International Journal of Environmental Sciences
ISSN: 2229-7359
Vol. 11 No. 3, 2025
https://www.theaspd.com/ijes.php

Effect Of Organic Fertilizer And Phosphate Rock On The Dry Weight Of The Vegetative And Root System And Leaf Content Of Npk In Three Citrus Origins

Nermen Asad Abdulazeea

Northern Technical University / College of Health and Medical Technologies / Kirkuk / Iraq.
nermen.asad@ntu.edu.iq

Abstract

The experiment was conducted inside a wooden canopy in a private nursery in Kirkuk Governorate Iraq, to determine the effect of organic fertilizer (wheat waste factory) and phosphate fertilizer using rock phosphate fertilizer and superphosphate fertilizer and their interactions on five month old seedlings of three citrus rootstocks (Narainj and Sunicle Stromello and Volcameriana). The study used a randomized complete block design (R.C.B.D.) with three replications. The least significant difference (LSD) was used to compare the means at a probability level of 0.05. The traits were taken 3 and 5 months after the fertilizer combinations. The results indicated that the Sonicel Stromelo Origin outperformed the Naring Origin in the dry weight traits of vegetative and root system mass and the leaf NPK content traits in 3-5 months . Fertilizer combinations (10g organic fertilizer + 2g phosphate rock) significantly affected the other fertilizers combinations used for all the studied traits. As for the interaction between origins and fertilizer combinations used, the interaction between organic fertilizer (10g organic fertilizer + 2 g phosphate rock) and Sonicel Stromelo significantly affected the dry weight of vegetative and root system, and leaf NPK content.

Keywords: *citrus origins, mineral elements,organic fertilizer, phosphate rock*

INTRODUCTION

Citrus fruits belong to the family (Rutaceae), the fruits of which are (berry) fruits called (Hesperidium). The family includes many genera, the most economically important of which is the genus (Citrus), and sources indicate that the original habitat of citrus fruits is in warm regions, including subtropical regions. The original habitat of citrus fruits is the warm regions, which include subtropical regions, and from these regions, citrus spread to other world regions Citrus spread to other regions of the world between 40° north and south of the equator 40 . Citrus fruits have specific nutritional requirements from the soil to ensure optimal growth and production (29). Essential oils commonly used from citrus fruits in aromatherapy(12). The health and quality of the crop depends on the availability of essential nutrients in the soil at the appropriate concentration , providing nutrients in a balanced manner, especially phosphorus, is one of the most important problems in the agricultural process due to the high cost of fertilizer, environmental pollution resulting from the use of large quantities of phosphate fertilizers and problems with phosphorus retention in the soil despite the addition high levels of fertilizer, so ground nutrition is one of the most important issues, The nutritional elements of crops are one of the most important foundations of agricultural production and preserving plant life. Treating these problems has become necessary, requiring either reducing fertilizer levels and adding them in multiple batches or using alternatives such as natural rocks, including raw phosphate rock, the raw material inmanufacturing phosphate fertilizers (28). Phosphorus added to the soil undergoes a series of chemical and physical reactions that affect splant availability . These reactions are influenced by soil type, pH, moisture, adsorption reactions, precipitation reactions and other environmental factors(33), The degree of soil reaction plays an important role in phosphorus readiness, as the degree of soil reaction (or pH) plays a vital role in the readiness of phosphorus (i.e. its availability to plants), The chemical reaction between phosphorus and the compounds present in

the soil is greatly affected by the level of acidity or alkalinity in the soil, as its availability decreases with increasing degree of reaction, as is the case in Iraqi soils, as Iraqi soils suffer from a deficiency in the amount of phosphorus ready for absorption, as Iraqi soils have a essential degree of reaction due to the increase in the percentage of carbonate calcium(4), which causes the fixation of ions phosphate on the surfaces of carbonate calcium, and organic matter in the soil is organic components resulting from the decomposition of living materials such as plants, animals and microorganisms that were present in the soil. Organic matter plays an important role in improving soil properties and supporting plant growth (2), as it is considered an important source of many nutrients and contributes to improving the structure of the soil and its water retention and supplying plants and microorganisms with a several nutrients necessary for their growth and gas exchange and raising the cation exchange capacity of positive ions (CEC) (Cation Exchange Capacity) and reducing soil pH, thus increasing the availability of phosphorus for plants (11), (9) (18).Due to the mutual physiological relationship between the origins and the scion, the mutual physiological relationship between the origins and the scion is a complex relationship that significantly affects the growth of the tree, its productivity and the quality of the fruits in citrus cultivation. The " origin " is linked to the scion (the upper part of the tree that produces the fruits) in the grafting process .This relationship can improve or reduce the performance of the tree according to the type of origin and scion chosen, as the origin affects the growth, productivity and quality of the scion fruits and its resistance to diseases, with differences in the absorption of nutrients by the citrus origin used, as they vary among themselves in the absorption of nutrients and their distribution within the plant (26) and (21). Preparing the origin correctly and in a good and rapid growth condition is one of the most important requirements for its successful use as an origin, as it plays an important role in the success of grafting on it. It is necessary to use means that help in this, including the use of organic fertilizers and the use of sources of phosphorus from its natural sources (phosphate rock) and its industrial sources (super phosphate fertilizer) and the effect of these factors combined on the response of the origin under study (31)(8). Therefore, the study aimed to know the response of 5-month-old citrus seedlings, bitter orange and sunkal stromelo, to combinations of organic fertilizer (made from wheat waste) and phosphate fertilizer using phosphate rock and super phosphate fertilizer and their interactions.

