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STUDY OF THE EFFECT OF PRUNING LEVEL, GROWTH REGULATOR CPPU AND THE ADDITION OF ORGANIC FERTILIZER ON THE CHARACTERISTICS OF VEGETATIVE GROWTH AND LEAF CONTENT OF (K-P-N) FOR THE GRAPES (*VITIS VINIFERA* L.) VAR. OLIVETTE NOIER

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Abstract

The study was carried out in one of the orchards of the Yaiji District, Kompetler village in Kirkuk Governorate for the season 2019-2020, on the grape variety Olivette Noier variety cultivated on the cabin, to understand the response of grapevines to three levels of pruning (8-11-14 eye/ vine) with a fixed number of canes (10 cane/ vine). As well as, the spraying growth regulator CPPU with three concentrations (0, 2.5 and 5 mg.L^{-1}) and the addition of organic fertilizer with three concentrations (0, 3 (recommended) and 4.5 mg.L^{-1}) and their effect on vegetative growth characteristics according to the split-plot design with three replicates. The results showed that the pruning level (140 eyes/ vine) caused a significant increase in the characteristics of the number of leaves, as it reached (551.6 leaves/ vine), while the percentage of dry matter in leaves by 24.24%. Besides, the pruning level (80 eyes/ vine) exceeded in the leaf area, leaf content of chlorophyll, leaf content of nitrogen, phosphorus, and potassium by (19.36 cm^2, 421.4 mg.100 g^{-1} fresh weight 2.489%, 0.803%, and 1.922%), restively. Also, spraying with CPPU at a concentration (5 mg.L^{-1}) caused a significant increase in the characteristics of the number of leaves, the percentage of dry matter in leaves, the leaf area, leaf content of chlorophyll, leaf content of nitrogen, phosphorus and potassium by (651.3 leaves/ vine, 29.70%, 23.16 cm^2, 280.4 mg.100 g^{-1} fresh weight, 2.763%, 0.918%, and 2.038%), respectively. Whereas the addition of liquid organic fertilizer at the concentration (4.5 ml.L^{-1}) caused a significant increase in the characteristics of the number of leaves, percentage of dry matter in leaves, leaf area, leaf content of chlorophyll, leaf content of nitrogen, phosphorus and potassium by (546.4 leaves/ vine, 24.56%, 18.86) cm^2, 235.1 mg.100 g^{-1} fresh weight, 2.372%, 0.731%) and 1.883%), respectively. The results also confirm that all the bilateral interactions recorded significant differences except the bilateral interaction between (M × E) in the characteristic and the leaf content of chlorophyll did not record significant differences, while the leaf content of potassium, it did not record significant differences between the bilateral interactions. The results also confirm between the triple interactions that there were significant differences between all the characteristics under study.
Keywords: Pruning level, Growth Regulator CPPU, The addition of organic fertilizer, Grapes Olivette Noier Variety.

