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ORIGINAL ARTICLE

RESPONSE OF APRICOT SEEDLING LABEEB VAR. TO ADDING POULTRY WASTE AND SPRAYING WITH GROW GREEN AND THEIR EFFECT ON AVAILABILITY, ABSORPTION ELEMENTS

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Abstract: This experiment was conducted in the station of Horticulture and Forestry, Al-Mahaweel, Babylon government during the period from season 2021, to study the effect of adding poultry waste (0, 5, 10, and 15 ton/h) and spraying grow green foliar fertilization (0, 3, 6, and 9 gm/L) on seedling growth and availability, as well as uptake of NPK. An experiment with three replications using a Complete randomized design (CRD). The following is one possible way to summarize the results: The level 15 ton/h offered a considerably high rise in available NPK and uptake by seedling, in addition to seedling height, the number of leaves, and leaf area. However, the level 9 gm/l of grow green gave a significantly high increase in all of the qualities mentioned above.

***Key words*:** Labeeb var., Poultry waste, Grow green, Elements.

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1. Introduction

Organic fertilizer has been used for a very long time in order to enhance the qualities of the soil, boost its fertility, and make the soil more capable of processing the nutrients that are essential for plant growth. These fertilizers can be added in the form of plant or animal manure that has decomposed (compost organic matter), according to Jhonson (1980). Organic fertilization of olive trees leads to an increase in antioxidant substances in their fruits and the oil content of phenolic substances. Additionally, the use of organic matter residues in the medium of plant growth was shown to be more effective in comparison to the medium that did not contain such residues. The use of decomposed organic residues in the growth medium of citrus plants at a ratio of (1:1) led to an increase in the leaf area and dry matter of the vegetative of apple seedlings and its content of chlorophyll. However, when using poultry waste in the growth medium of apple trees Anna cultivars, this led to a significant increase in the content of the leaves of the potassium element as well as an increase in yield and leaf area of the apple trees [Al-Ahbabi (2011), Abdulkadhim and Mortada (2022)]. Olive seedlings had their vegetative parts sprayed with humic acid, and when compared to the control treatment, significant differences were found in increasing the averages of the main stem length, the number of leaves, and the leaf content of nitrogen, phosphorus, potassium, and carbohydrates. The humic acid treatment was applied to the olive seedlings' leaves [Ali *et al*. (2012)]. Hamad and Abd (2013) found that using four different kinds of organic waste on pomegranate seedlings led to a significant increase in the traits of root length and number, as well as improving the growth traits represented by leaf area, chlorophyll, and potassium in the leaves of seedlings. The types of organic waste used were poultry waste, peat moss, cow waste, and sheep waste.

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Table 1: Some physical and chemical properties of the soil.

Traits	Values	units
pH	7.4	
Electrical conductivity (Ec)	3.46	ds/m^2
Clay	225	gm/kg soil
Silt	345	
Sand	430	
soil texture	Loam	
total nitrogen	11.1	mg/kg soil
available phosphorus	3.7	
available Potassium	18.6	
available iron	7.1	
organic matter	7.4	gm/kg

2. Materials and Methods

The experiment was carried out at the Babylon Horticultural Station in Babylon province, which is a part of the General Company for Horticulture and Forestry, in order to investigate the impact of four distinct levels of poultry waste as organic matter (0, 5, 10, and 15 ton/h) and four distinct levels of spraying. Grow green at a concentration of 0, 3, 6, or 9 gm/l during the process of grafting apricot seedlings onto apricot seed stocks (one year age). It has a stem diameter of 5-6 mm and is planted in plastic pots that are 25 kilogram in capacity. Before planting the seedlings, the organic manure, also known as poultry waste, was applied in the appropriate amounts and mixed with the soil in each of the pots. For the purpose of determining the potting soil's physical and chemical characteristics, which are detailed in Table 1, samples of the soil were taken at random. A factorial experiment was conducted using a completely randomized block design with three replications. The findings were evaluated in accordance with Al-Sahooki and Wahib (1990) and the averages were compared using the least significant difference test with a significance threshold of 5%.

