University of Thi-Qar Journal of agricultural research

Thi-Qar Journal of agricultural research

ISSN Onlin:2708-9347, ISSN Print: 2708-9339 Volume 14, Issue 1 (2025) PP 280-289

https://iasj.rdd.edu.iq/journals/journal/issue/15543 *https://doi.org/10.54174/utjagr.v13i1.323*

Growth Response of Potato varieties (*Solanum tuberosum* L.) to organic and mineral fertilizer

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Abstract

The experiment was conducted in Agricultural Research Station of the College of Agriculture, University of Basra/ Karma Ali, during the Autumn season 2023-2024 to study the effect of adding organic fertilizer at two levels (0,30 t ha^{-1}) and six levels of mineral fertilizer (P60 N80, P60- N160, 60P-N240, P120- N80, 120P-N160, P120-240N kg ha^{-1}) on some growth characteristics of three varieties of potato (Arizona, Burren, Riviera) . The experiment was applied in a randomized complete block design (RCBD) using A split plot arrangement with three replicates, the main plots contained Organic fertilizer, levels of mineral fertilizer were at the sub plots ,whereas the varieties put in sub-sub plots. The results showed that Rivera variety had the highest chlorophyll content (2.9361 mg g^{-1} leaf. fr. wt.) and stem diameter (10.81 mm). Bureen had highest number of branches per plant (4.28 branch plant-1) and dry weight (22.36 g $plant^{-1}$). Arizona had the highest number of plant height (56.29 cm). An application of either organic manure at the rate of 4 t ha^{-1} or mineral NP at the level of P120-240N kg ha^{-1}gave significantly the highest values of all studied vegetative growth. Combination of organic and mineral fertilizer at resulted in the highest significant mean values of the vegetative growth traits. This field experiment showed a difference in the response of varieties when interact with organic fertilizer and a high percentage of mineral fertilizer to obtain the best growth characteristics.

Keywords: Potato, varieties ,Organic fertilizer, mineral fertilizer

I. Introduction

Potatoes *Solanum tuberosum*L. belongs to the Solanaceae. Around one billion people globally eat potatoes, which are produced on 330 million tons of land on 18 million hectares of planted land((Pllana *et al.*, 2018).. so Many people depend on it for food and preparation The fourth crop is among the main crops that have Economic impact after wheat, corn and rice as well It is a cheap source of energy that it needs Humans, as it is a source Starch, protein, vitamin C and B, and mineral salts (Panwar and Negi, 2017). It has thus been suggested as a crop for food security by the United Nations Food and Agriculture Organization (Devaux *et al*., 2014). The variety is an influential factor in the productivity of the potato crop, as it is grown in Iraq in many varieties. these varieties differ in their characteristics and ability to resist disease and insect infection. In order to increase production and improve crop growth, it is necessary to choose the best varieties suitable for the environmental conditions of the region. From this standpoint, attention must be paid to producing tubers suitable for cultivation, with a preference for early maturing and abundant varieties (Al-Mashhadani and Al-Qassab, 2017) . Hassan *et al.*, (2017) noted the superiority of the Arizona variety in plant height rate and dry weight of the vegetative group compared to the two varieties Riviera and Volar, which gave the least values. The recent increase in the area planted with potatoes in most areas of Iraq, especially the southern region, needs a fertilizer strategy appropriate for the variety of plant that will be grown. One of the main obstacles to crop production is declining soil fertility .Low soil fertility is a major obstacle to crop growth and production, as potato growth is affected by fertilization processes, whether mineral or organic fertilizers, due to their benefit in improving soil properties, as well as improving growth and increasing production, as it encourages the formation of plants with a good vegetative system and thus obtaining a crop with high nutritional value (Koch *et al.*, 2020). Kumar *et al.*, (2023) showed that adding organic fertilizer at a level of 10 tons ha^{-1} led to

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University of Thi-Qar Journal of agricultural research

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ISSN Onlin:2708-9347, ISSN Print: 2708-9339 Volume 14, Issue 1 (2025) PP 280-289

https://iasj.rdd.edu.iq/journals/journal/issue/15543 *https://doi.org/10.54174/utjagr.v13i1.323*

improving most of the growth characteristics of the potato as it recorded the highest plant height and number of aerial branches compared to the comparison treatment. Mahmoud and Salman (2017) found that addition of K200, N240 - P120 gave the highest plant height, number of aerial stems and dry weight of the vegetative group compared to control . Therefore, this study aims to know the effect of organic and mineral fertilization on some growth characteristics of three varieties of Potatoes.