Introduction

Grapes (*Vitis vinifera* L.) is one of the oldest cultivation of plants known to humans, which cultivated in most countries of the world. In Iraq, its cultivation has spread since ancient times and is considered one of the oldest grape-growing habitats in the world, and its cultivation has been known in the cabin during the Assyrians 'era before 2440 BC (Al-Saeedi, 2000). However, it has many varieties are all beneficial, and everything in its fruits from dandruff, pulp, and seeds is beneficial, as it has a laxative effect on the intestine and reduces the incidence of heart, liver, and colon diseases to show its properties against infections. Besides, its juice has many benefits that help to dissolve urolithiasis and for treating the diarrhea and pulmonary lesions (Al-Mawsly, 2012). Statistics of the Food and Agriculture Organization of the United Nations showed that the areas planted with grapes in the world were 181658 hectares and the production amount reached 78901866 tons of grapes for the year (2017) (FAO, 2018). The production of grapes in Iraq was estimated to (99444) tons for the summer season (2017), and the average productivity of one tree was (28.16) kg for the year (2017) (Central Agricultural Statistics System, 2018). Several researchers have found, through recent studies and researches, that annual pruning, using the foliar application of growth regulator CPPU, and the addition of organic fertilizer to the soil has overcome some basic and major problems in decreasing the characteristics of vegetative growth (Zoffoli *et al.*, 2009). Pruning is one of the most important agricultural processes upon which the success of cultivating and producing grapes depends and leads to a balance between vegetative and fruiting growth. It works to open the heart of the vine to light and air to reach every part of it, which increases the absorption of water and food and strengthens it and makes it carried good branches and fruits with a regular shape (Qasim *et al.*, 2012). In a study of (Atrushi, 2009) on Zark grapes variety with three levels of pruning by 16-24-32 eye/ vine, that the level 32 eye/ vine exceeded in the number of total leaves and the dry weight of leaves, while the level 16 eye/vine exceeded in the chlorophyll content. Moreover, (Ameer, 2013) found through a study on grape Flame Seedless variety with three levels of pruning were 2, 3, 4 and 5 eyes on the cross-section of the stem / cm^2, that the level 2 eye exceeded on the rest of the levels in the leaf area, nitrogen and phosphorous reached (0.34-0.36%) and the potassium in the leaves. (Farhan *et al*., 2018) pointed out upon studying on four levels of pruning (2-4-5-6 eye/cane) on the local grape, white intensity variety that the pruning of 5 eye/cane caused a significantly increased in the number of leaves the leaf area. Also, (Al-Atrushy, 2019) observed through studying on the Mirane grape variety with four levels of pruning (36- 44- 48- 64 eye/ vine), that level 36 eye/ vine caused a significant increase in the leaf area and the total chlorophyll content. Among the foliar application of plant growth regulators that leads to improving the quality, size of grape grains, and vegetative growth (Nampila, 2010). The CPPU is a type of industrial Cytokinines and its common name is Forchlorfenuron, and its molecular formula $C_{12}H_{10}ClN_3O$, which is a white crystalline substance that was used in increasing vegetative growth and consequently increases the amount of yield because it increases cell division (Dimovska, 2014). (Bhat *et al*., 2011) stated through their using growth regulators with the following concentrations (2 PPM of CPPU + 0.4 PPM of Brassinosteriod + 25 PPM of GA) on Flame Seedless seedlings that, the above concentrations caused a significant increase in the number of leaves, leaf area and the dry matter content in the leaves. Furthermore, (AL-ahbaby 2016) observed that there was a significant increase in the variety Halawani in terms of the number of leaves, leaf area, total chlorophyll, dry weight of leaves. In addition to leaf content of nitrogen and potassium during the studying of two varieties of grape Halawani and *Vitis vinifera* L. seedlings with a spraying interaction between the growth regulator (KT- 30 at a concentration of 10 mg.L^{-1} + Brassinolide at a concentration of 0.010 mg.L^{-1}). The addition of the organic fertilizer EVREGREEN- Plus organic fertilizer that consists of (NPK, organic acids, amino acids and seaweed), which is one of the humus compounds. It has many chemical properties among them it contribute to improving plant growth directly or indirectly because it works as a biostimulant (Al-Ta'i, 2010). It represents a medium that transferring nutrients from the soil to the plant and can bind with the positive ions and forming chelating compound and retaining ketones that are absorbable by the plant roots. As well as, stimulates the release of oxidizable substances that include insoluble substances in water such as tannins and beta-carotene and contains important nutrients, especially Nitrogen, Phosphorus, and Potassium. Besides, it improves soil structure and its physical and chemical properties and decrease the number of soil reaction (Al-Araji and Al-Hamdani, 2012). The adding of organic fertilizer consisting of (NP by 18:18) at four levels (0-2-4-6 g for seedling) on *Vitis vinifera* L. seedlings showed that level 4 g caused a significant increase in the number of leaves. Also, the leaf area, the dry weight of leaves, the total chlorophyll in the leaves, and the leaf content of nitrogen and phosphorus (Hammoud *et al*., 2013). Whereas (Birjely and Al-Atrushy, 2017) used organic and inorganic fertilizers on grapevines variety *Vitis vinifera* L. As (ammonium sulfate 100 g.tree^{-1} + organic fertilizer 6 kg.tree^{-1} + humic acid at a concentration of 4 g.tree^{-1}) caused a significant increase in the leaf area, the dry weight of leaves, the leaf content of chlorophyll, and the leaf content of nitrogen, phosphorous and potassium. As for variety (Olivette Noier) , it is distinguished as one of the table grape varieties, as it has good conical or cylindrical-conical clusters, the grains are oval, similar to the olive. As well as, the thick crust is covered with a thick waxy layer of a dark red color, the leaves are triple lobed and smooth on both sides, the flowers are normal hermaphrodites, and require a pruning with long- canes, ripening in July (Al-Saeedi, 2000). Finally, this study aims to find out the grapevines respond to the pruning level, spraying CPPU, the addition of liquid organic fertilizer to form an optimal vegetative growth balanced with the fruiting energy of the Olivette Noier grape variety.