Following the application of a random distribution of the treatments to the seedlings, the Grow green nutritional solution was sprayed on them. The spraying treatment, which began on April 15th, 2021, utilized the concentrations described earlier, and there was a gap of fifteen days in between each application of the treatment. The seedlings were sprayed using a manual sprayer with a capacity of 2 liters, and 1 cm^3 of cleaning liquid (Al-Zahi) was added as a dispersant material for the purpose of reducing the surface tension of water and making it easier for plant tissues to absorb the nutrient solution. The nutrient solution was applied to the foliage of the plant, where it could be taken up more easily by the plant's cells. The sprayer was used to apply the solution [Al-Jumaili and Al-Dujaili (1989)]. The process of spraying was carried out in the morning until the seedlings had absorbed all of the liquid, whereas the control treatment was sprayed with distilled water alone. One day before the process of spraying, the field was irrigated in order to reduce the concentration of solutes in the leaf cells. This was done in preparation for the spraying. This was accomplished by water entering the leaf, causing it to expand more, and opening the stomata, which, in turn, increased the quantity of spray solution ions that were able to permeate into the leaf cells. Water also entered the leaf, causing it to swell more [Al-Sahhaf (1989)].

2.1 Studied parameters

The availability of NPK components in the soil: The Keldal method and a Micro-Keldal device were used to determine the amount of available nitrogen in the soil. After the extraction and analysis of the ammonium, the NH_4^+ concentration was determined by using two molars of potassium chloride, and the nitrate concentration was lowered by employing the Devarda alloy.Regarding the available phosphorus, it was extracted from the ground utilizing the Olsen technique in conjunction with 0.5M sodium hydroxide. After that, it was evaluated with the assistance of a spectrophotometer (also called a spectrophotometer) operating at a wavelength of 882 nm. In spite of the fact that an estimation of the amount of accessible potassium was acquired by first extracting it with 1N NH4OAC at pH 7 and then measuring it with a flame measuring equipment, the procedures described in were adhered to for the most part.

The average concentration of mineral elements (NPK) in the leaves: Leaf samples were taken randomly from all parts of the seedling and for each replicate, then washed with distilled water to get rid of dust and impurities attached to it, and placed in perforated paper bags, then dried in an electric oven at a temperature of 70°C and until the dry weight was confirmed, then the samples were ground and analyzed by taking a sample weighing 0.2 gm for each replicate and comparing the results. Estimates of the amounts of the elements nitrogen,

Table 2: The effect of adding poultry waste and Foliar spray and their interaction on the medium available nitrogen in the soil.

Foliar fertilizer	Poultry waste ton/h				Average
gm/L	0	5	10	15	
0	54.3	57.2	59.7	61.4	58.15
3	58.9	60.7	63.2	65.6	62.10
6	64.7	67.9	69.5	72.5	68.65
9	69.4	71.6	74.3	79.8	73.78
Average	61.83	64.35	66.68	69.83	
$LSD_{0.05}$	Poultry waste	Foliar fertilizer	Interaction		
	3.04	3.04	6.08		

phosphorus, and potassium were obtained by applying the procedures described in Haynes (1980) for nitrogen, and John (1970) for phosphorus and potassium, respectively. Haynes' work focused on nitrogen, while John's research focused on phosphorus and potassium. In addition, the measurements for the vegetative growth requirements were obtained on November 15th, 2021, after the growing season had come to an end.

The height of the main stem in centimeters: A metric tape was used to measure the length of the main vegetative stem from the graft contact region to the root tip. This measurement was taken from the top of the main stem. In addition, the average length of the vegetative branches was measured for each experimental unit in one replicate, and then the average was calculated for each treatment. This was done for each treatment individually.

The number of leaves (number of leaves per seedling): After calculating the number of leaves for each seedling in the experimental unit, we computed the average number of leaves for each treatment. This allowed us to compare the effects of each treatment on the total number of leaves.

The typical surface area of the plant's leaves: It was measured in centimeter squares while the plant leaf was being printed on white paper, the area of the leaf on the plant was measured with a tool called a digital planimeter. This was done while the leaf was on the plant. After that, the lens of the apparatus was moved around the margins of the leaf three times before an average was determined and the area of the leaf that had been affected by each treatment was determined. After that, the total leaf surface area of the plant was measured.