MATERIALS AND METHODS

The experiment was conducted inside the woody canopy in a private nursery in Kirkuk Governorate Iraq for the 2024 growing season .To study three citrus origins propagated by seeds, 5 months old ,planted in 5 kg plastic anvils with mixed sandy soil and combinations fertilizer , phosphate fertilizer ,super phosphate fertilizer and phosphate rock was obtained from phosphate rock mines in Akashat area in Anbar Governorate, and dried in the oven at °110C for 24 hrs and then milled and passed through a sieve with a hole diameter of 2.5mm, and was analyzes for some of its chemical properties. Table(1) shows some of the chemical properties of the phosphate rock and organic fertilizer used in the study, which were analyzed in a private laboratory.

`

Table (1): Chemical properties of the phosphate rock and organic fertilizer.

organic fertilizer				
N %	P %	K %	EC $ds.m^{-1}$	M.O $g.kg^{1-}$
3.6	0.83	9.4	1.66	162.1
phosphate rock				
Ph 1:1	EC $ds.m^{-1}$	P^{+} $g.kg^{1-}$	K^{+} $g.kg^{1-}$	
6.4	5.8	101.24	729	
So^{++} %	Ca^{++} %	Na^{++} %	Mg^{++} %	

2.45	293.6	311	282

A randomized complete block design (RCBD) was used (13), and the results were evaluated using analysis of variance (ANOVA), with means compared using the least significant difference (LSD) test at a probability level of 0.05.

STUDIED FACTORS:

First_ Three citrus origins (Naring and sonicle stromelo and Volcameriana). The symbol is (N and S and V)

Second_ combinations fertilizer (organic + phosphate) Their concentrations were as follows:

1- The control symbol is T0

2- Fertilization with 0.500 g super phosphate symbol is T1

3- Fertilization with 2g phosphate rock symbol is T2

4- Fertilization with 10 g organic fertilizer symbol is T3

5- Fertilization with (10g organic fertilizer + 0. 500 g super phosphate) symbol is T4

6- Fertilization with (10g organic fertilizer + 2g phosphate rock) symbol is T5

The number of treatments was 18 with three replicates, so the number of experimental units was 54, with 3 seedlings per treatment in each replicate. The number of seedlings used in the experiment was 162 s seedlings . The quantities of phosphate fertilizer were calculated based on achieving the same amount of added phosphorus, i.e. (60 kg phosphorus/hectare).

STUDIED TRAITS:

The studied characteristics were recorded on two dates, the first after 3 months and the second after 5 months from the start of the experiment:

1-The dry weight of the vegetative and root system on two dates. The weight is stable after drying the vegetative and root system in an electric oven at a temperature of 60°C (25).

2-Estimation of NPK percentage in leaf on two dates , The nitrogen percentage was estimated using a (micro-kejldant) device based on (22). The phosphorus percentage was estimated using a spectrophotometer with a wavelength of (700 nm) according to the method mentioned .The potassium percentage was estimated using a flame spectrophotometer (Flame-photometer)according to the method mentioned by (23).

RESULTS

1-Dry weight of the vegetative system (g):

The results in Table 2 indicated that the cultivars differed significantly in the average dry weight of the vegetative group, as the seedlings of the Sonicle Stromelo cultivar were superior and gave the highest average of 36.28 and 56.76 g after 5 and 8 months, respectively, while the lowest average was for the Naring cultivar, which reached 29.74 and 37.64 g after 5 and 8 months, respectively .It is observed from the same table that phosphate fertilization had a significant effect on the average dry weight of the total vegetative mass of the citrus cultivars under study as the seedlings of the fertilizer treatment (organic manure + phosphate rock) gave the highest average dry weight of the total vegetative mass after 5 -months and also after 8 months with 35.75 and 52.48 g after 5 months. 75 and 52.48 g after 5 and 8 months, respectively. At the same time the lowest rate of 33.48 and 39.63 g after 5 and 8 months, respectively, was given by non-fertilized seedlings (without organic fertilizer and without phosphate rock).The results of the same table indicate the superiority of the interference seedlings (organic fertilizer + phosphate rock) with Sonicel Stromelo after 5 and 8 months, as it gave the highest average dry weight of the total vegetative matter of 40.56 and 66.08 g, respectively. 56 and 66.08 g, respectively, while the interference seedlings (Naring with no organic fertilizer + no phosphate rock) gave the lowest rate of dry weight of 29.35 and 27.11 g after 5 and 8 months, respectively.

Table(2): The effect of citrus Origins and organic fertilizer and phosphate fertilizer and their interference on the dry weight of the vegetative system of seedlings (g).

