Effect of Fertilization Sources on Leaf Area and Leaves Mineral Content in Apricot Trees

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Abstract

This study was conducted in private apricot orchard in Sabaá Al- Bour township- Baghdad during 2013 and 2014 growing seasons to investigate the influence of different fertilizer sources,(Mineral, Bio) on the growth of 7 years old apricot trees (Zanjelli cultivar). five of fertilizer sources (B): with out application (B_1), application of 15 $g.tree^{-1}$ of Phosphorene biofertilizer (B_2), application of 15 $g.tree^{-1}$ of Nitrobeine biofertilizer (B_3), application of 15 $g.tree^{-1}$ from each of (Phosphorene + Nitrobeine) (B_4) and application of NPK fertilizers as recommended for apricot trees (B_5). Each treatment replicated three times with a factorial experiment using RCBD. The experimental results showed that the fertilizers application especially B_5 and B_4 increased significantly the leaf area, concentrations of nitrogen, phosphorus, potassium, iron, zinc and manganese in leaves. It can be concluded that in spite of the superiority of NPK fertilizer, biofertilizer can improve leaves mineral content in apricot trees.

Key Word: Fertilization, Leet, Area, Mineral and Apricot

تأثير مصادر التسميد في مساحة الورقة ومحتوى الأوراق من العناصر لأشجار المشمش

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الخلاصة

أجريت هذه التجربة في بستان مشمش خاص في مدينة سبع البور في بغداد للموسمين 2013 و 2014 وعلى صنف المشمش زنجيلي (طارق) بعمر سبع سنوات لمعرفة تأثير مصادر الأسمدة المختلفة (معدني وحيوي) . تمت إضافة الأسمدة و بخمسة مصادر هي بدون إضافة (B_1) وإضافة نوعين من السماد الحيوي Phosphorene (B_2) و Nitrobeine (B_3) بإضافة 15 غم.شجرة$^{-1}$ لكل منهما و إضافة السمادين الحيويين خلطاً بإضافة 15 غم.شجرة$^{-1}$ لكل منهما (B_4) و اضافة السماد الكيميائي (B_5) . كانت التجربة عاملية و وزعت المعاملات وفق تصميم القطاعات الكاملة المعشاة وبثلاثة مكررات وبشجرة واحدة للوحدة التجريبية الواحدة. أظهرت نتائج الدراسة أن إضافة الأسمدة لاسيما اضافة السماد الكيميائي(النتروجين، الفوسفور، البوتاسيوم) (بموجب التوصيات السمادية للمشمش) (معاملة B_5) و إضافة السمادين الحيويين خلطاً بإضافة 15 غم.شجرة$^{-1}$ لكل منهما (معاملة B_4) تفوقاً معنوياً في مساحة الورقة و تراكيز عناصر (النتروجين، الفسفور، البوتاسيوم، الحديد، الزنك و المنغنيز) في الأوراق . يمكن الاستنتاج بأن التسميد الحيوي يمكن ان يكون له دور في تحسين محتوى أوراق اشجار المشمش من العناصر على الرغم من تفوق التسميد الكيميائي.

الكلمات المفتاحية: التسميد، مساحة الورقة، عناصر و المشمس

Part of Ph.D. Dissertation for the First Author.

Introduction

Apricot (*Prunus armeniaca* L.) classified under the *prunus* species of *prunoidae* sub –family of the Rosaceae family of the *Rosales* group. Is an important fruit crop believed to have originated in China (Janick, 2005), (Choudhary & Mehta, 2010). The world annual production of apricot exceeded 3956640 ton. Turkey is ranked 1st in world production of apricot, while Iran is ranked 2nd and Uzbekistan the third (FAO STAT, 2014). The total number of apricot trees planted in Iraq was estimated to be 917501trees and the average yield of tree was 28.6 kg (Annual Abstract STAT, 2009). Apricot because it is regard plays an important role in human nutrition a good source of carbohydrate , protein and vitamins especially A and C , and can be used as a fresh, dried or processed fruit such as frozen apricot, jam, jelly, marmalade, pulp, juice, nectar, extrusion products etc. Moreover, apricot kernels are used in the production of oils, cosmetics, active carbon and aroma perfume (Yildiz, 1994), (Bal, 2005). Bio-fertilization for fruit crops has become in the last few years a positive alternative to chemical fertilizers. Application of biofertilizers as supplementary amendments to fruit crops reduce pollution happened concerning both soil and underground water. Biofertilizers are microbial preparation containing primarily of sufficient numbers of potent strains of microorganisms and furnishing a beneficial rhizoshere for plant growth. Moreover, biofertilizers have a significant effect of deferent strain groups such as nitrogen fixers (Abou El-kashab, 2002 and Abou Taleb, *et al* ., 2004) and nutrient mobilizing microorganisms which help in the availability of metals and their forms in the composted materials and level of extractable nutrient elements (El-karamany, *et al*. ,2000). Bio-application improves plant growth, fruit yield and chemical composition through the exertion of plant promoting substances mainly IAA, gibberellic acid and cytokinin like substances, vitamins and amino acid Content (Abd El-mouty, 2001).