3. Results and Discussion

It is clear from looking at Table 2 that the levels of organic matter have a significant impact on the typical amount of nitrogen that is made available in the soil after planting. The treatment that included the addition of fertilizer performed extraordinarily well at the level of 15 tons/ha and produced an average of 69.83 mg/kg, which was much greater than the treatment that did not include the addition of any fertilizer, which produced an average of 61.83 mg/kg. The treatment significantly outperformed the application of fertilizer at the level of (9 mg/l) and gave the highest average of 73.78 mg/kg in comparison to the control treatment, which consisted of spraying with distilled water only and gave the lowest average of 58.15 mg/kg. In terms of the application of Grow Green foliar fertilizer, the treatment significantly outperformed the application of fertilizer at the level of (9 mg/l). This transpired as a consequence of the fact that the Grow Green treatment performed noticeably better than the application of fertilizer at the level of 9 mg/l. The same data also demonstrates that there are significant differences between the various interaction combinations, which is somewhat surprising. The combination of spraying with foliar fertilizer at a level of 9 gm/L and applying organic fertilizer at a rate of 15 tons/h worked exceptionally well and produced the highest mean concentration of 79.8 mg/kg. The combination consisted of spraying with foliar fertilizer at the rate of 9 gm/L and applying organic fertilizer at the rate of 15 tons/h. Despite the fact that the interaction treatment resulted in the lowest mean concentration of 54.3 mg/kg (no organic fertilizer was added, and purified water was used in the spraying process),

3.1 The average available phosphorus in the soil after planting is mg/kg

When looking at Table 3, it is easy to see that the

Table 3: The effect of adding poultry waste and Foliar spray and their interaction on the average available phosphorous in the soil.

Foliar fertilizer	Poultry waste ton/h				Average
gm/L	0	5	10	15	
0	10.7	11.2	11.7	12.8	11.60
3	11.6	11.9	12.5	13.1	12.28
6	13.4	13.9	14.6	14.9	14.20
9	14.5	14.9	16.3	17.6	15.83
Average	12.55	12.98	13.78	14.60	
$LSD_{0.05}$	Poultry waste	Foliar fertilizer	Interaction		
	0.72	0.72	1.44		

Table 4: The effect of adding poultry waste and Foliar spray with manure and their interaction on the average available potassium in the soil.

Foliar fertilizer	Poultry waste ton/h				Average
g./L-1	0	5	10	15	
0	15.2	15.8	16.4	17.2	16.15
3	17.3	19.1	19.8	21.2	19.35
6	19.1	20.8	22.3	24.1	21.58
9	22.6	23.4	25.6	27.4	24.75
Average	18.55	19.78	21.03	22.48	
$LSD_{0.05}$	Poultry waste	Foliar fertilizer	Interaction		
	1.08	1.08	2.16		

amounts of organic matter had a significant impact on the average amount of phosphorus that was available in the soil after the crop was planted. This is evidenced by the fact that the amount of phosphorus that was present in the soil increased after the crop was planted. The treatment that did not add any fertilizer produced the lowest average of 12.55 mg/kg, while the treatment that added fertilizer at the rate of 15 tons per hour performed exceptionally well and produced the greatest average of 14.60 mg/kg. The lowest average was found in the treatment where fertilizer was added at a rate of 15 tons per hour, at 12.55 mg/kg. Compared to the control treatment, which consisted of merely spraying distilled water, the quantity of (9 gm/L) was substantial and resulted in the greatest average amount of 15.83 mg/kg being produced. The control treatment produced 11.60 mg/kg, which was the lowest amount. The same data reveals that there are discernible distinctions between the various interaction combinations. The combination treatment, which involved not applying organic fertilizer and spraying with distilled water, produced the greatest mean of 17.6 mg/kg, but the interaction treatment, which had the same two procedures, produced the lowest mean of 10.7 mg/kg. The combined treatment did incredibly well overall and ended up producing the highest average.

