Bionatura
Latin American Journal of Biotechnology and Life Sciences

Article

Effect of spraying with Jasmonic acid and chemical fertilizer Ennne on the content of Grapefruit saplings

*Mohammed Salim Dawood [1], Khalid Abdullah Saher Al Hamdani[2]**

1 University of Samarra , College of Eduction , Department of Biology
Syd7118@gmail.com .
2 Faculty of Agriculture , University of Samarra khaild_sa@tu.edu.iq.
** Correspondence: khaild_sa@tu.edu.iq.*
Available from. http://dx.doi.org/10.21931/RB/2023.08.03.132

ABSTRACT

The experiment was carried out in the Modify wooden canopy to lath houseof the College of Agriculture / University of Samarra for the growing season 1/7/2021 to 1/6/2022. The saplingswere brought from Salah El-Din Governorate, Balad District, and 54 seedlings of one and a half year old grapefruit saplings were chosen, budded onto the sour orange rootstock , in order to study the effect of spraying with Jasmonic acid (JA), and the addition of nutrient solution (Ennne) in the chemical content of grapefruit saplings, as the saplings were sprayed with three concentrations of Jasmonic acid (0, 5 and 10 mg.L^{-1}). Add three levels of Ennne High Nitrogen Nutrient Solution (0, 2.5 and 5 mL^{-1}) The spraying process was carried out on three dates, the first date is 1/7/2021, the second date is 21 days after the first date, and so on for the third date. This study was carried out according to a Randomized Complete Block Desigen (R.C.B.D) with two factors Jasmonates (JA). The nutrient solution was Ennne and with three replications, two seedlings for each experimental unit The results were analyzed using the analysis of variance table, and the factors and their interactions were tested using the program The ready-made statistician (SAS) calculated the least significant difference (LSD) at the probability level of 0.05. The results of the study are summarized as follows: Add Spraying with Jasmonic acid especially G_2 concentration of10 mg.L^{-1} led to an increase Significantly the leaves content of nitrogen, phosphorous, and carbohydrates, which amounted to 2.30%, 0.49%, 3.47%,1.56% respectively, The concentration G_1 of 5 mg.L^{-1} gave a significant increase in the potassium content of leaves, which amounted to 1.67%, while the comparison treatment gave the lowest average for the aforementioned traits. Also, spraying with the nutrient solution Ennne, especially at the level of 5 ml.L^{-1}, led to a significant increase in the leaves content of nitrogen, phosphorous, potassium, carbohydrates amounted to 2.32%, 0.50%, 1.67%, 3.48%, respectively. While the comparison treatment gave the lowest average for the aforementioned traits. As for the ratio of carbohydrates to nitrogen, the comparison treatment gave the highest rate, reaching 1.56, While treatment E1 gave the highest ratio of carbohydrates to nitrogen 1.55%. The interaction between (the two study factors) showed significant differences in most of the traits The treatment of G2E2 outperformed and gave the highest rate except for the nitrogen content of the leaves, as treatment G2E1 outperformed, while treatment G0E0 gave the lowest rate for the aforementioned traits.

Keywords: spray, jasmonic acid, Ennne nutrient solution, for grapefruit seedlings.s

INTRODUCTION

Citrus is an evergreen fruit tree belonging to the family Rutaceae, which includes a number of genera, the most important of which are the genus Citrus, , the genus Poncirus and the genus Fortunella, and the species belonging to the genus Citrus are widely spread throughout the whole world because of their adaptation to a wide range of environmental conditions. Citrus cultivation is spread in subtropical (dry), and semi-tropical regions, and the genus Citrus includes four groups, the orange group and the orange group The mandarin (allanki), the Indian lemon group, and the acid group, and each group includes a number of species that include many varieties and strains[1-2].

Al-Samarrai [3] confirmed through their study on the effect of the foliar nutrient Disper Bloom GS on seedlings of grapes cultivar Halawani and Aswad Balad at concentrations (0, 2 and 4 g L-1) that there was a significant increase in the content of nitrogen and phosphorous compared to the control treatment. In addition, Al-Fatlawi[4] showed in a study that she conducted to investigate the effect of treating grafts with different concentrations of IAA and spraying with GROW MORE foliar fertilizer on the vegetative growth characteristics of apricot seedlings, Prunus armeniaca cultivar Zagina, it concluded that spraying with GROW MORE foliar fertilizer every 15 days at a concentration of 2 g. L-1 It caused an increase in the leaves' content of nutrients, as the concentration of potassium, calcium, magnesium, nitrogen and phosphorous increased.