II. Materials and methods

The field experiment was carried out at the Agricultural Research Station of the College of Agriculture, University of Basra./ Karmat Ali website (Latitude30°.57´N and 47°.80´L, to study of the growth response of three potato varieties (Arezona, Burren, and Rivera) to add organic fertilizer at two levels (O_0: 0, O1: 4 tons ha^{-1}) and six mineral combinations of nitrogen and phosphorus, which are:

T1:(kg P ha-160 +kg N ha-180)
T2:(kg P ha-160 + kg N ha-1 160)
T3:(kg P ha-1 60 +240 kg N ha-)
T4:(kg P ha-1 120 + 80 Kg N ha-1)
T5:(kg P ha-1120 + kg N ha-1 160)
T6:(kg P ha-1 120+ kg N ha-1 240)

The experiment was conducted using a split plot arrangement with three replicates, the main plots contained Organic fertilizer, levels of mineral fertilizer were at the sub plots ,whereas the varieties put in sub-sub plots. the number of experimental units were 108, before planting, random samples were collected for several sites at a depth of 0–30 cm. The soil analysis was conducted in the laboratory of the Department of Soil Sciences and Water Resources - College of Agriculture - University of Basra. As shown in Table (1)

Table (1) Some physical and chemical properties of field soil

Character		Mean value	unit
Electrical Conductivity (E.C.)		11.36	dS. m^{-1}
pH		7.35	-
Organic Matter (OM)		1. 7	g. kg^{-1}
Total available	N	22.97	g. kg^{-1}
	P	19.50	g. kg^{-1}
	K	111.94	g. kg^{-1}
Soil components	Sand	76.64	g. kg^{-1}
	Silt	7.80	g. kg^{-1}
	Clay	15.56	g. kg^{-1}
Soil texture		Loamy sand	

The soil was plowing, then smoothing and settling, The land was divided into three blocks, The land was divided into ridges, the distance between them was 75 cm, and the distance between the hollows was 25 cm. The number of rows was 22, with a length of 18 m. The experimental unit contained 10 plants, with a spacing of 3 m for each experimental unit...Drip irrigation system has been implemented .and Irrigation pipe network distribution according to the crop cultivation requirements. Planting was done on 2/15/2024 in holes at a depth of 10 cm in order to prepare a suitable bed for the tubers. Decomposed organic fertilizer (cow manure) was added to the soil at a rate of 4 ton $hectare^{-1}$ a month before planting to ensure the decomposition of the organic matter, then fertilizer was added. diammonium phosphate (46% P_2O_5)when planting in holes as a source of phosphorus. Nitrogen fertilizer was added in the form of urea (46%.N) in two doses, the first after emergence and the second after 45 days from the first dose.

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University of Thi-Qar Journal of agricultural research

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The data were statistically analyzed using the statistical analysis program GenStat(Ver. 12), and the averages were compared using the least significant difference (LSD) test at a probability level of 0.05 .
Growth traits were measured by randomly selecting five plants from each experimental unit before the end of the growing season, as follows:

1-Total chlorophyll content (mg 100g^{-1} fresh weight)

Total chlorophyll in green leaves at was determined according to the method (Goodwin, 1976) by extracting chlorophyll from samples of mature leaves using acetone solvent (80%).

2 -Plant height (cm)

The average height of plants was measured from the soil surface level to the growing tip of the tallest aerial stem.

3- Stem diameter (mm)

The main stem of plants in each experimental unit was calculated from an area 5 cm from the soil surface using a Vernier micrometer.