3.2 The available potassium in the soil after planting mg/kg

According to Table 4, the amounts of organic matter have a significant impact on the typical amount of potassium that is available in the soil after planting. This can be seen as an increase or decrease in the quantity of available potassium. The treatment that included adding fertilizer performed exceptionally well at the level of 15 tons/h and produced an average of 22.48 mg/kg, which was significantly higher than the treatment that included not adding any fertilizer, which produced an average of 18.55 mg/kg. Adding fertilizer resulted in a significantly higher yield. The treatment was significantly superior to the application of fertilizer at the level of (9 gm L^{-1}) and gave the highest average of 24.75 mg/kg in comparison to the control treatment, which consisted of spraying with distilled water only and gave the lowest average of 16.15 mg kg^{-1}. In terms of the application of the Grow Green foliar fertilizer, the treatment was significantly superior to the application of fertilizer at the level of (9 gm L^{-1}) and gave the highest average of 24.75 mg/kg. The same data also demonstrates that there are significant differences between the various interaction combinations, which is somewhat surprising. The interaction treatment (without adding organic fertilizer and spraying with purified

Table 5: The effect of adding poultry waste and spraying with foliar fertilizer and their interaction on the average nitrogen in the leaves.

Foliar fertilizer	Poultry waste ton/h				Average
g/1	0	5	10	15	
0	1.43	1.45	1.52	1.59	1.50
3	1.48	1.56	1.63	1.69	1.59
6	1.57	1.68	1.74	1.79	1.70
9	1.67	1.77	1.81	1.89	1.79
Average	1.54	1.62	1.68	1.74	
$LSD_{0.05}$	Poultry waste	Foliar fertilizer	Interaction		
	0.05	0.05	0.10		

Table 6: The effect of adding poultry waste and spraying with foliar fertilizer and their interaction on the average phosphorous in leaves.

Foliar fertilizer	Poultry waste ton/h				Average
gm/1	0	5	10	15	
0	0.28	0.3	0.31	0.33	0.31
3	0.31	0.35	0.38	0.41	0.36
6	0.34	0.37	0.41	0.44	0.39
9	0.39	0.42	0.44	0.47	0.43
Average	0.33	0.36	0.39	0.41	
$LSD_{0.05}$	Poultry waste	Foliar fertilizer	Interaction		
	0.02	0.02	0.04		

water) resulted in the lowest average of 15.2 mg kg^{-1}, whereas the combination treatment functioned remarkably well and resulted in the highest mean of 27.4 mg /gm. The combination used 15 tons ha^{-1} of organic fertilizer and sprayed 9 g L^{-1} of foliar fertilizer to the plant's canopy.

3.3 Nitrogen content in the leaves %

When looking at Table 5 it is easy to see that the quantities of organic matter had a significant impact on the average quantity of nitrogen that was discovered in the leaves after the planting procedure. This was the case because of the relationship between the two variables. The treatment that includes the application of fertilizer at a rate of 15 tons per hour performed extraordinarily well and generated the highest average of 1.74%. The treatment that did not include any fertilizer at all generated the lowest average yield, which was 1.54%. This was in contrast to the treatment that did include fertilizer. In reference to the method of applying the Grow Green foliar fertilizer by spraying it on the leaves the treatment was significantly superior to spraying fertilizer at a level of 9 gm/l and delivered the highest average of 1.79% in comparison to the control treatment, which consisted of spraying with simply distilled water and gave the lowest average of 1.50%. The treatment was also superior to spraying fertilizer at a level of 9 gm/l. The same data also demonstrates that there are significant differences between the various interaction combinations, which is somewhat surprising. In comparison to the overlap treatment, which produced an average of 1.80%, the combination performed remarkably well (15 tons/ h organic fertilizer + spraying at the level of 9 gm/ L foliar fertilizer), and it produced the maximum average of 1.89% (without adding organic fertilizer and spraying). Distilled water has the lowest average of all the other types of water, coming in at 1.43%.

3.4 Phosphorus content in the leaves %

According to Table 6, the amounts of organic matter had a significant impact on the typical quantity of phosphorous that was discovered in the leaves of the plant after it had been planted. The treatment was superior to the level of adding fertilizer (15 tons/h), and it produced the highest achievable average of 0.41%. In contrast to the condition in which no fertilizer was added at all, which produced the lowest average of 0.33%, our investigation revealed that. When it came to the foliar fertilizer application of Grow Green, the treatment performed extremely well on the application of fertilizer at the level of (9 gm/l), and it gave the highest

Table 7: The effect of adding poultry waste and spraying with foliar fertilizer and their interaction on average potassium in leaves.