Fertilizer combinations	Citrus Origins			Fertilizer Effect Rate
	N	V	S	
Dry weight of total vegetative matter after 3months				
T0	29.35	33.48	34.86	**33.48**
T1	31.85	34.38	37.56	**34.38**
T2	23.98	34.25	31.28	**34.25**
T3	26.06	35.71	33.36	**35.71**
T4	33.35	35.81	40.09	**35.81**
T5	33.85	35.75	40.56	**35.75**
Origins Effect Rate	29.74	34.89	36.28	
LSD(0.05)	Fertilizer Combination=0.970 interference =1.677 Origins =0.683			
Dry weight of total vegetative matter after 5months				
T0	27.11	45.58	46.21	**39.63**
T1	38.75	43.68	58.65	**47.02**
T2	38.11	46.75	57.41	**47.42**
T3	34.85	43.45	55.15	**44.48**
T4	42.45	43.65	57.08	**47.72**
T5	44.61	46.75	66.08	**52.48**
Origins Effect Rate	37.64	44.97	56.76	
LSD(0.05)	Fertilizer Combination=2.565 interference =4.438 Origins =1.811			

*T0=Control / T1= 0.500 g super phosphate /T2=2g phosphate rock / T3=10 g organic fertilizer /T4=(10g organic fertilizer + 0. 500 g super phosphate)/ T5=(10g organic fertilizer + 2g phosphate rock).** N=Naring /S=Sonicle Stromelo V= Volcameriana

2- Dry weight of root system (g):

The results in Table (3) indicated that the seedlings significantly differed from each other in the root system's dry weight rate The excelled seedlings origin S and gave the highest rate reached (24.76- 32.44) g after 3-5 months, respectively, while the lowest rate was for seedlings origin N, which reached(14.05-19.15) g after 3 and 5 months, respectively.

It is noted from the same table that phosphate fertilizer had a significant effect on the dry weight rate of the root system of citrus origins, as the seedlings of the outperformed treatment T5 to give the highest rate of dry weight the root system after 3 months and after 5 months, reached (22.03-30.66) g after 3 and 5 months respectively, followed by treatment T1, which did not differ significantly with treatment T4 in the first growth period 3 months which they reached (21.35-20.25) g respectively, and in the second

growth period 5 months, treatments T4 andT3 did not differ significantly with each other which they reached (28.36-27.30) g respectively, while the lowest rate reached (15.36-18.57) g after 3 and 5 months respectively, which was given to the seedlings of the treatment T0.
As for the interference between the origins and fertilizer treatments, the results indicate the superiority of the interference seedlings (S&T5) after 3 and 5 months, as they gave the highest rate of the dry weight root system(28.41 - 39.7) g, respectively, while the interference seedlings (N&T0) gave the lowest rate dry weight of the root system, reached (11.61 - 14.08) g after 3 and 5 months, respectively.

Table(3): The effect of citrus Origins and organic fertilizer and phosphate fertilizer and their interference on the dry weight of the root system of seedlings (g).

Root total dry weight after 3 months

Fertilizer combinations	Citrus Origins			Fertilizer Effect Rate
	N	V	S	
T0	11.61	14.68	19.11	**15.13**
T1	16.78	18.55	25.91	**20.41**
T2	13.71	16.51	22.91	**17.71**
T3	12.21	15.61	26.11	**17.97**
T4	14.38	20.41	26.11	**20.3**
T5	15.65	24.15	28.41	**22.73**
Origins Effect Rate	14.05	18.31	24.76	
LSD(0.05)	**Fertilizer combinations=0.970 Interference=1.677 Origins=0.683**			

Root total dry weight after 5 month

T0	14.08	22.55	23.05	**19.89**
T1	20.78	26.91	33.81	**27.16**
T2	19.71	23.31	30.51	**24.51**
T3	18.31	22.71	31.27	**24.09**
T4	20.41	32.21	36.31	**29.64**
T5	21.61	36.81	39.7	**32.70**
Origins Effect Rate	19.15	27.41	32.44	
LSD(0.05)	**Fertilizer Combination=1.579 Interference=2.737 Origins=1.118**			

*T0=Control / T1= 0.500 g super phosphate /T2=2g phosphate rock / T3=10 g organic fertilizer /T4=(10g organic fertilizer + 0. 500 g super phosphate)/ T5=(10g organic fertilizer + 2g phosphate rock).**
N=Naring /S=Sonicle Stromelo V= Volcameriana

3- Nitrogen content of leaf (%):

The results in Table (4) indicated that the seedlings were significantly different from each other in the rate of Nitrogen in the leaf. The excelled seedlings origin S and gave the highest rate reached (1.22 - 1.38) %

after 3-5 months, respectively, while the lowest rate was for seedlings origin N, which reached (0.91 - 1.06) % after 3 and 5 months, respectively.
It is noted from the same table that phosphate fertilizer had a significant effect on the citrus origins, as the seedlings of the outperformed treatment T5 to give the highest rate of Nitrogen in the leaf after 3 months and after 5 months , reached(1.29 - 1.43) % after 3 - 5 months respectively, This is followed by the treatment T4 in the two growth periods of 3-5 months, which are reached(1.20,1.30)% respectively. while The lowest rate reached (0.89 - 1.02) % after 3 and 5 months, respectively, which was given to the seedlings of the treatment T0.As for the interference between the origins and fertilizer treatments, the results indicate the superiority of the interference seedlings (S&T5) after 3 and 5 months, as they gave the highest rate of Nitrogen in leaf reached (1.54 - 1.65) % respectively, while the interference seedlings (N&T3) and (N&T0) gave the lowest rate nitrogen in leaf after 3 and 5 months, Which they reached (0.84-0.93)% and (0.84-0.94) % respectively.