Materials and Methods

This study was carried out during the growing seasons 2019-2020 in one of the orchards of the Yaiji District, Kompetler village in Kirkuk Governorate. The main aim of this research was to study the effect of pruning levels (80, 110 and 140 eye/ vine) symbolized as (M_1, M_2, and M_3), respectively, by 10 fruit canes at the end of January, the vines were at the age of 7 years and were placed on the cabin with a height of 2.15 m. As well as, spraying CPPU in three concentrations (0, 2.5, and 5 mg. L^{-1}) symbolized as (C_1, C_2, and C_3), which sprayed twice at 15/3, and 30/3, respectively, in the early morning until full wetness, as for the comparison vines, they were sprayed with distilled water only. Finally, the adding of organic fertilizer at concentrations (0, 3 (recommended) and 4.5 mg.L^{-1}) symbolized as (E_1, E_2, and E_3), and was added on 10/3, 10/4, 10/5 after diluting it with a liter of distilled water, where it was added after making a half-circle hole near the stem of the vine. The split-plot design was used in this experiment, the main plots were used for the pruning level and the sub-plots were used for the CPPU, as for sub-sub-plot, they were used for the organic fertilizer with three replicates. Moreover, one grapevine was chosen as an experimental unit for each treatment, so the number of grapevines used equals (81) vines. The data were analyzed statistically using the commercial Gene state statistical program, the averages were compared using the least significant different LSD test at the 5% probability level (Mohammedi and Muhammadi, 2012), and the study included the following treatments:

The characteristics of vegetative growth

1- **The total number of leaves on the vine (leaf.vine^{-1}):** it was calculated according to the following equation: *Total number of leaves = number of leaves for the main branches on the vine + the number of leaves for the side branches on the vine*

2- **Percentage of dry weight in leaves (%):** Completely grown leaves samples were taken by 10 leaves per vine, washed well with distilled water, then air-dried and weighed by the sensitive balance. Then placed in perforated paper bags and dried in an oven at a temperature of 70 ºC for 72 hours until the weight is constant. Finally, the dry samples are weighed and the percentage of the dry weight to the fresh weight (Al-Sahaf, 1989) is calculated according to the following equation: -

Percentage of dry weight in leaves = (dry weight / fresh weight) x100

3- **The leaf area (cm^2):** The average full-width leaf area calculated by taking 10 leaves of the vine and weighed after separating the petioles from the leaves and the leaves were stacked on top of each other. Then perforated by a cork borer with a diameter of 1 cm with an area of 0.785 cm^2, the leaves, and the cutting circles were placed in an oven at a temperature of 65 ºC for 72 hours until the weight remains constant. The average leaf area was calculated as mentioned by (Dvornic, 1965) as follows:-

$$Leaf\ area\ (cm2) = \frac{dry\ leaf\ weight\ (g) \times area\ of\ the\ cutten\ circle (cm2)}{dry\ weight\ of\ the\ cutten\ circle\ (g)} \div 10$$

4- **The leaf content of chlorophyll (mg.100g^{-1} fresh weight)**: The leaf content of chlorophyll was estimated according to the method of (Goodwin, 1976), as 10 leaves were taken from each vine and washed with distilled water. A weight of 0.2 g from the sample taken and placed in a dark glass bottle with the addition of 20 ml acetone at a concentration of 85% after adding sodium carbonate to prevent dye oxidation and left for 48 hours. Then the leachate was separated from the sediment using filter paper and was read it with a Spectrophotometer at the wavelengths of 645 and 663 nm, then the amount of total chlorophyll pigment was calculated (mg dye.100g^{-1} fresh leaf tissue) according to the following equation:

$$Total\ chlorophyll\ (mg.L-1) = 20.2\ x\ D\ (645) + 8.02\ x\ D\ (663)$$

Where:-

D = Optical density.