4- Total number of aerial branches per plant $^{-1}$

It was measured by calculating the average number of main aerial stems before the end of the growing season.

5- Vegetative dry weight (gm plant-¹)

The vegetative dry weight was calculated by taking several random samples from the vegetative parts of the plants specified for each experimental unit. They were mixed together, weighed fresh, and then dried in an electric oven at 65°C for 72 hours until the weight was stable.

III. Results and discussion

Total chlorophyll Content in leaves (mg g^{-1} leaf. fr. wt.)

Results are shown in Tables (2) The moral effect of organic and mineral fertilizers, varieties and all interactions were significantly different ($P<0.05$) on the content of chlorophyll in the leaves. Riviera variety gave the highest average chlorophyll Content in leaves (2.9361 mg g^{-1} leaf. fr. wt.) leaves compared to Arizona, with an increase of 55.92 %. On the same table, organic fertilizer had a significant effect on chlorophyll Content and its highest value at O1 was 2.72 mg g^{-1} leaf. fr. wt. compared to O_0, which reached 2.20 mg g^{-1} leaf. fr. wt. The effect of mineral fertilizer was significant and the highest value was in the treatment of T6 which reached 3.027 mg g^{-1} leaf. fr. wt. Compared to the treatment T1 which achieved the lowest content (1.880 mg g^{-1} leaf. fr. wt.) .As for the interaction, it was found that there was a significant increase of chlorophyll content with increased level of adding mineral and organic fertilizer, the highest value was in the treatment of (O_1×T6) , which was 3.272 mg g^{-1} leaf. fr. wt. in comparison to the treatment of (O_0×T1) was recorded((1.637 mg g^{-1} leaf. fr. wt.).As for the effect of the interaction between varieties and level of mineral fertilizer the interaction (T6×Riviera) gave the highest average reached (3.723 mg g^{-1} leaf. fr. wt.), while the interaction treatment (T1×Arizona) gave the lowest chlorophyll content (1.640 mg g^{-1} leaf. fr. wt.) . Riviera variety with O_1 gave the highest average of chlorophyll content by 3.237 While, Arizona under O_0 gave the lowest value by1.704. As for the triple interaction, the results of the same table showed that the interaction was significant, as the interaction treatment (Riviera × O_1 × T6) gave the highest chlorophyll content in leaves reached 4.067 mg g^{-1} leaf. fr. wt. compared to the treatment(Arizona ×O_2×T1) reached (1.410 mg g^{-1} leaf. fr. wt.).

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University of Thi-Qar Journal of agricultural research

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ISSN Onlin:2708-9347, ISSN Print: 2708-9339 Volume 14, Issue 1 (2025) PP 280-289

https://iasj.rdd.edu.iq/journals/journal/issue/15543 *https://doi.org/10.54174/utjagr.v13i1.323*

Table (2) The effect of organic and mineral fertilizer on Chlorophyll Content (mg g^{-1} leaf. fr.wt.) of three varieties of potato

Organic fertilizer	Mineral fertilizer	Varieties			O x T
		Arizona	Riviera	Burren	
O_0	T1	1.410	1.770	1.730	1.637
	T2	1.517	2.070	1.997	1.861
	T3	1.650	2.757	2.120	2.176
	T4	1.773	2.850	2.300	2.308
	T5	1.863	2.983	2.540	2.462
	T6	2.013	3.380	2.950	2.781
O1	T1	1.870	2.270	2.230	2.123
	T2	1.913	2.477	2.423	2.271
	T3	1.987	3.160	2.797	2.648
	T4	2.110	3.493	3.030	2.878
	T5	2.183	3.953	3.130	3.089
	T6	2.300	4.067	3.450	3.272
Mean v.		1.883	2.936	2.558	
		Arizona	Riviera	Burren	Mean O
V × O	O1	1.704	2.635	2.273	2.204
	O2	2.061	3.237	2.843	2.715
		Arizona	Riviera	Burren	Mean T
V × T	T1	1.640	2.020	1.980	1.880
	T2	1.715	2.273	2.210	2.062
	T3	1.818	2.958	2.458	2.412
	T4	1.942	3.172	2.665	2.593
	T5	2.023	3.468	2.835	2.776
	T6	2.157	3.723	3.200	3.027