Foliar fertilizer	Poultry waste ton/h				average
g/l	0	5	10	15	
0	1.92	1.95	1.97	2.08	1.98
3	1.95	1.98	2.06	2.16	2.04
6	2.11	2.17	2.26	2.34	2.22
9	2.19	2.25	2.36	2.45	2.31
Average	2.04	2.09	2.16	2.26	
$LSD_{0.05}$	Poultry waste	Foliar fertilizer	Interaction		
	0.08	0.08	0.16		

average of 0.43%. This was due to the fact that the treatment gave the most amount of fertilizer. This was attributable to the fact that the treatment greatly outperformed the control group in terms of the amount of fertilizer that was applied. These same statistics also show that there are substantial variances between the various interaction combinations. This is in contrast to the therapy that served as a control, which was simply the application of a spray made up of distilled water. The lowest overall average was achieved by using this treatment, which was 0.31%. The combination treatment was the most successful overall, yielding the highest average of 0.47%, whereas the interaction treatment yielded the least successful overall average of 0.28%. The combination included spreading organic fertilizer at a rate of 15 tons per liter and spraying foliar fertilizer at a concentration of 9 grams per liter.

3.5 The potassium content in the leaves %

According to Table 7, it can be seen that the quantities of organic matter had a significant impact on the typical amount of potassium that was discovered in the leaves after planting. This was the case because of the relationship between the two variables. The treatment had outstanding results in terms of the addition of fertilizer at the level of fifteen tons per hectare, which led to the highest average of 2.26%. The treatment of applying Grow Green foliar fertilizer was significantly superior to the application of fertilizer at the level of (9 gm/l) and gave the highest average of 2.31% when compared to the control treatment of spraying with distilled water only, which gave the lowest average of 1.98%. When compared to the treatment of not adding fertilizer, which gave the lowest average of 2.04%, the treatment of applying Grow Green foliar fertilizer was significantly superior. The same table also demonstrates that there are distinguishable differences between the interaction combinations that have been considered. The interaction therapy produced the lowest average of 2.45%, in contrast to the combination treatment, which produced the greatest average of 2.45%. Both treatments were administered in identical conditions. The combination therapy included the application of 15 tons/ha of organic fertilizer as well as the spraying of 9 gm/l of foliar fertilizer (without adding organic fertilizer and spraying). The use of unadulterated water led to an average concentration that was 1.92%, which was the lowest permissible value.

3.6 Average main stem length (cm)

Table 8 demonstrates that the levels of organic matter had a significant impact on the average length of the main stem of the seedling after it was planted. This was the case after the seedling had been germinated. The treatment was effective in that it added fertilizer at the rate of fifteen tons per hour, which led to the highest overall average of 71.75 centimeters being produced. In contrast to the treatment that did not involve the addition of any fertilizer, which resulted in the average height being the shortest at 57.65 centimeters, the treatment that did include the addition of fertilizer produced the highest average height. The treatment significantly excelled on the application of fertilizer at the level of (9 gm/l) and gave the highest average of 75.33 cm in comparison to the control treatment, which consisted of spraying with distilled water only and gave the lowest mean of 53.80 cm. In terms of the application of the Grow Green foliar fertilizer, the treatment significantly excelled on the application of fertilizer at the level of (9 gm/l). The same data also demonstrates that there are significant differences between the various interaction combinations, which is somewhat surprising. The combination treatment performed exceptionally well (15

Table 8: The effect of adding poultry waste and spraying with foliar fertilizer and their interaction on the average length of the main stem of the seedling.

Foliar fertilizer	Poultry waste ton/h				Average
gm/l	0	5	10	15	
0	48.6	52.6	55.7	58.3	53.80
3	53.4	58.2	64.7	69.5	61.45
6	61.2	65.4	69.8	74.5	67.73
9	67.4	72.8	76.4	84.7	75.33
Average	57.65	62.25	66.65	71.75	
$LSD_{0.05}$	Poultry waste	Foliar fertilizer	Interaction		
	3.26	3.26	6.52		

Table 9: The effect of adding poultry waste and spraying with foliar fertilizer and their interaction on the average number of leaves per seedling.