In an experiment carried out by Sheteawi [5] on soybeans to see the effect of two levels of jasmonic acid, which is (1,0) micro molar, on the growth and yield of soybeans, there was a significant difference in the concentration of elements between the levels of jasmonic acid if the concentration of potassium, nitrogen and phosphorous elements increased when spraying With jasmonic acid at a concentration of 1 micromolar in saline levels (0, 50, 100) when comparing each salt level with the same in the absence of jasmonic acid spray

MATERIALS AND METHODS

The experiment was carried out in the lath house of the College of Agriculture / University of Samarra for the growing season 2021 to 2022. The saplings

were brought from Salah Al-Din Governorate, Balad District, and 54 seedlings were selected from the grapefruit saplings, about one and a half years old, budded onto the rootstock of the sour orange

. Planted inside plastic containers with a container capacity of 5 kg The homogeneous seedlings were selected as much as possible, the seedlings were transferred to larger plastic containers with a container capacity of 10 kg in a mixture of soil. Samples were taken from the soil used for the purpose of conducting some chemical and physical analyzes (Table 1).

Transactions and experiment design: The study included the following transactions

First: The first factor: spraying with Jasmonic acid in three concentrations:

1 - Spraying with water only (comparison treatment). It symbol is G0 .

2 - Spraying with jasmonic acid at a concentration of 0.5 mg. L-1 . It is denoted by the symbol G1. It is

3- Spraying with jasmonic acid at a concentration of 10 mg.L-1 . It is denoted by the symbol G2.

Second: The second factor: spraying with a nutrient solution in three concentrations:

The comparison treatment is denoted by the symbol E0.

Spraying with Ennne neutral fertilizer at a level of 2.5 m.L-1 . It is denoted by the symbol E1 .

Third: Spraying with Ennne neutral fertilizer at the level of 5 m.L-1 . It is denoted by the symbol E2 .

The spraying process was carried out on three dates, the first date 1/7 and the second date 21 days after the first date, and so on for the third date. The followed design is a randomized complete block design (RCBD) as a factorial experiment with two factors Jasmonic acid and nutrient solution with three concentrations for each factors. With two saplings for each experimental unit and with three replications, the total number of saplings is 54 [6-7].

Studied traits:

Determination of the nitrogen content of leaves (%):

Samples were collected from each experimental unit, dried and crushed, then 0.2 g of the crushed sample was taken and digested by concentrated sulfuric and perchloric acid, then Microkjeldahl apparatus was used according to the method mentioned in [8] .

Determination of phosphorous content of leaves (%):

The percentage of phosphorous in the leaves was estimated by colorimetric method and reading the light absorption at a wavelength of 410 nm using a spectrophotometer type 100 1_v lab EMC according to the method mentioned in [9].

Determination of potassium content of leaves (%):

The potassium content in the leaves was estimated using a flame photometer type 378_Elicocl according to the method given in [10].

Estimated protein content in leaves (%):

The percentage of protein in plant leaves was estimated on the basis of dry weight [11] and according to the following equation: Protein % = % Nitrogen x 6.25

Estimated percentage of carbohydrates (%):

The percentage of carbohydrates was measured using [12] method in estimating the percentage of total carbohydrates in branches and agencies: 0.2 g of dry sample powder was taken and placed in a test tube and an attempt was added Perchloroic acid (N1). The samples were placed in a water bath at 60 ° C for 60 minutes, with this process being repeated three times, each time being centrifuged for 15 minutes at a speed of 3000 cycles. Minute^{-1} The clear solution was collected in a volumetric flask and completed to 100 ml by adding distilled water, then 1 ml of the dilute solution was taken and 1 ml of 5% phenol solution and 5 ml of concentrated sulfuric acid were added to it. The absorption of the solutions was read by a spectrophotometer with a wavelength of 490 nm.

Estimation of the carbohydrate/nitrogen ratio (C:N ratio**):**

Calculated by dividing the percentage of carbohydrates by the percentage of nitrogen for each refiner.