LSD	V	O	T	O×T	V×O	V×T	V×O×T
P<0.0	0.0193	0.0497	0.0297	0.0463	0.038	0.048	0.070

Plant height (cm)

The results in Table (3) showed the significant effect (P<0.05) of the study factors and all interactions on plant height. The results indicated that the Arizona variety was superior to the other varieties in plant height with an average of 56.29 cm, while minimum from Burren variety (51.07 cm). The results of the table also showed that adding organic fertilizer led to an increase in plant height by an average of 57.26cm, while the control (O_0) gave49.76cm. Among the fertilizer combination the results showed the superiority of the fertilizer combination (T6) recorded the maximum value of plant height reached 63.95 cm while the minimum value of plant height was observed with (T1) (46.52cm). Interaction between organic and mineral fertilizers, as the results of the table (3) showed the interaction (O_1×T6) is superior with an average of 69.07cm while (O_0×T1) gave the lowest rate (44.38cm). On the other hand interaction (O_1× Arizona) record the highest plant height by 60.68cm ,while (O_0 × Rivera) recorded the lowest value (47.61 cm). The interaction treatment (Arizona × T6) gave the highest average plant height of 68.58cm whereas (Rivera xT1) recorded the lowest average of 44.42cm, as the results showed that the interaction treatment (O_1 × T6 × Arizona) gave the highest average plant height (73.83 cm) while (O_2 x T1 x Riviera) gave the lowest plant height (43.00 cm).

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Table (3) The effect of organic and Mineral fertilizer on plant height (cm) of three varieties of potato

Organic fertilizer	Mineral fertilizer		Varieties				O x T
			Arizona	Riviera	Burren		
O_0	T1		45.57	43.00	44.57		44.38
	T2		46.50	43.33	45.83		45.22
	T3		49.17	44.33	46.33		46.61
	T4		49.67	46.67	48.33		48.22
	T5		57.17	53.67	55.00		55.28
	T6		63.33	54.67	58.50		58.83
O_1	T1		50.67	45.83	49.50		48.67
	T2		52.20	49.30	51.20		50.90
	T3		54.67	49.67	51.67		52.00
	T4		63.00	53.50	54.00		56.83
	T5		69.73	63.33	65.17		66.08
	T6		73.83	65.50	67.87		69.07
Mean v.			56.29	51.07	53.16		
			Arizona	Riviera	Burren		Mean O
V × O	O_0		51.90	47.61	49.76		49.76
	O1		60.68	54.52	56.57		57.26
V × T			Arizona	Riviera	Burren		Mean T
	T1		48.12	44.42	47.03		46.52
	T2		49.35	46.32	48.52		48.06
	T3		51.92	47.00	49.00		49.31
	T4		56.33	50.08	51.17		52.53
	T5		63.45	58.50	60.08		60.68
	T6		68.58	60.08	63.18		63.95
LSD	V	O	T	O×T	V×O	V×T	V×O×T
P<0.05	0.270	0.466	0.340	0.401	0.40	0.627	0.894

Stem diameter(mm)