Foliar fertilizer	Poultry waste ton/h				Average
gm/l	0	5	10	15	
0	180.6	196.4	215.8	224.9	204.43
3	200.4	211.3	221.5	237.8	217.75
6	224.2	234.1	242.9	258.9	240.03
9	238.9	252.1	263.7	278.4	258.28
Average	211.03	223.48	235.98	250.00	
$LSD_{0.05}$	Poultry waste	Foliar fertilizer	Interaction		
	9.34	9.34	18.68		

tons/h of organic fertilizer and spraying at the level of 9 g L^{-1} of foliar fertilizer), which resulted in the largest mean of 84.7 cm. On the other hand, the interaction therapy brought about the lowest mean, which was 84.7 cm (without adding organic fertilizer and spraying) utilizing only water that has been filtered, the typical height was found to be 48.6 centimeters.

3.7 The average number of leaves (leaf/ seedlings)

The results in Table 9 show that the quantities of organic matter had a significant impact on the typical number of leaves that were produced by each seedling after they were planted. The treatment that did not add fertilizer resulted in the lowest mean number of leaves (211.03), while the treatment that added fertilizer at the level of 15 tons per hour performed exceptionally well and produced the highest mean number of leaves. This was in comparison to the treatment that did not add fertilizer, which resulted in the lowest mean number of leaves (250.00). The treatment significantly excelled on spraying the fertilizer at the level (9 gm/l) and gave the highest average of 258.28 leaves in comparison to the control treatment (spraying with distilled water only), which gave the lowest average of 204.43 leaves, as the same table indicates that there were Significant differences between the combinations of interaction, as well as the fact that there was a significant difference. As for the spraying of Grow Green foliar fertilizer, when compared to the interaction treatment (not adding organic fertilizer and spraying with distilled water), which produced the fewest leaves overall (180.6), the Grow Green foliar fertilizer spraying treatment significantly outperformed, whereas the combination treatment (15 tons/h organic fertilizer and spraying at a level of 9 gm/l foliar fertilizer) performed exceptionally well.

3.8 The average leaf area of seedling (cm^2)

According to Table 10, the levels of organic matter had a significant effect on the average leaf area of one seedling after planting. This can be seen in the data shown there. Simply glancing at the table, one can discern this information about the situation. The treatment was preferable to the addition of fertilizer at the level of fifteen tons per hour, and it produced the largest average of one thousand nine hundred eighty-eight centimeters. It gave the lowest mean of 1408.15 cm^2 compared to the treatment in which no fertilizer was added, which gave the lowest average of 1495.65 cm^2, with regard to the application of Grow Green foliar fertilizer, the treatment was significantly superior to the

Table 10: The effect of adding poultry waste and spraying with foliar fertilizer and their interaction on the average leaf area of seedling (cm2).

Foliar fertilizer	Poultry waste ton/h				Average
g/l	0	5	10	15	
0	1325.7	1385.4	1425.3	1496.2	1408.15
3	1415.2	1456.3	1517.8	1678.5	1516.95
6	1522.8	1587.7	1837.6	2134.5	1770.65
9	1718.9	1922.2	2325.4	2654.3	2155.20
Average	1495.65	1587.90	1776.53	1990.88	
$LSD_{0.05}$	Poultry waste	Foliar fertilizer	Interaction		
	121.82	121.82	243.64		

application of fertilizer at the level (9 gm/l) and gave the highest average of 2155.20 cm^2 in comparison to the control treatment (spraying with distilled water only), which gave the highest average of 2155.20 cm^2. Furthermore, the treatment exhibited substantial enhancements compared to the utilization of identical data. Additionally, the analysis reveals noteworthy disparities among the different interaction combinations, which is somewhat unexpected. The interaction treatment with distilled water resulted in the lowest average, which was 1325.7 cm^2, while the combination performed exceptionally well (15 tons/h organic fertilizer plus spraying at the level of 9 g/l foliar fertilizer), and it resulted in the highest average of 2654.3 cm^2, whereas the interaction treatment (without adding organic fertilizer and spraying) resulted in the lowest average.