Table(4): The effect of citrus Origins and organic fertilizer and phosphate fertilizer and their interference on leaf nitrogen content (%).

Leaf nitrogen content (%) after 3 months

Fertilizer combinations	Citrus Origins			Fertilizer Effect Rate
	N	V	S	
T0	0. 84	0. 85	0. 94	**0.87**
T1	0. 85	1. 13	1. 35	**1.11**
T2	0. 86	1. 23	1. 26	**1.11**
T3	0. 83	0. 95	0. 92	**0.9**
T4	1. 06	1. 13	1. 33	**1.17**
T5	1. 03	1. 22	1. 54	**1.26**
Origins Effect Rate	0.75	1.08	1.22	
LSD(0.05)	**Fertilizer Combination = 0.092 interference = 0.159 Origins = 0.065**			

Leaf nitrogen content (%) after 5 months

T0	0. 90	1. 11	1. 10	**1. 04**
T1	1. 07	1. 20	1. 50	**1. 26**
T2	1. 06	1. 25	1. 40	**1. 24**
T3	0. 95	1. 00	1.03	**0. 99**
T4	1. 15	1. 29	1. 45	**1. 30**
T5	1. 20	1. 35	1. 65	**1. 40**
Origins Effect Rate	1.06	1.20	1.36	
LSD(0.05)	**Fertilizer Combination = 0.091 interference = 0.157 Origins = 0.064**			

*T0=Control / T1= 0.500 g super phosphate /T2=2g phosphate rock / T3=10 g organic fertilizer /T4=(10g organic fertilizer + 0. 500 g super phosphate)/ T5=(10g organic fertilizer + 2g phosphate rock).**
N=Naring /S=Sonicle Stromelo V= Volcameriana

4- phosphor content of leaf (%):

The results presented in Table (5) showed that the seedlings of the cultivars under study differed among themselves in their effect on leaf phosphorus content. The seedlings of the Sonicel Stromelo cultivar outperformed the seedlings of the other two cultivars to give the highest average leaf phosphorus content of 0.35 and 0.64% after 5 and 8 months, respectively, while the seedlings of Naring and Volka Mariana cultivars gave the lowest average of 0.26 each after 5 and 8 months, respectively .

The seedlings of the fertilizer combinations differed significantly, with the treatment (organic manure + phosphate rock) giving the highest average leaf phosphorus content of 0.36 and 0.69% for both growth periods of 5 and 8 months respectively, while the control treatment (organic manure + phosphate rock) gave the lowest rate of 0.26% after 5 and 8 months. The control treatment (no organic fertilizer + no phosphate fertilizer) gave the lowest rate of 0.24 and 0.55% after 5 and 8 months, respectively . The interference of the three origins with fertilizer combinations (organic fertilizer and phosphate fertilizer) significantly affected the leaf phosphorus content, as the highest leaf phosphorus content was with the seedlings of the Stromelo B (organic fertilizer + phosphate rock) interference, which reached 0. 50 and 0.79% after 5 and 8 months, respectively, while the seedlings of Naring B intercrossing treatment (no organic fertilizer + no phosphate rock) gave the lowest rate of 0.23 and 0.50% after 5 and 8 months, respectively.

Table(5): The effect of citrus Origins and organic fertilizer and phosphate fertilizer and their interference on the phosphor content of leaf (%).

Leaf phosphorus content (%) after 3 months

fertilizer combinations	Citrus Origins			fertilizer Effect Rate
	N	V	S	
T0	0.23	0.24	0.26	**0.24**
T1	0.26	0.26	0.35	**0.29**
T2	0.25	0.25	0.28	**0.26**
T3	0.26	0.25	0.27	**0.26**
T4	0.27	0.28	0.44	**0.33**
T5	0.28	0.29	0.50	**0.36**
Origins Effect Rate	0.26	0.26	0.35	
LSD(0.05)	**fertilizer Combination = 0.025 interference = 0.039 Origins = 0.017**			

Leaf phosphorus content (%) after 5 months

T0	0.50	0.55	0.6	**0.55**
T1	0.57	0.63	0.64	**0.61**
T2	0.63	0.65	0.55	**0.61**
T3	0.54	0.6	0.61	**0.58**
T4	0.61	0.64	0.65	**0.63**
T5	0.61	0.68	0.79	**0.69**
Origins Effect Rate	0.57	0.62	0.64	
LSD(0.05)	**Fertilizer Combination = 0.024 interference = 0.040 Origins = 0.018**			