The results of Table (4) showed significant differences were significantly different ($p<0.05$) among varieties, organic and mineral fertilizer in stem diameter of plant. Riviera gave highest average by 10.81 mm. Whereas, Arizona gave the lowest average by 9.88mm.The effect of the organic fertilizer was significant and the highest value of stem diameter was in the treatment of O_1 which reached 10.68 mm compared to the control of 10.13 mm. and from the same table, the mineral fertilizer had a significant effect on the stem diameter and its highest value was 11.40 mm with the treatment of T6 compared with the treatment of T1, which was 9.59 mm. As can be seen from the same table The effect of the interaction between organic and mineral fertilizer also had a significant effect on stem diameter and the highest value was in the treatment of O1×T6 which was 11.94 mm in comparison to the treatment of O1×T6 of 9.49 mm. The results of table 4 showed significant effect for the interaction of varieties and application of organic fertilizer on stem diameter, Riviera with application of organic fertilizer O1 highest stem diameter by 11.13mm, while Arizona with control gave the lowest value(9.67mm).The interaction between varieties and mineral fertilizer had a significant effect on stem diameter and the highest value at treatment was the Riviera×T6 which was 12.03compared to treatment of Arizona×T1, which amounted to 9.03mm .The results of Table 4 showed that, the interaction of varieties, organic and mineral fertilizer had significant effect on stem diameter, Riviera under the interaction of O1 x T6 gave highest average by 12.63mm, whereas the treatments(Arizona×O0×T1) and gave the lowest (9.03mm).

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Table .(4)The effect of organic and mineral fertilizer on stem diameter (mm) of three varieties of potato

Organic fertilizer	Mineral fertilizer	Varieties			O x T
		Arizona	Riviera	Burren	
O_0	T1	9.03	9.77	9.67	9.49
	T2	8.97	10.00	10.00	9.66
	T3	9.57	10.30	9.70	9.86
	T4	9.90	10.60	10.33	10.28
	T5	10.43	10.87	10.67	10.66
	T6	10.13	11.43	11.00	10.86
O_1	T1	9.23	10.07	9.77	9.69
	T2	9.13	10.40	10.13	9.89
	T3	9.83	10.27	10.53	10.21
	T4	10.17	11.17	10.70	10.68
	T5	11.00	12.23	11.67	11.63
	T6	11.10	12.63	12.10	11.94
Mean v		9.88	10.81	10.52	
		Arizona	Riviera	Burren	Mean O
V × O	O_0	9.67	10.50	10.23	10.13
	O_1	10.08	11.13	10.82	10.68
		Arizona	Riviera	Burren	Mean T
V × T	T1	9.13	9.92	9.72	9.59
	T2	9.05	10.20	10.07	9.77
	T3	9.70	10.29	10.12	10.04
	T4	10.03	10.88	10.52	10.48
	T5	10.72	11.55	11.17	11.15
	T6	10.62	12.03	11.55	11.40

LSD	V	O	T	O×T	V×O	V×T	V×O×T
P<0.05	0.07	0.05	0.09	0.12	0.08	0.15	0.21

4- Total number of aerial branches (branch plant^{-1})

Analysis of variance indicated that varieties, organic and aerial branches mineral fertilizer were significantly different ($p<0.05$) on aerial branches (Table5). Variety Burren exhibited higher number of (4.28 branch plant^{-1}) as compared to Arizona which gave the lowest number of branches (2.92 branch plant^{-1})..The Results of Table 5 revealed, that adding of organic fertilizer significantly increased number of aerial branches from 3.61 to **3.42** branch plant^{-1} .On the same table, mineral fertilizer had a significant effect on aerial branches and its highest value at T6 was 4.056 branch plant^{-1}compared to T1, which gave the lowest (2.89 branch plant^{-1}) . Varieties with mineral fertilizer interactions resulted in significant differences on number of aerial branches (Table 4), the highest aerial branches (5.17 branch plant^{-1}) was observed for Burren at T6 , while the lowest for this trait reached2.67 branch plant^{-1} with (Arizona× T1). The data in Table (5) is demonstrating that there is a significant effect for the interaction varieties, organic fertilizer and mineral fertilizer on the number of aerial branches, the interaction (Burren×O1×T6) gave the highest number of aerial branches (5.33 branch plant-1) while the lowest value (2.33 branch plant^{-1}) was found from the interaction of Arizona ×O× T1 .