Many previous studies revealed that biofertilizers enhanced nutritional status and improved the yield and quality of different fruit crops , (Fawzi, *et al* ., 2010) mentioned that the treatment of Le Conte pear trees with biofertilizers (Phosphorene and Nitrobeine) showed higher concentration of leaf N , Zn and Fe and vegetative growth (shoot length and leaf area) .(Dutt, *et al*.,2013) mentioned that the treatment of apricot trees with biofertilizers showed higher leaf area , higher concentration of (P, Fe, Zn and Mn) , also (Al-hadethi , *et al*.,2014) found that Lozi apricot trees were treated with biofertilizer (Nitrobeine) led in improving leaf area and leaf content of NPK. The aim of this study is to test the effect of biofertilizers on apricot trees growth wing the folloing parameters:Leaf area:Leaf carbohydrates and leaf chernical com position.

Materials and Methods

This study was conducted in private apricot orchard in Saba'a Al- Bour city in Baghdad during 2013 and 2014 growing seasons to investigate the influence of fertilizer on 7 years old trees of "Zanjelli" apricot cultivar. Trees were healthy, similar in vigor and subjected to the same horticultural practices adapted in the region. The five types of fertilizers (B); without application (B_1), application 15 gm. tree^{-1} of biofertilizer (Phosphorene) (B_2), application 15 gm.tree^{-1} of biofertilizer (Nitrobeine) (B_3), application 15 gm.tree^{-1} of both (Phosphorene + Nitrobeine) (B_4) and application on compound fertilizer NPK with recommended quantity in apricot trees (B_5). Each treatment replicated three times with a randomized complete block design (RCBD). The number of trees used was 15 trees.

The obtained results were subjected to analysis of variance according to (Elsahookie & Wuhaib, 1990) using L.S.D for comparing differences between various treatment means. The following parameters were determined in the two successive seasons

1- Leaf area (cm^2): Ten leaves from the middle position of the shoot were randomly taken for measuring leaf area (cm^2). By leaf area meter (Model Cl-202, USA made).
2- Leaf carbohydrates content: was determined according to (Smith, *et al* ., 1986).
3- Leaf chemical composition: Leaf samples were collected for chemical analysis at the 1st week of June of both seasons. Each sample consisted of 20 leaves / tree. Leaves were washed several times with tap water, rinsed with distilled water, and then dried at 70 °C until a constant weight, grounded and digested according to Chapman & Pratt (1978). Nitrogen was estimated by semi-micro kieldahl according to Plummer method (1974). Phosphorus was determined by the method outlined by (Jackson, 1973). Potassium was determined using atomic absorption spectrophotometer "Perkin Elmer 1100B" after samples digested according to Chapman & Pratt method (1978). Fe, Zn and Mn – spectrophotometerically determined using atomic absorption as described by Jackson, (1973).

Results and Discussion

Leaf Area

It is clear from the data in Table.1 that NPK application significantly increased leaf area compared to the control treatment. The results showed that application of NPK fertilizers more effective compared with other treatments. Higher and lower of these characteristics in "Zanjelli" apricot trees were obtained from B_5 treatment, 31.95 and 30.11 cm^2 and B_1 (control), 24.64 and 26.35 for both seasons respectively. Increased leaf area may be attributed to good mineral nutrition major elements that lead to increased cell division and breadth, which lead to expansion of leaves and increase the strength of growth in the tree, thereby increasing the leaf area (Al-ishaqi, 2007).