$D_{(663)}$ = Optical absorption reading at 663 nm wavelength.

$D_{(645)}$ = Optical absorption reading at 645 nm wavelength.

Then the amount of chlorophyll was converted from mg. L^{-1} to mg.100g^{-1} fresh weight according to the following equation: -

$$The\ amount\ of\ chlorophyll\ mg.100g-1 = \frac{chlorophyll\ mg.L-1}{1000x\ sample\ weight} \times 100$$

5- **The leaf content of (N-P-K)%:** The leaves were taken after separating their petioles from different areas and dried in an electric oven at a temperature of 65 ° C until the weight remained constant. They were crushed and 0.2 g of the crushed sample was taken, the samples were digested by adding 4 ml of concentrated sulfuric acid and 2 ml of concentrated perchloric acid (Jones and Steyn, 1973), where the elements were determinate as follows:

a. The Micro Kjeldahl device was used to determine the Nitrogen according to the method mentioned in (Jackson, 1958).

b. The ammonium molybdate was used to determine the phosphorus, where the measuring achieved by the Spectrophotometer device at a wavelength of 882nm, according to the method described in (Page, 1982).

c. The flame photometer was used to determine the Potassium according to the method mentioned in (Haynes, 1980).

Results

The total number of leaves on the vine (leaf.vine^{-1})

The results in Table 1 indicated that the pruning levels have a significant effect, as the treatment M_3 exceeded and reached (551.6 leaf.vine^{-1}) over the treatment M_1 which amounted to (483.9 leaf.vine^{-1}). As for spraying CPPU, it resulted in significant differences, as the treatment C_3 was superior significantly and gave the highest averages, as it reached (651.3 leaf.vine^{-1}) over the treatment C_1 which reached (393.1 leaf.vine^{-1}). As for the addition of organic fertilizer, the treatment E_3 was exceeded and reached (546.4 leaf.vine^{-1}) over the treatment E_1 that reached (491.4 leaf.vine^{-1}). The results also confirm that there were significant differences between the bilateral interactions (M × E), where ($M_3 \times E_3$) was superior and achieved (572.2) compared to a treatment ($M_1 \times E_1$) which achieved (456.0), as well (C × E). The treatment ($C_3 \times E_3$) was superior and achieved (663.6) compared to the treatment (C_1 x E_1) that reached (353.6), while (M x C), the treatment (M_3 x C_3) was superior and achieved (686.0) compared to the treatment (M_1 x C_1) that reached (354.8). As for the triple interactions, the results also showed that there were significant differences between the treatments, as the treatment (M_3 x C_3 x E_3) was exceeded and reached (693.5 leaf.vine^{-1}) compared to the comparison (M_1 x C_1 x E_1) that reached (309.1 leaf.vine^{-1}).

Percentage of dry weight in leaves (%)

The results in Table 2 indicated that the pruning levels have a significant effect in increasing the percentage of dry weight in leaves, as the treatment M_3 exceeded and reached (24.24%) over the treatment M_1 which amounted to (22.62%). As for spraying CPPU, it resulted in significant differences, as the treatment C_3 was superior significantly and gave the highest averages, as it reached (29.70%) over the treatment C_1 which reached (17.63%). However, the addition of organic fertilizer, the results showed that the treatment E_3 was exceeded and reached (24.56%) over the treatment E_1 that reached (22.05%). Also, the results confirm that there were significant differences between the bilateral interactions (M × E), as ($M_3 \times E_3$) was superior and achieved (25.04%) compared to a treatment ($M_1 \times E_1$) which achieved (21.13%), as well (C × E). The treatment ($C_3 \times E_3$) was superior and achieved (31.25%) compared to the treatment (C_1 x E_1) that reached (17.32%), while (M x C), the treatment (M_3 x C_3) was superior and achieved (31.60%) compared to the treatment (M_1 x C_1) that reached (16.91%). As for the triple interactions, the results showed that there were significant differences between the treatments, as the treatment (M_3 x C_3 x E_3) was exceeded and reached (31.83%) compared to the comparison (M_1 x C_1 x E_1) that reached (16.69%).