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Table (5) The effect of organic and mineral fertilizer on number of aerial stems (mm) of three varieties of potato

Organic fertilizer	Mineral fertilizer	Varieties			O x T
		Arizona	Riviera	Burren	
O_0	T1	2.33	2.67	3.00	2.67
	T2	2.67	3.00	3.67	3.11
	T3	3.00	3.33	4.00	3.44
	T4	3.00	3.00	5.00	3.67
	T5	3.00	3.33	4.67	3.67
	T6	3.00	4.00	5.00	4.00
O_1	T1	3.00	3.00	3.33	3.11
	T2	3.00	3.00	3.67	3.22
	T3	3.00	3.33	4.00	3.44
	T4	3.00	3.67	4.67	3.78
	T5	3.00	4.00	5.00	4.00
	T6	3.00	4.00	5.33	4.11
Mean v.		2.92	3.36	4.28	
		Arizona	Riviera	Burren	Mean O
V × O	O_0	2.83	3.22	4.22	3.43
	O_1	3.00	3.50	4.33	3.61
		Arizona	Riviera	Burren	Mean T
V × T	T1	2.67	2.83	3.17	2.89
	T2	2.83	3.00	3.67	3.17
	T3	3.00	3.33	4.00	3.44
	T4	3.00	3.33	4.83	3.72
	T5	3.00	3.67	4.83	3.833
	T6	3.00	4.00	5.17	4.056

LSD P<0.05	V	O	T	O×T	V×O	V×T	V×O×T
	0.14	0.	0.21	N.S	N.S	0.35	0.48

Dry weight of plant(g plant^{-1})

The effect of varieties, organic and mineral fertilizer and all interactions on dry weight of plant was significantly different ($p<0.05$) (Table 6).Variety Burren recorded the highest dry weight of 22.36 g plant^{-1} followed by Riviera with 21.68 g plant^{-1} and Arizona with 21.05 g plant^{-1}.The application of organic fertilizer influenced dry weight of plant , the higher value for dry weight was recorded when organic fertilizer was applied and it was increased by 22.32 g plant^{-1}, while the lowest dry weight was counted at control (21.07 g plant^{-1}), This observation is in agreement with **Ahmed** *et al*.,(2019). Results of Table 6 shows the superiority of treatment T6 in increasing the dry weight to 22.45 g plant^{-1} compared to the treatment T1, which gave the lowest dry weight of 20.96 g plant-1. As for the interaction between organic fertilizer and mineral treatments, it had a significant effects in increasing dry weight of plant, as the highest rate reached 22.98 g plant^{-1} at the interaction O_1×T6 to 20.06 g plant^{-1} at O_0×T1. Burren with application of organic fertilizer O1 highest dry weight by 23.02, while Arizona with control gave the lowest value(20.36 g plant^{-1}).The interaction treatment of Buren × T6 led to a significant increases in dry weight(23.11 g plant^{-1}), While the lowest value of trait was found in Arizona×T2 (20.53 g plant^{-1}).With regard to the triple interaction between the experimental factors, it had a significant and clear effects in increasing the dry weight of plant, as the treatment (Burren ×O_1T5) excelled with the highest dry weight, which reached 23.66 g plant^{-1}, and it did not differed significantly from the treatment (Burren ×O_1 ×T6) compared to (Arizona ×O_0 × T1) which gave the lowest dry weight of 19.38 g plant^{-1}(Table 6).

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Table (6) The effect of organic and mineral fertilizer on dry weigh of plant (g) of three varieties of potato

Organic fertilizer	Mineral fertilizer	Varieties			O x T
		Arizona	Riviera	Burren	
O_0	T1	19.38	20.16	20.63	20.06
	T2	20.18	20.96	21.21	20.78
	T3	20.35	20.87	21.60	20.94
	T4	20.44	21.04	21.793	21.091
	T5	20.70	21.78	22.36	21.61
	T6	21.09	22.07	22.61	21.92
O_1	T1	21.75	21.60	22.22	21.86
	T2	20.88	21.58	22.64	21.70
	T3	21.75	22.28	22.77	22.27
	T4	21.74	22.56	23.20	22.50
	T5	21.99	22.28	23.66	22.65
	T6	22.39	22.95	23.60	22.98
Mean v.		21.05	21.68	22.36	
		Arizona	Riviera	Burren	Mean O
V × O	O_0	20.36	21.15	21.70	21.07
	O1	21.75	22.21	23.02	22.32
		Arizona	Riviera	Burren	Mean T
V × T	T1	20.56	20.88	21.43	20.96
	T2	20.53	21.27	21.93	21.24
	T3	21.05	21.58	22.19	21.60
	T4	21.09	21.80	22.50	21.79
	T5	21.35	22.03	23.01	22.13
	T6	21.74	22.51	23.11	22.45