The information that was presented in Tables 2-10 demonstrated that organic fertilization with poultry waste at a level of 15 tons ha^{-1} and spraying Grow Green nutrient solution at a concentration of 9 gm/l had a significant advantage over conventional fertilization in terms of both increasing the soil content of ready-made nitrogen, phosphorus, and potassium elements and the leaf content of these elements, as well as improving the characteristics of vegetative growth in the investigate plants. The tables presented in this study provided evidence of the impact of organic fertilization. It is possible that this is due to the chemical role that organic fertilizers play, which is represented by the fact that they are the fundamental material for nourishing the revitalization of the soil. Another possibility is that this is due to the fact that organic fertilizers are more environmentally friendly. This, in turn, adds to making it easier for the elements to be released from their compounds and ready for usage in the soil solution. This is due to the fact that this makes it easier for the elements to be freed from their compounds. This is one reason why organic fertilizers are considered to be so vital. The buffering capacity of the soil is maintained by the organic matter thanks to the competition that takes place on the surface of the soil granules between organic compounds containing the hydroxyl ion and organic compounds containing the phosphate ion. The hydrogen that is released as a by-product of the reaction between carboxylic aggregates and water makes this possible. Phosphorus is involved in a wide variety of interactions, particularly adsorption reactions, and organic matter has been shown to have a substantial influence on these processes. Organic matter, which has a negative charge due to the presence of humus, has the ability to reduce the amount of phosphorus that is retained in the soil by chelating other ions, such as iron, aluminium, and calcium. The negative charge of organic stuff makes this phenomenon observable and explicable. In addition, the carbon dioxide gas that is produced during the decomposition of organic matter and that is dissolved in the soil solution will lead to the formation of carbonic acid, which will in turn dissolve some phosphate compounds, as well as the formation of phosphohumic complexes in the soil solution that prevent it from sedimentation [Al-Azzawi (2010)]. Alternatively, the reason may be due to the role of organic matter (poultry waste) through its containment of organic acids and other organic compounds [Judy (2012)]. Or, it could be due to the fact that organic fertilizer contains humic and fulvic acids, both of which contain a high percentage of the nitrogen element, which works to increase the stored carbohydrates, which helps to increase the strength of vegetative growth and increases the efficiency of photosynthesis, both of which are reflected positively on plant growth indicators. Lastly, it could be due to the fact that organic fertilizer is more cost effective than synthetic fertilizer [Al-Ahbabi (2011)]. It is also possible to credit it to the

beneficial role that humate plays in the plant's ability to absorb nutrients. The availability of nutrients in the soil and the transfer of those nutrients are both improved by the use of humate, particularly the availability of the smaller nutrients. The amine group in humic acids has the ability to absorb the negative phosphate ion, which improves the phosphate's availability to the plant. This is because humate acts to improve the availability of nutrients in the soil and the transfer of those nutrients [Ali *et al.* (2012)]. In addition, humic acids lower the activity of the enzyme known as IAA oxidase, which in turn causes an increase in the activity of the hormone known as auxin. Humic acids are found in humus, which is found in the soil (IAA). It is well established that auxin plays a part in promoting the growth of plants and the development of their roots. Additionally, humic acids boost the ability of the soil to retain a variety of different components [Al-Hayani *et al.* (2016)]. It is to everyone's advantage that the addition of humic acids to soil or plants results in an enrichment of such substances with nutrients and a significant boost in the plant's tolerance to the effects of drought and high temperatures. Adding humic acids to soil or plants results in an enrichment of such substances with nutrients. Humic acid increases the concentration of these compounds in plant tissues. Furthermore, it enhances the root system, leading to faster development. In addition to this, it brings about an improvement in the root group, which, as a consequence, experiences higher growth. Concerning the function served by the nutrient solution, it is possible that this is due to the fact that it already possesses a predetermined proportion of the various types of nutrients. These nutrients include nitrogen, phosphorus, and potassium, in addition to some of the necessary microelements in the formation of amino acids, nucleic acids, and important enzymes in increasing vegetative growth and the emergence of the chlorophyll molecule, which is the basis of the photosynthesis process, which in turn increases the proportion of manufactured foodstuffs increasing the vegetative growth rates of the plant, such as the length and thickness of the plant, as well as the number of leaves and the surface area of their leaves which increases both the total area covered by their leaves and the total number of leaves they produce.

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