*T0=Control / T1= 0.500 g super phosphate /T2=2g phosphate rock / T3=10 g organic fertilizer /T4=(10g organic fertilizer + 0. 500 g super phosphate)/ T5=(10g organic fertilizer + 2g phosphate rock).** N=Naring /S=Sonicle Stromelo V= Volcameriana

5-potassium content of leaf (%):

The results shown in Table (6) indicate that the seedlings of the cultivars differed significantly in the leaf potassium content, as the seedlings of the Sonicle Stromelo cultivar outperformed the other cultivars, giving 1.57 and 1.62% after 5 and 8 months, respectively, while the seedlings of the Naring cultivar gave the lowest rates of 1.30 and 1.40% after 5 and 8 months, respectively. It is also clear from the same table that there were significant differences in the rates of leaf potassium content under the effect of organic fertilizers. The seedlings of the fertilizer treatment (organic fertilizer + phosphate rock) gave the highest average leaf potassium content of 1.59 and 1.77% after 5 and 8 months, respectively, while The treatment (no organic fertilizer + no phosphate fertilizer) gave the lowest average of 1.29 and 1.26% after 5 and 8 .months, respectively. The overlap between parent and fertilizer treatments showed a significant effect on leaf potassium content, with seedlings of Sonicle Stromelo fertilized with (organic fertilizer + phosphate rock) giving the highest rate for both growth periods of 1.87 and 1.97% after 5 and 8 months respectively. 87 and 1.97% after 5 and 8 months, respectively, while Naring seedlings fertilized with (organic fertilizer + no phosphate rock) gave the lowest rate of 1.27% and 1.23% after 5 and 8 months, respectively.

Table(6): The effect of citrus Origins and organic fertilizer and phosphate fertilizer and their interference on the potassium content of leaf (%).

Leaf potassium content (%) after 3 months

fertilizer combinations	Citrus Origins			fertilizer Effect Rate
	N	V	S	
T0	1.27	1.27	1.33	**1.29**
T1	1.37	1.4	1.6	**1.45**
T2	1.3	1.37	1.43	**1.36**
T3	1.23	1.3	1.33	**1.28**
T4	1.4	1.43	1.87	**1.56**
T5	1.3	1.6	1.87	**1.59**
Origins Effect Rate	1.31	1.39	1.57	
LSD(0.05)	**Nominal Combination = 0.076 interference = 0.126 Origins = 0.055**			

Leaf potassium content (%) after 5 months

T0	1.23	1.23	1.33	**1.26**
T1	1.47	1.57	1.77	**1.60**
T2	1.4	1.27	1.43	**1.36**
T3	1.27	1.23	1.33	**1.27**
T4	1.5	1.6	1.93	**1.67**
T5	1.57	1.77	1.97	**1.77**

Origins Effect Rate	1.40	1.44	1.62
LSD(0.05)	**fertilizer Combination = 0.075 interference = 0.136 Origins = 0.058**		

*T0=Control / T1= 0.500 g super phosphate /T2=2g phosphate rock / T3=10 g organic fertilizer /T4=(10g organic fertilizer + 0. 500 g super phosphate)/ T5=(10g organic fertilizer + 2g phosphate rock).** N=Naring /S=Sonicle Stromelo V= Volcameriana

DISCUSSION

1- The effect of origins on the studied traits:

The results in Table (2.3.4.5.6) show that the Origin Sonicel Stromelo significantly outperformed the Origin Narinj in the indicators (dry weight of vegetative and root system) and (leaf NPK content) at 3 and 5 months from the start of the experiment. This may be due to the genetic variation between varieties resulting from the variation of genetic factors responsible for vegetative growth traits, which were positively reflected in the physiological activities required for vegetative growth and root growth. On the other hand genetic structures have proven their ability to show genetic differences between different varieties or genetic structures . However, the determinants that negatively affect the results of these indicators, including environmental, physiological and other factors, led us to move towards indicators that are more stable and less affected by environmental influences, as genetic variation between varieties is one of the main factors that affect vegetative and root growth traits. Thus it has great effects on the physiological activity of the plant and genetic variation reflects the diversity of genes that control the different traits of the plant, such as vegetative growth (e.g. leaf size, stem length, number of branches) and root growth (e.g. root size and density)(19). The reason for this difference in nutrient concentration across origins and the uniqueness of the origin Sonicle Stromelo may be due to the nature of the root system, which is characterized by a strong and dense root system.

The variation among the origins studied in t heir growth was consistent with what was found in (27) the effect of citrus origins type on the indicators of Vegetative growth of seedlings of 6 citrus origins, and with (35) When testing four origins of citrus origins in Spain in terms of their Activate it for growth. In addition to what was found (36) regarding the differences between citrus origins in the growth root system. This was attributed to the differences between citrus origins in the efficiency of their roots in nutrient uptake and its reflection on the indicators of vegetative growth. As shown in the study of(30) effect of genetic action, the values of genetic variance were greater than the values of environmental variance for all the studied traits of the bean crop of Faba Bean(*VICIA FABA L.*).