LSD P<0.05	V	O	T	O×T	V×O	V×T	V×O×T
	0.06	0.0	0.06	0.08	0.08	0.139	0.19

IV. Discussion

The study of vegetative growth characteristics is of great importance because its study reflects the physiological and biochemical state of the plant and the resulting positive results that are reflected in the characteristics of the crop (Marschner,2012). The results showed that Potato varieties differed significantly in all measured traits. Riviera produced higher average of chlorophyll content and stem diameter , in other hand Burren variety gave higher total number of aerial branches and dry weight of plant . Arizona achieved the highest plant height, while the lowest value of these traits were observed in the Arizona variety, except for plant height in the Burren variety. Different genetic makeup is reflected in the varietal variances in the traits discussed here. These findings are in line with Al Mahmud et al. ; (2015) Youseef *et al.,* (2017); Shayaa and Hussein (2019) ;Al-Obaide (2022). Vegetative growth traits increased as a result of organic fertilization compare with control . These results were agreed with Fatma *et al.*,(2018). Zaman *et al*,(2018); Fantaw *et al.*,2019 which play an important role in increasing the vegetative growth of plants by improving soil fertility and increasing the viability of the necessary nutrients for plant growth and increasing the process of photosynthesis. Eleduma *et al.,* (2020) noted that the higher the amount of manure applied the greater the mean value of the vegetative growth parameters. . There was also an increase in vegetative growth traits with an increase in the level of mineral fertilizer addition. This is due to the role of nitrogen and phosphorus in the formation of nucleic acids, energy compounds, and vitamins, all of which work to

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University of Thi-Qar Journal of agricultural research

Thi-Qar Journal of agricultural research

ISSN Onlin:2708-9347, ISSN Print: 2708-9339 Volume 14, Issue 1 (2025) PP 280-289

https://iasj.rdd.edu.iq/journals/journal/issue/15543 *https://doi.org/10.54174/utjagr.v13i1.323*

increase the efficiency of the carbon assimilation process and thus increase the accumulated materials in the plant (Abd El-Azeim *et al.*,2020;Wang *et al.*,2023). There was a complementarity between the addition of organic and mineral fertilizers, as the addition of organic fertilizers led to the positive role of these fertilizers in improving some properties of the soil, which leads to the spread of the roots, as well as providing good nutrition and abundance of nutrients, which leads to the roots absorbing nutrients and results in a good building of the plant and then its physiological and biological effectiveness, which led to the improvement of the characteristics of vegetative growth.

V. Conclusions

In general, these findings showed that the potato cultivars under study responded further, but to varying degrees, to the use of both fertilizers—mineral and organic. Combinations of the three parameters under study showed beneficial effects on most of the vegetative development traits under study. Furthermore, it is commonly understood that high-quality cultivars are necessary to provide a vegetable harvest that both growers and consumers would be satisfied with. Moreover, organic and/or inorganic fertilizers are necessary for plant development.

VI. Resources

Abd El-Azeim, M.]; Sherif, A.;M.S.; Hussien, M.S.; Tantawy, I.A.A. and Bashandy, S.O. (2020). Impacts of nano- and non-nanofertilizers on potato quality and productivity. Acta Ecologica Sinica, ,40(5) : 388-397.

Ahmed,F.; Mondal, M. A. and Akter, Md. B.(2019). Organic Fertilizers Effect on Potato (Solanum tuberosum L.) Tuber Production in Sandy Loam Soil. International Journal of Plant & Soil Science 29(3): 1-11

Al-Mashhadani, K. A., and O. M. Al-Qassab. (2017). Common designs and analysis of their experiences program Genstat. Baghdad University. first edition. A.S: 140.