RESULTS

Leaves content of nitrogen:

Table (2) results show that there are significant differences resulting from spraying with Jasmonic acid, having achieved a significant increase in the leaves content of nitrogen . theG2 concentration gave the highest ratio of

2.30%, followed by the G1 transaction by a significant difference of 2.25%, while the G0 concentration gave the lowest percentage of nitrogen 2.09%.

From the results of the same table (2), there are significant difference as a result of the Ennne nutrient solution, the E2 concentration gave the highest nitrogen ratio of 2.32%, followed by the E1 concentration significant difference of (2.22%), while the E0 concentration gave the lowest nitrogen content of the leaves at 2.11 % .

As for the interaction between the growth regulator of Gasmonic Acid and Ennne Nutrient Solution, the results of Table(2) showed a significant effect on the leaves content of nitrogen, with concentration of G1E2 and G2E1 achieving the highest ratio of 2.30%, while the comparison treatment G0E0 gave the lowest nitrogen ratio of 1.89%.

Leaves content of phosphorus:

Table(3) results show that there are significant differences resulting from spraying with Jasmonic acid having achieved a significant increase in the Leaves content of phosphorus. The G2 concentration gave the highest ratio of 0.49%, followed by the G1 concentration by a significant difference of 0.46%, while the G0 concentration gave the lowest percentage of phosphorus 0.42%.

As for the effect of spraying with Ennne nutrient solution, note the results of the same table (3). The E2 concentration gave the highest phosphorus ratio of 0.50%, followed by the moral difference of the E1 concentration by giving it a ratio of 0.46%, while the E0 concentration gave the lowest phosphorus percentage of 0.42%.

As for the bilateral overlap between the growth regulator Jasmonic Acid and Ennne Nutrient Solution, the results of table (3) showed that there were significant differences in the content of the papers of phosphorus, with the G2E2 concentration achieving the highest rate of 0.53%, while the comparison concentration gave G0E0 the lowest proportion of phosphorus at 0.35% .

Leaves content of potassium:

From the results of table (4), there are significant differences resulting from spraying with Jasmonic acid. The G1 concentration gave the highest ratio of 1.67%, followed by the G2 concentration without a significant difference of 1.66%, while the G0 concentration gave the lowest percentage of potassium at 1.52%.

The results of the statistical analysis in the same table (4) indicate that there are significant differences as a result of Ennne's nutrient solution concentration, giving E2 the highest potassium rate at 1.67%, followed by the moral difference of E1 concentration at 1.62%, while the comparison concentration gave E0 the lowest ratio in the content of the leaves' of phosphorus at 1.62%.

On the bilateral overlap between the growth regulator Jasmonic Acid and Ennne Nutrient Solution, the results of Table(4) showed a moral effect on the leaves' content of potassium, with the G2E2 concentration achieving the highest rate of 1.74%, while the comparison concentration gave the lowest G0E0 phosphorus ratio of 1.38% .

Leaves content of carbohydrates:

The results of table (5) indicate that there are significant differences as a result of spraying with Jasmonic acid in the Leaves content of carbohydrates. The G2 concentration gave the highest ratio of 3.47%, followed by the G1 concentration significant difference of 3.40%, while the G0 concentration gave the lowest proportion of carbohydrates at 3.24%.

Results from the same table (5) show that there are significant differences as a result of Ennne's nutrient solution spraying, giving E2 the highest carbohydrate ratio at 3.48%, followed by the significant difference of E1 by giving it a ratio of 3.41%, while the comparative treatment gave the lowest E0 in the Leaves content of carbohydrates

Trait		Value	Unit
Chemical properties			
The degree of soil interaction Ph		7.45	
EC electrical connection		1.6	Mellmuse.cm3
Organic matter O.M.		8.8	$g.Kg^{-1}$
Ready-made items			
N nitrogen ready		17	mg.kg-1
P-ready phosphorus		10	mg.kg-1
Potassium Ready K		123	$mg.kg^{-1}$
Positive ions			
CA ready calcium		2798	mg.kg-1
Na^{+} ready sodium		419	mg.kg-1
Magnesium Ready mg		328	mg.kg-1
Physical properties			
Detached Soil	Clay	122	g.Kg-1
	Siln	477	g.Kg-1
	Sand	502	g.Kg-1
Tissue		Loam	

Table 1.Samples were taken from the soil used for the purpose of conducting some chemical and physical analyzes

As for the bilateral overlap between the growth regulator Jasmonic acid and Ennne nutrient solution, the results of table (5) showed a significant effect in the Leaves content of carbohydrates, giving the G2E2 concentration the highest rate of 3.57%, while the comparison treatment G0E0 the lowest proportion of carbohydrates was 2.95%.