The above results can be interpreted in light of what (10) stated that the origins differ with each other according to their genetic characteristics and with what (1) mentioned that the citrus cultivars, namely Naring, Stromium and Vulcamariana differ in different growth traits when treated with organic fertilizer. also found(6) that when studying the growth of three citrus origins, the Origins differed from each other, as the Soncel Stromelo origin outperformed the Bitter Narinj origin and volkamer lemon origin in terms of the dry weight of the vegetative and root systems. The results study(17) showed that there were significant differences between the citrus origins, with the Volkamer lemon origin being superior in dry weight of vegetative system (in the first and second seasons).

2- The Effect of organic and phosphate fertilizers on the studied traits:

The study showed that the fertilizer combinations (organic and phosphate fertilizer) significantly affected the traits under study after 3 and 5 months, respectively. The reason may be due to improved growth due

to organic fertilizer of the soil, which led to an increase in the availability of phosphorus in the soil, as organic matter reduces the exposure of phosphorus to factors that help to precipitate it, and the organic matter coats the soil fines and oxides reducing their ability to stabilize phosphorus, as shown in Study (24). The results are consistent with what was found by (7)and(18), that the increase in the dry weight of the vegetative system in all organic fertilizer treatments may be attributed to its effect on the vegetative system, which encourages the increase of photosynthetic products and their accumulation in the plant, and the transfer of the excess to the roots contributes to the increase in root growth, reflected in the increase in the dry weight of the roots, This is consistent with what was reached(31) .

Many researchers have pointed out the importance of different organic matter added to the growing medium because it adds different for plant growth and improves soil properties, water retention, and porosity(34), This is reflected in the abundance of nutrients, which increases the absorption of these elements and thus optimizes vegetative growth (3). confirmed in a study on the effect of organic fertilization and phosphate fertilization on the growth of wheat plants. Organic fertilization at a rate of (20 tons. ha^{-1}) and phosphate fertilization at a concentration of 60 kg. ha^{-1} led to a significant increase in all growth indicators and gave the highest values in the leafs vegetative system's dry weight and the leaves' phosphorus content. (14) stated that studying bio-stimulants' effect on olive plants led to increased concentrations of major elements (NPK) in the leaves. The results revealed that applying biostimulants had a beneficial effect on the overall growth and development of the trees.(15) proved, when studying the effect of foliar spraying with urea on vegetative system, that it gave the highest percetage of leaf content of NPK in yucca(*ALOIFOLIA L.*) trees.

The superiority of fertilizer combinations (fertilizer organic and phosphate) may also be due to the role played by fertilizer organic in lowering the soil pH, which has a great impact on increasing the availability of nutrients in the soil. The effect of organic matter in dissolving phosphate rock was evident through the increase in phosphorus values, which may be due to the production of organic acids during their decomposition by heterotrophic microorganisms that help dissolve phosphate rock and insoluble phosphate compounds present in the soil, I agree with the results (5)and (38),the addition of organic matter leads to an increase in the number and activity of heterotrophic microorganisms, including phosphate- solubilizing microorganisms, which may lead to an increase in the attack of insoluble phosphates, This is what he confirmed(37)(26) . As (20) explained, studying the effect of organic fertilizer at high levels led to enhancing vegetative growth, and the growth parameters studied increased significantly. Organic fertilization improved the nutritional status of the leaves by increasing their nitrogen, phosphorus, and potassium content for orange trees. A study conducted by (33) showed that the results obtained for the effect of biofertilizer on Olive trees gave the highest values for all vegetative growth criteria and the leaf content of minerals (N, P, K). (32) Organic fertilizers were added to the growth medium of orange seedlings grafted onto citrus roots at a level of 2 kg. seedling-1 significantly increased seedlings' average vegetative growth indicators and gave the highest values . Also mentioned(36) is that when using foliar application of bio-health at 20 mg, L^{-1} caused significant increase in most of the studied parameters, At the same time, foliar application of Synergic fertilization at (6 ml. L^{-1}) gave the highest value of dry vegetative system weight and dry root system weight, and the interaction between the two biostimulants resulted in a significant increase in all growth traits, as well as a significant increase in all growth traits Local sour orange trees (*CITRUS AURANTIUM L.*) .

CONCLUSION

The most important conclusions obtained in this experiment are that Sonicle Stromelo's origin is more responsive to fertilizer and was significantly affected in the studied characteristics. The best fertilizer for citrus fruits and has a significant effect is the fertilizer combinations (organic fertilizer and phosphate rock) which improved the studied characteristics. The binary interactions between the origin Sonicle Stromelo and the fertilizer combinations (organic fertilizer and phosphate rock) significantly increased most studied characteristics.