Leaf area (cm^2)

The results in Table 3 indicated that the pruning levels have a significant effect, as the treatment M_1 exceeded and reached (19.36 cm^2) over the treatment M_3 which amounted to (17.54 cm^2). As for spraying CPPU, it resulted in significant differences, as the treatment C_3 was superior significantly and reached (23.16 cm^2) over the treatment C_1 which reached (14.09 cm^2). The addition of organic fertilizer, the results showed that the treatment E_3 was exceeded and reached (18.86 cm^2) over the treatment E_1 that reached (18.11 cm^2). The results confirm that there were significant differences between the bilateral interactions (M × E), as the treatment ($M_1 \times E_3$) was superior and achieved (19.54 cm^2) compared to a treatment ($M_3 \times E_1$) which achieved (17.13 cm^2), as well (C × E). Furthermore, the treatment ($C_3 \times E_3$) was superior and achieved (23.33 cm^2) compared to the treatment (C_1 x E_1) that reached (13.36 cm^2), while (M x C), the treatment (M_3 x C_3) was superior and achieved (24.08 cm^2) compared to the treatment (M_1 x C_1) that reached (13.15 cm^2). Finally, the results showed that there were significant differences between the treatments, as the treatment (M_3 x C_3 x E_3) was exceeded and reached (24.28 cm^2) compared to the comparison (M_1 x C_1 x E_1) that reached (12.36 cm^2).

The leaf content of chlorophyll (mg.100g^{-1} fresh weight)

The results in Table 4 indicated that the pruning levels have a significant effect, as the treatment M_1 exceeded and reached (241.4 mg.100g^{-1} fresh weight) over the treatment M_3 which amounted to (203.1 mg.100g^{-1} fresh weight). As for spraying CPPU, it resulted in significant differences, as the treatment C_3 was superior significantly and gave the highest averages reached (208.4 mg.100g^{-1} fresh weight) over the treatment C_1 which reached (135.6 mg.100g^{-1} fresh weight). The addition of organic fertilizer, the results showed that the treatment E_3 was exceeded and reached (235.1 mg.100g^{-1} fresh weight) over the treatment E_1 that reached (208.6 mg.100g^{-1} fresh weight). The results showed that there were significant differences between the bilateral interactions (M × E), while the treatment (C × E) was recorded significant differences. Treatment ($C_3 \times E_3$) was superior and achieved (289.3) compared to the treatment (C_1 x E_1) that reached (124.4), whereas (M x C), the treatment (M_3 x C_3) was superior and achieved (290.0) compared to the treatment (M_1 x C_1) that reached (113.8 mg.100g^{-1} fresh weight). As for the triple interactions, the results showed that there were significant differences between the treatments, as the treatment (M_3 x C_3 x E_3) was exceeded and reached (296.1 mg.100g^{-1} fresh weight) compared to the comparison (M_1 x C_1 x E_1) that reached (103.7 mg.100g^{-1} fresh weight).

Leaf content of nitrogen (%)

The results in Table 5 indicated that the pruning levels have a significant effect, as the treatment M_1 exceeded and reached (2.489%) over the treatment M_3 which amounted to (1.976%). As for spraying CPPU, it resulted in significant differences, as the treatment C_3 was superior significantly and gave the highest averages reached (2.763%) over the treatment C_1 that reached (1.813%). The addition of organic fertilizer, the results showed that the treatment E_3 was exceeded and reached (2.372%) over the treatment E_1 that reached (2.122%). The results showed that there were significant differences between the bilateral interactions (M × E), while the treatment (C × E) was recorded significant differences. Treatment ($C_3 \times E_3$) was superior and achieved (2.827%) compared to the treatment (M_1 x E_1) that reached (1.666%), while (M x C), the treatment (M_3 x C_3) was superior and achieved (2.905%) compared to the treatment (M_1 x C_1) that reached (1.474%). As for the triple interactions, the results showed that there were significant differences between the treatments, as the treatment (M_3 x C_3 x E_3) was exceeded and reached (2.960%) compared to the comparison (M_1 x C_1 x E_1) that reached (1.373%).