Leaves content of carbohydrate/nitrogen:

The results of table (6) show that there are significant differences resulting from spraying with jasmonic acid and has achieved a significant increase in the Leaves content carbohydrates/nitrogen, The G0 concentration gave the highest percentage of 1.56%, followed by a moral difference of G2 concentration giving it a 1.51%, while the G1 concentration gave the lowest percentage of carbohydrates/nitrogen at 1.48%.

The results of the same table (6) indicate that there are significant differences as a result of Ennne's nutrient solution spraying, giving E1 the highest carbohydrate/nitrogen ratio of 1.55%, followed by no E0 concentration significant difference of 1.53%, while E2 gave the lowest Leaves content of carbohydrate/nitrogen

As for the overlap between the jasmonic acid growth regulator and Ennne nutrient solution, the results of table (6) showed a moral effect in carbohydrate/nitrogen, with the G0E1 concentration achieving the highest rate of 1.61%, while the G1E2 concentration gave the lowest proportion of carbohydrate/nitrogen 1.40%.

Table (1) some chemical and physical properties of the soil used in the study

* Soil was analyzed in the laboratory of the Department of Soil Sciences and Water Resources, Faculty of Agriculture, Tikrit University.

Table (2) The effect of spraying with Jasmonic acid and Ennne nutrient solution and their interaction in the Leaves content of nitrogen (%).

Jasmonic Acid G	**Nutritious Solution ENNNE**			**Effect of Jasmonic Acid**
	E_0	**E_1**	**E_2**	
G_0	1.89	2.08	2.28	2.09
G_1	2.19	2.27	2.30	2.25
G_2	2.24	2.30	2.26	2.30
Effect of Nutrient Solution ENNNE	2.11	2.22	2.32	
LSD $_{0.05}$	G = 0.04	E = 0.04	G*E= 0.06	

Table (3) Spraying Effect with Jasmonic Acid and Ennne Nutrient Solution and interaction between them in phosphorus Leaves content (%).

Jasmonic Acid G	**Nutritious Solution ENNNE**			**Effect of Jasmonic Acid**
	E_0	**E_1**	**E_2**	
G_0	0.35	0.44	0.48	0.42
G_1	0.45	0.46	0.48	0.46
G_2	0.46	0.48	0.53	0.49
Effect of Nutrient Solution ENNNE	0.42	0.46	0.50	
LSD $_{0.05}$	G =0.02	E = 0.02	G*E= 0.03	

Table (4) Spraying effect with Jasmonic acid and Ennne nutrient solution and interference between them in the leaves' potassium content (%).

Jasmonic Acid G	**Nutritious Solution ENNNE**			**Effect of Jasmonic Acid**
	E_0	**E_1**	**E_2**	
G_0	1.38	1.55	1.63	1.52
G_1	1.63	1.67	1.69	1.67
G_2	1.60	1.65	1.74	1.66
Effect of Nutrient Solution ENNNE	1.54	1.62	1.67	
LSD $_{0.05}$	G =0.04	E =0.04	G*E= 0,07	

Table (5) Spraying effect with jasmonic acid and Ennne nutrient solution and interaction between them in the Leaves content of carbohydrates (%).

jasmonic Acid G	**Nutritious Solution ENNNE**			**Effect of jasmonic Acid**
	E_0	**E_1**	**E_2**	
G_0	2.95	3.34	3.43	3.24
G_1	3.37	3.40	3.44	3.40
G_2	3.36	3.49	3.57	3.47
Effect of Nutrient Solution ENNNE	3.22	3.41	3.48	
LSD $_{0.05}$	G =0.04	E = 0.04	G*E=0.07	

Table (6) Spraying effect with jasmonic Acid and Ennne Nutrient Solution and interference between them in the Leaves content of carbohydrates/nitrogen (%).

jasmonic Acid G	**Nutritious Solution ENNNE**			**Effect of jasmonic Acid**
	E_0	**E_1**	**E_2**	
G_0	1.56	1.61	1.50	1.56
G_1	1.53	1.51	1.40	1.48
G_2	1.50	1.52	1.51	1.51
Effect of Nutrient Solution ENNNE	1.53	1.55	1.47	
LSD $_{0.05}$	G =0.06	E = 0.06	G*E= 0.11	