References

1. Abbasi, G. B. (2014). Response of three citrus assets for bio-fertilization, organic and phosphate rock. Ph.D. thesis. Faculty of Agriculture. University of Kufa Iraq.
2. Abdulqader, Sh. M.(2024).EFFECT OF DIFFERENT TYPES OF FERTILIZERS ON THE GROWTH AND PRODUCTIVITY OF OLIVE TREES *(Olea europaea* L.) CV. ARBEQUINA. Mesopotamia .Journal of Agriculture, 52(1): 151-169.
3. Abu Al-Mekh, M.T., Easi, S.I. ,Abdul Amir, H.K.(2018). Effect of organic and phosphatic fertilization on growth and yield of wheat *Triticum aestivum* L.. Karbala University Scientific Journal,16(4): 268-276.
4. Abud, GH.B., Abdul Hussein, M.A, Hassan, A.E.(2015). Effect of phosphate Rock and Bio-Fertilizer by Bacillus subtilis on Growth of Three Citrus Rootstocks transplants. Kufa .Journal of Agricultural Sciences, 7 (1):1-21.
5. Afif, E. V., Barron and Torrent, J. (1995). Organic matter delays but does not present phosphate absorption by Cerrado Soils from Brazil. Soil. Sci., 159: 207-211.
6. AL-Abbasi, Gh.B., Abdul Hussein, M.A ., Hassan, A.E. (2015).Effect of phosphate Rock and Bio-Fertilizer by Bacillus subtilis on Growth of Three Citrus Rootstocks transplants. Kufa Journal of Agricultural Sciences. 7(1):1-21.
7. Al-Alaf, A. H. I. (2012). Effect of urea and humic acid addition on the growth of yankee dunia seedlings. Journal of Rafidain Agriculture, 40(4): 31-22.
8. AL-Bayati .H. J.(2021). Effect of Nitrogen and Organic Fertilization on Growth and Yield of Two Cabbage Varieties Brassica oleracae Var. Capitata. NTU Journal of Agricultural and Veterinary Sciences 1 (1) : 21-28.
9. Al-Hamdani, Kh. A. S., Ibrahim A. A.(2015). The effect of spraying with gibberellic acid Urea and zinc in the growth and yield of local orange trees planted in Salah El-Din Governorate. Journal Tikrit University of Agricultural Sciences, 15(3): 50-63.
10. Al-Hayani, A. M. A., Al-Samarrai, A. A. , Al-Shammari .M. F. M. (2014). Effect of inoculation with fungus Trichoderma spp. and fertilizing with Hydroxic acid and Algex sea extract in the growth of some citrus root-stocks. Diyala Journal of Agricultural Sciences, 2 (6): 96-1063.
11. Al-Imam, N.M. A., Al-Qady, R. A. (2018). The effect of media, nitrogen fertilization and foliar spray of gibberellic acid on growth and mineral status of olive transplants cv. Bashika. Mesopotamia .Journal of Agriculture,64 (4):171-186.
12. Alobidy. A. A. and Abdulsalaam. Sh. R.(2024). The effect of using some extraction techniques on the physical and chemical properties of essential oils of citrus peels. NTU Journal of Agricultural and Veterinary Sciences 4 (1) : 25-30.
13. Al-Rawi, Kh.R. , Khalafalla, A.(1980).Design and Analysis of Agricultural Experiments. House of Books for Printing and Publishing. University of Mosul.
14. Al-Saif, A. M., Ali, M. M., Ben Hifaa, A. B., Mosa, W. F. (2023). Influence of spraying some biostimulants on yield, fruit quality, oil fruit content and nutritional status of olive (Olea *europaea* L.) under salinity. Horticulturae, 9(7):2-16.
15. ALSheikh. Q.S. and Aziz. J. M.(2021). Test of Nano-Fertilizer and Different Irrigation Intervals on Growth and Yield of Maize *Zea mays L*. NTU Journal of Agricultural and Veterinary Sciences . 1 (1) :14-20.
16. AL-Taee, A.H.Y. , Alsawaf.M.D. (2019). Effect of urea foliar and organic fertilizer Humimax application on growth of (*Yucca aloifolia* L.). International Journal of Agricultural and Statistical Sciences, 15(2): 605-610.
17. AL-Taee,Z.T ., AL-Abbasi, Gh.B., AL-Sahaf, F.H.(2018). The effect of organic fertilizer and its extract and chemical fertilizer in some Vegetative and anatomical characteristics for three rootstock of citrus(Citrus spp.). Karbala Journal of Agricultural Sciences, 5(4):24-40.
18. Al-Tohafi, S. A. A., Sinai, A. J., Nashat A. Y. (2013). Effect of ground addition and spraying with organic fertiliser (Humic Aljohara) on the vegetative growth of naring seedlings (*Citrus aurantium L.*). First Scientific Conference of the Technical College. Al-Musayyib, Plant Production.
19. Athman, A.F., Khalif, M. N. H., Atallah, M. Ab. (2006). Production of evergreen and deciduous fruit .crops. Manshaat Al Maarif . Alexandria Arab Republic of Egypt.
20. Barakat, M.R. , Yehia, T.A., Sayed, B.M. (2012). Response of Newhall Naval Orange to Bio-Organic Fertilization under Newly Reclaimed Area Conditions I: Vegetative Growth and . Nutritional Status. Journal of Horticultural Science & Ornamental Plants, 4 (1): 18-25.
21. Birjely, H. M. S., Al-Atrushy, S. M. M. (2017). Effect of some organic and non-organic fertilizers on some parameters of growth and berries quality of grape cv Kamali. Kufa Journal For Agricultural Sciences, 9(3): 262–274.
22. Chapman, H.D. ,Pratt,P.F. (1961). Method of analysis for Soil, plant and of California, Division of Agricultural Sciences. USA water.University .