Devaux, A.; Kromann, P., and Ortiz, O. (2014). Potatoes for sustainable global food security. *Potato Research, 57*(3–4), 185–199.

Eleduma, AF.; Aderibigbe, ATB and Obabire, SO. (2020). Effect of cattle manure on the performances of maize (Zea mays L) grown in forest-savannah transition zone Southwest Nigeria. Int J Agric Sc Food Technol 6(2): 110-114.

Fantaw , S.; Asrat , A; Daniel , T.; Zenebe , G. M. and Eshetu , A. (2018) . Evaluation of potato (*Solanum tuberosum* L.) varieties for yield and yield component . J. of Hori. and Forest , 11(3) : 48-53.

Fatma A. Mohamed ,H. ; Abido, A. I. A. Abdel-Nasser, G.; Abd-Alla ,S. M. and Yousry ,M. M. Response of Potato to Irrigation Water Levels and Organic Manure Fertilization Under Drip Irrigation System, J. Adv. Agric. Res. 23 (2):230-249

Goodwin ,T. W.(1976).Chemistry and biochemistry of plant pigment.2nd Ed.,Academic press,London.373P

Koch, M.; Naumann, M.; Pawelzik, E.; Gransee, A., and Thiel, H. (2020). The importance of nutrient management for potato production Part I: Plant nutrition and yield. European Potato Journal 63(1): 97-119.

Kumar, V.; Shivani;Kumar, A.; Kumar, A. and Shukla, V. (2023). To Study the Effect of Cow Dung and Phosphate Solubilizing Bacteria on Growth and Yield of Potato (*Solanum tuberosum L.*). Journal of Environment & Bio-sciences, 37(2): 105-108.

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ISSN Onlin:2708-9347, ISSN Print: 2708-9339 Volume 14, Issue 1 (2025) PP 280-289

https://iasj.rdd.edu.iq/journals/journal/issue/15543 *https://doi.org/10.54174/utjagr.v13i1.323*

Mahmoud, J. T. and Salman, N. A. (2017). The effect of the source of organic fertilizer and the level of mineral fertilizer on some qualitative characteristics and total yield of potatoes (Solanum tuberosum L.). Al-Qadisiyah J. of Agric. Sci. 7(2): 37-45.

Marschner P., Marschner's .2012.Mineral Nutrition of Higher Plants, 3rd,Edn. Elsevier, Academic Press, USA, pp. 178–189.

Panwar A, Negi S. Effect of various treatments on yield attributes of potato crop. Plantica-Journal of Plant Science. 2017; 1(1):18-26.

Pllana, M.; Merovci, N.; Jashari, M.; Tmava, A.; Shaqiri, F.(2018) Potato market and consumption. International Journal of Sustainable Economies Management, V.7, ;19-29, 2018. https://doi.org/10.4018/IJSEM.2018070102

Shayaa , A. H. and Hussien, W. A. (2019) . Effect of the Neem leaves and extract and organic fertilizer in the production and quality of two Potato varieties. Iraqi J. of Agri. Sci. , 50(1):275- 285.

Wang، X.، Xie، H.، Wang، P.، and Yin (2023). Nanoparticles in Plants: Uptake, Transport and Physiological Activity in Leaf and Root ,, *Materials* 2023, *16*(8),3097; https://doi.org/10.3390/ma16083097

Youseef , M.E. ; I.A. Al-Easily and Dalia, A.S. (2017). Impact of Biochar Addition on Productivity and Tubers Quality of Some Potato Varieties Under Sandy Soil Conditions . Egypt J. Hort., 44(2) : 199-217.

Zaman, M. S.; Ali, G. M.; Muhammad, A.; Farooq, K. and Hussain, I. (2015). In vitro screening of salt tolerance in potato (Solanum tuberosum L.) varieties. Sarhad J. of Agri., 31(2):106-113.

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