DISCUSSION

It is clear from the results in Table (2, 3, 4, 5 and 6) that there is a response of grapefruit saplings to the study factors. The reason for the increase in the percentage of carbohydrates,nitrogen, phosphorous, potassium and carbohydrates in the leaves when spraying with jasmonic acid (JA) and the nutrient solution Ennne can be attributed to the role of both in stimulating cell division and its expansion, which increases the rate of vegetative growth. The increase in the percentage of carbohydrates in the leaves as a result of spraying with jasmonic may be due to its role in stimulating the growth of leaves due to the increase in cell division and expansion. It also stimulates the formation of some photosynthesis enzymes to the accumulation of starch in the leaves [13].The reason for the increase in the leaves of their content of nitrogen, carbohydrates, phosphorous and potassium when adding the nutrient solution Ennne, may be due to the content of this nutrient of macro and micro nutrients, vitamins and amino acids, which have a wide effect in activating vital activities inside the plant[14]. Increasing the concentration of nitrogen, as nitrogen enters into the construction of the chlorophyll pigment due to its participation in the formation of the porphyrins units involved in the composition of this pigment, in addition to the fact that nitrogen enters the formation of amino acids and protein, which increases the construction of chloroplasts [15]. Either element phosphorous as one of the components of the nutrient solution Ennne can help element phosphorous to metabolize nitrate because its reduction requires adequate preparation of P and its presence does not lead to its accumulation [16]. P is a very important component of photosynthesis, as it is critical for preserving phosphorylation reactions during CO2 assimilation[17]

.Phosphorous may have an important role in plant growth, as it contributes to the formation of energy-rich compounds that the plant needs in the formation of other compounds such as carbohydrates, phospholipids and enzymatic compounds that contribute to activating the vital activities of the plant, which leads to an increase in vegetative growth and nutritional content [18] . Whereas potassium is essential for the synthesis of chlorophyll although it is not included in its synthesis[19] ,the primary effect of K in photosynthesis is to maintain the concentration of K in the stroma of the chloroplast to allow CO2 to fix [20] . And that the results of spraying in the previous tables agree with [21] in increasing the content of phosphorous and potassium in leaves when spraying at a concentration of 0.02 mg L^{-1} for orange trees. NPK significantly increased the content of elements N, P and K in olive tree leaves .

CONCLUSIONS

While the comparison treatment gave the lowest average for the aforementioned traits. As for the ratio of carbohydrates to nitrogen, the comparison treatment gave the highest rate, reaching 1.56, While treatment E1 gave the highest ratio of carbohydrates to nitrogen 1.55%. The interaction between (the two study factors) showed significant differences in most of the traits The treatment of G2E2 outperformed and gave the highest rate except for the nitrogen content of the leaves, as treatment G2E1 outperformed, while treatment G0E0 gave the lowest rate for the aforementioned traits.