Leaf content of phosphorus (%):

The results in Table 6 indicated that the pruning levels have a significant effect, as treatment M_1 exceeded and reached (0.803%) over the treatment M_3 which amounted to (0.629%). As for spraying CPPU, it resulted in significant differences, as the treatment C_3 was superior significantly and gave the highest averages reached (0.918%) over the treatment C_1 that reached (0.499%). The addition of organic fertilizer, the results showed that the treatment E_3 was exceeded and reached (0.731%) over the treatment E_1 that reached (0.671%). The results showed that there were significant differences between the bilateral interactions (M × E), where the (M_1 x E_3) reached (0.827%) compared to the treatment (M_3 x E_1) that reached (0.609%), while the treatment (C × E) was recorded significant differences. Furthermore, treatment ($C_3 \times E_3$) was superior and achieved (0.961%) compared to the treatment (C_1 x E_1) that reached (0.475%), whereas (M x C), the treatment (M_3 x C_3) was superior and achieved (1.104%) compared to the treatment (M_1 x C_1) that reached (0.456%). As for the triple interactions, the results showed that there were significant differences between the treatments, as the treatment (M_3 x C_3 x E_3) was exceeded and reached (1.117%) compared to the comparison (M_1 x C_1 x E_1) that reached (0.438%).

Leaf content of potassium (%)

The results in Table 7 indicated that the pruning levels have a significant effect, as the treatment M_1 exceeded and reached (1.922%) over the treatment M_3 which amounted to (1.823%). As for spraying CPPU, it resulted in significant differences, as the treatment C_3 was superior significantly and gave the highest averages reached (2.038%) over the treatment C_1 that reached (1.678%). The addition of organic fertilizer, the results showed that the treatment E_3 was exceeded and reached (1.883%) over the treatment E_1 that reached (1.853%). The results showed that there were no significant differences between the bilateral interactions for treatments. As for the triple interactions, the results showed that there were significant differences between the treatments, as the treatment (M_3 x C_3 x E_3) was exceeded and reached (2.113%) compared to the comparison (M_1 x C_1 x E_1) that reached (1.638%).

Table 1 : The effect of pruning levels, spraying CPPU and the addition of organic fertilizers and their interactions in the percentage of dry weight in leaves (%) of the Olivette Noier grape variety for the 2019 season

Total number of leaves on the vine (leaf. vine^{-1})					
Pruning levels	**CPPU mg.L^{-1}**	**Organic fertilizer (ml.L^{-1})**			**M X C**
		E_1	**E_2**	**E_3**	
M_1	C_1	309.1	335.6	419.9	354.8
	C_2	468.4	478.6	508.5	485.2
	C_3	590.5	615.7	629.4	611.8
M_2	C_1	357.2	382.7	439.0	393.0
	C_2	484.6	523.0	536.1	514.6
	C_3	644.2	655.8	667.9	656.0
M_3	C_1	394.4	445.3	455.2	431.6
	C_2	495.0	548.6	568.0	537.2
	C_3	679.3	685.1	693.5	686.0
LSD 0.05		4.373			2.694
Organic fertilizer averages		491.4	518.9	546.4	
LSD 0.05		1.467			
C x E					
		E_1	E_2	E_3	C averages
C_1		353.6	387.8	438.0	393.1
C_2		482.6	519.7	537.5	512.3
C_3		638.0	652.2	663.6	651.3
LSD 0.05		2.580			2.008
M x E					
		E_1	E_2	E_3	M averages
M1		456.0	476.6	519.2	483.9
M2		459.3	520.5	547.7	512.2
M3		522.9	559.7	572.2	551.6
LSD 0.05		2.537			1.605

Table 2 : The effect of pruning levels, spraying CPPU and the addition of organic fertilizers and their interactions in the percentage of dry weight in leaves (%) of the Olivette Noier grape variety for the 2019 season