23. Cunningham, J. E. , Kuiack, C. (1992). Production of citric and oxalic acids and solubilization of calcium phosphate by Penicillium bilaii .Applied and Environmental Microbiology Washington 58: 1451-1458.
24. Dahiya, R. , Malik, R.S. (2002). Trash and green mulch effects on soil N and P. Part of Ph.D. thesis . CCS Haryana Agric. Univ. Hisar availability, India.
25. Dvorinic, V.(1965). Locral : practice de ambelo gratie in: Bucuresti R.S. Romania (Edsi).Didaticta sipedagica. C.F.Al-Wan. 1986 M.Sc thesis , Mosul university.
26. Fox. T. R.; N. B. , Mcfee.W. W. (1990). Kintics of Phosphorus Release from27- Spodosols: Effect of Oxalate and Formate. Soil Sci. Soc. Am. J. 54: 1441-1447.
27. Hafez, O.M.(2006). Evaluation of growth characteristics of some citrus rootstock using protein finger print technique. American-Eurasian J. Agric. and Environ. Sci., 1(3)243-248.
28. Hamad, M. Sh., Farouk, F. G.(2000). Effect of foliar fertilisation on mineral content and nodal ratio of local orange trees (Citrus sinensis). Iraqi Journal of. Agricultural Sciences 31(2): 116-127.
29. Hasan, S. A., Abdullah, R. M., Hanoon, M. B., & Sahi, M. K. (2023). GENETIC AND PATH COEFFICIENT ANALYSES OF QUALITY-RELATED TRAITS OF OAT (*AVENA SATIVA L.*) WITH POTASSIUM APPLICATION. SABRAO Journal of Breeding & Genetics, 55(5):1526-1535.
30. Hasan, S.A. ,Abdullah, R.M., Hanoon, MB. (2022). effect of foliar application with proline on growth, yield, and quality of faba bean (*vicia faba l.*) (a review) . european journal of agricultural a nd rural education (ejare), 3(3): 2660-5643.
31. Hasan, S.A., Abdullah, R.M. (2020). Estimating the performance and gene action of a number of individual genotypes and hybrids on the crop of faba bean (Vicia faba L.) . Plant Archives , 20 (2) : 8981-8988.
32. Hasan,M.M.,Al-Bakri, H.A.H. (2022).RESPONSE OF THE GROWTH OF ORANGE SEEDLINGS GRAFTED ON CITRUS ROOTSTOCK TO SPRAYING WITH ZINC AND THE ADDITION OF ORGANIC MATTER. International Journal of Agricultural and Statistical Sciences, 18(1) : 2111-2116.
33. Hassan, H.S.A., Abd-Alhamid, N., Laila F. H., Hassan.A.M. (2015). Effect of Organic and Bio-Fertilization on Vegetative Growth and Leaf Mineral Contents of Manzanillo Olive Trees. Middle East Journal of Agriculture Research , 04 (04):899-906.
34. Hess. C.E ., Fleming, G. (1965). The isolation of damping –off inhibitor from sphangnum moss.proc. Inter . Plant Prop . Soc., (14): 153-154.
35. Legua, P., Bellver, R. , Forner, J., Forner-Giner, M. A. (2011). Plant growth, yield and fruit quality of 'Lane Late' navel orange on four citrus .rootstocks. Spanish Journal of Agricultural Research, 9(1) : 271-279.
36. Rozbiany,P.M.K., Taha, Sh. M.,.(2023). RESPONSE OF LOCAL SOUR ORANGE (*CITRUS AURANTIUM* L.) SEEDLINGS TO FOLIAR APPLICATION WITH TWO TYPES OF BIO .STIMULATORS. Anbar Journal of Agricultural Sciences, 21(1): 87-94.
37. Tisdale , S.L. , Nelson, W.L. , Beaton, J. , Havlin, J. (1997).Soil fertility and fertilizers. Prentice - Hall of India, New Delhi.pp.176-229.
38. Yong, K. K.; H. Hoom, P. R., Dong, S. K., Young,K. Y., Woong; P. B. Ki ., Bhupathi, K. H. (2002). 2-Ketogluconic Acid Production and Phosphate Solubilization by Enterobacter intermedium. 17th WCSS, August 2002, Thailand, Symposium No. 6.
39. Zambrosi, F.C.B. ,Mattos Jr.D. ,Quaggio,J.A. , Cantarella, H. ., Boaretto, R.M.(2013). Phosphorus Uptake by Young Citrus Trees in Low-P Soil Depends on Rootstock Varieties and Nutrient Management. .Communications in Soil Science and Plant Analysis,44(14): 2107-2117.