REFERENCES

1. Abu Zaid, Al-Shahat Nasr. (2000). Plant hormones and agricultural applications. Arabic House book. Publishing and Distribution. The Egyptian Arabic Republic.
2. Agha, J. Th. and Da 'id Abdullah (1991). Production of evergreen fruit. Part II Book House for Printing and Publishing, Mosul University, Ministry of Higher Education and Scientific Research, Republic of Iraq.
3. Al Hamdani, Kh. Abd. S., A. W. Taha and A. Kh. Osman. 2018. The effect of spraying with two inns. and the addition of brosol nutrient solution in the chemical content of sour lemon seedlings Citrus lemon Burman. 3rd International Scientific Conference on Agricultural Sciences/University of Kirkuk Journal of Agricultural Sciences (special issue).
4. Al-Hamdani, Kh. Abd. S., A. J. A. al-Ihbabi and O. H. Musaleh (2018). The response of local orange seedlings Citrus sinensis to spray with the developer Brassinolide, and the nutritious solution Miller. Tikrit Journal of Agricultural Sciences, vol. (18) Special issue of the proceedings of the 7th and 1st International Scientific Conference, held on 10-11/4/2018, on pages 12/12 .
5. Al-Sahaf, F. H. (1989). Applied plant feeding. University of Baghdad. Ministry of Higher Education and Scientific Research. Iraq.
6. Al-Samarrai, W Abd. M. H. and A. J. A. Al-Ahbabi. 2017 . Effect of spraying with Disper Bloom GS and cytokinin 30KT- on some vegetative growth characteristics and mineral content of Vitis vinifera L. Helwani and Aswad Balad grapes. Tikrit University Journal of Agricultural Sciences, 17 (1): 89 - 101.
7. Bhargava, B.S. and Raghupathi H.B.1999.Analysis of plant materials for macro and micronutrients . p: 49-82 . In Tandon, H.L.S. (eds). Methods of analysis of soils , plants, water and fertilizers . Binng Printers L- 14 , Lajpat Nagor New Delhi , 110024
8. Elloumi , O. ; M. Ghrapand and M. Ben mimoun. (2009). Responses ofOlea europeae .L olive trees (cv.chemlali) after five years of experiment to potassium nitrate nutrition under rainfedcondition.The proceedings of the International plant Nutrition colloquium XVI , Plant Sciences ,pp:1318-1324. California, USA .
9. Gao, Z. M., Y.D. Zhang, D. Y. Zhang, R. H. Shi and M. F. Zhang. (1989). Effect of N, P and K on accumulation of nitrate and the activity of nitrate reductase and superoxidase in leafy vegetables. Acta Hort.Sin. 16:293-298.
10. Havlin , J . L .; J . D . Beaton ; S . L .Tisdale and W. L .Nelson.(2005). Soil Fertility and Fertilizers .7th ed . Upper Saddle River , New Jersey 07458 .
11. A.O.A.C., 1980. Official Methods of Analysis . 13th. Ed. Association of Official Analytical Chemists. Washington , D.C.
12. Hermans, C., J. P. Hammond, P. J. White, N. Verbruggen,.(2006). How do plants respond to nutrient shortage by biomass allocation? Trends Plant Sci 11:610-617.
13. Ismail , M.and J. Zhang ،(2004) Postharvest Citrus diseases and their control . Outlooks Pest Manag . 1(10), 29 – 35 .
14. Jones, J. B and W.J.A Steyn .(1973). Sampling ,Handling and Analyzing plant tissue samples .P.248-268 . In: Soil Testing and plant Analysis. ed .bywalsh ,L.M .and J.D .Beaton. Soil Science Society of America, Inc ,677 South Segee Rd , Madison ,Wiscon sin ,USA.
15. Ghanim, I. .; Ebrahim, S. E. . Preparing Of Bio-Cement Mortar By Using Bacillus Licheniformis Bacterial Cells. JLSAR 2022, 3, 23-29.
16. Jundia , Hassan 2003. Physiology of fruit trees. Arab House for Publishing and Distribution, Nasr City, Arab Republic of Egypt.
17. Kanan , T ; S . N . Singh, Harinder . S ; Ratnpal and H.S.Dhaliwal . (1999) .Effect of foliar and soilar application of Urea on soilar application of Urea on dry matter production chlorophyll content . and NPK status of citrus Nursery plants. Department of Horticulture . Panjab . Agricultural University. India.
18. Khaji, M. A. (2014). Plant growth organizations their applications and horticultural uses. Faculty of Agriculture, Baghdad University, Ministry of Higher Education and Scientific Research. University Orbit Press.
19. Mohammed N. Mas' ad Hilali. 2015. Plant Bio Organizations - Enzymes - Materials of Growth and Flowering - Vitamins - Modern Library of Publishing and Distribution - Egypt.

20. Osman, S.M. (2010). Effect of mineral , Bio-NPK soil application of (Olea europeae L)young olive trees and foliar fertilization on leaf and shoot chemical composition. Research Journal of Agriculture and Biological Science , 6(3):311-318
21. Rahim, Omar Harez, (2014). Effect of spraying with Humic acid and Brassinosteroid growth regulator on vegetative, flowering and yield growth characteristics of local orange trees sinensis L. Citrus., Master's Thesis, College of Agriculture, Tikrit University.

Received: 25 June 2023/ Accepted: 26 August 2023 / Published:15 September 2023

Citation: Dawood M S , Al Hamdani K A S .Contamination of poultry feed with Candida species in Duhok city using CHROMAgar. Revis Bionatura 2023;8 (3) 132 http://dx.doi.org/10.21931/RB/2023.08.03.132