Leaf Carbohydrate

The results of Table 1 showed also that the addition of bio-fertilizer treatment 15 $gm.tree^{-1}$ of both (Phosphorene + Nitrobeine) (B_4) may have affected significantly in the leaves carbohydrate content as given 8,205 and 9,843 % for both seasons respectively .This results may be due to role of biofertilizer in the improvement in soil physical and biological properties and also, the chemical properties resulting in more release of available nutrient elements to be absorbed by plant root and its effect on the physiological process such as the photosynthesis activity as well as the utilization of carbohydrates (Soliman, 2001). This result is consistent with the results of Masoud(2012).

Leaf Nitrogen and Phosphor Content

Results in Table 1 showed that the leaf N content was significantly affected by different treatments during both seasons. Treatment of chemical fertilization has given a higher leaves nitrogen content reached to 1.919 and 1.722 % for both seasons respectively, while the control treatment gave lowest

Table (1) Effect of Biofertilizers on Leaf Area, and Leaf Carbohydrates and NP Content of "Zanjelli" Apricot Trees During 2013 and 2014 Seasons.

Treatments	Leaf Area (cm^2)		Leaf Carbohydrate (%)		Leaf N Content (%)		Leaf P Content (%)	
	2013	2014	2013	2014	2013	2014	2013	2014
B_1	24.64	26.35	7.669	7.684	1.514	1.286	0.303	0.294
B_2	25.85	27.37	8.010	8.045	1.527	1.291	0.353	0.346
B_3	27.17	27.93	7.332	8.488	1.649	1.401	0.392	0.392
B_4	29.11	29.79	8.205	9.843	1.658	1.606	0.428	0.445
B_5	31.95	30.11	7.696	9.814	1.919	1.722	0.483	0.487
L.S.D. 0.05	2.22	1.06	0.416	0.940	0.108	0.066	0.068	0.073

rates for this trait, the results of the same table (Table 1) showed that the same treatment gave the highest leaves phosphor content of 0,483 and 0,487 % for both seasons respectively.

Leaf Content of Potassium, Iron, Zinc and Manganese of Apricot Trees as Affected by Biofertilizers and NPK

Data represented in Table (2) illustrated that the highest K, Fe and Zn content recorded with NPK fertilizer while for the biofertilizer (Treatment, B_4) recorded the highest values of Mn in leaves. The lowest values of leaves K, Fe, Zn and Mn content were observed with control treatment. This attributed the cause of increases of nitrogen, phosphorus and potassium in leaves that the fertilizer NPK compound fertilizers has led to increase tree growth by increasing the strength of the chlorophyll content and increase the leaf area of the tree, which led to increase absorption of these elements to meet the needs of the leaves. The reason was also attributable to the addition of compound fertilizer has led to increase concentrations of these elements in the soil, leading to increase readiness and absorption and increase the concentration of these elements in the leaves (Cherel , 2004 and Veberic, *et al.*, 2005). These results are in agreement with those reported by (Al-ishaqi, 2007; Milosevic, *et al.*, 2013) and Shah, *et al*., (2014) .

It can be concluded that in spite of the superiority of NPK fertilizer, biofertilizer can improve leaves mineral content in apricot trees.

Table (2) Effect of Biofertilizers on Leaf K, Fe, Zn and Mn Content of "Zanjelli" Apricot Trees during 2013 and 2014 Seasons.

Treatments	Leaf K Content (%)		Leaf Fe Content (mg.kg^{-1})		Leaf Zn Content (mg.kg^{-1})		Leaf Mn Content (%)	
	2013	2014	2013	2014	2013	2014	2013	2014
B_1	1.915	1.668	165.2	169.0	19.20	19.79	1.850	1.967
B_2	2.115	1.742	170.6	171.1	19.53	20.25	1.924	2.077
B_3	2.271	1.795	181.1	173.5	20.00	21.34	1.970	2.183
B_4	2.417	1.837	187.2	177.1	21.60	23.37	2.296	2.345
B_5	2.547	2.243	204.1	183.9	23.26	24.85	2.083	2.167
L.S.D. 0.05	0.117	0.109	9.37	4.04	0.71	0.60	0.075	0.096

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