384.