Percentage of dry weight in leaves (%)					
Pruning levels	**CPPU mg.L^{-1}**	**Organic fertilizer (ml.L^{-1})**			**M X C**
		E_1	**E_2**	**E_3**	
M_1	C_1	16.69	16.88	17.17	16.91
	C_2	20.29	22.48	24.25	22.34
	C_3	26.41	28.64	30.79	28.61
M_2	C_1	17.40	17.63	18.11	17.71
	C_2	20.81	22.64	24.49	22.65
	C_3	26.58	28.98	31.14	28.90
M_3	C_1	17.88	18.35	18.58	18.27
	C_2	21.02	22.87	24.71	22.87
	C_3	31.37	31.58	31.83	31.60
LSD 0.05		0.090			0.061
Organic fertilizer averages		22.05	23.05	24.56	
LSD 0.05		0.028			
C x E					
		E_1	E_2	E_3	C averages
C_1		17.32	17.62	17.95	17.63
C_2		20.71	22.66	24.49	22.62
C_3		28.12	29.73	31.25	29.70
LSD 0.05		0.051			0.041
M x E					
		E_1	E_2	E_3	M averages
M1		21.13	22.67	24.07	22.62
M2		21.59	23.08	24.58	23.09
M3		23.43	24.27	25.04	24.24
LSD 0.05		0.053			0.038

Table 3 : The effect of pruning levels, spraying CPPU and the addition of organic fertilizers and their interactions in the leaf area (cm^2) of the Olivette Noier grape variety for the 2019 season

Leaf area (cm^2)					
Pruning levels	**CPPU $mg.L^{-1}$**	**Organic fertilizer ($ml.L^{-1}$)**			**M X C**
		E_1	**E_2**	**E_3**	
M_1	C_1	12.36	12.72	14.36	13.15
	C_2	17.31	17.53	18.09	17.64
	C_3	21.72	21.82	21.95	21.83
M_2	C_1	12.86	14.76	14.52	14.04
	C_2	17.83	18.30	18.47	18.20
	C_3	23.38	23.59	23.76	23.58
M_3	C_1	14.88	15.11	15.27	15.08
	C_2	18.80	18.91	19.07	18.93
	C_3	23.87	24.09	24.28	24.08
LSD 0.05		0.059			0.034
Organic fertilizer averages		18.11	18.54	18.86	
LSD 0.05		0.020			
C x E					
		E_1	E_2	E_3	C averages
C_1		13.36	14.20	14.72	14.09
C_2		17.98	18.25	18.54	18.25
C_3		22.99	23.17	23.33	23.16
LSD 0.05		0.035			0.026
M x E					
		E_1	E_2	E_3	M averages
M1		19.18	19.37	19.54	19.36
M2		18.02	18.88	18.92	18.61
M3		17.13	17.36	18.13	17.54
LSD 0.05		0.034			0.020

Table 4 : The effect of pruning levels, spraying CPPU and the addition of organic fertilizers and their interactions in the leaf content of chlorophyll ($mg.100g^{-1}$ fresh weight) of the Olivette Noier grape variety for the 2019 season

Leaf content of chlorophyll ($mg.100g^{-1}$ fresh weight)					
Pruning levels	**CPPU $mg.L^{-1}$**	**Organic fertilizer ($ml.L^{-1}$)**			**M X C**
		E_1	**E_2**	**E_3**	
M_1	C_1	103.7	112.8	124.9	113.8
	C_2	209.3	230.1	240.9	226.7
	C_3	255.4	271.4	279.7	268.8
M_2	C_1	127.3	133.4	136.6	132.4
	C_2	232.5	260.6	274.6	255.9
	C_3	250.6	279.7	290.4	273.6
M_3	C_1	142.3	159.0	180.7	160.6
	C_2	273.2	282.2	292.1	282.5
	C_3	283.4	290.5	296.1	290.0
LSD 0.05		6.636			5.571
Organic fertilizer averages		208.6	224.4	235.1	
LSD 0.05		1.743			
C x E					
		E_1	E_2	E_3	C averages
C_1		124.4	135.0	147.4	135.6
C_2		230.8	256.8	268.6	252.1
C_3		270.7	281.3	289.3	280.4
LSD 0.05		5.484			5.562
M x E					
		E_1	E_2	E_3	M averages
M1		225.4	243.0	255.7	241.4
M2		211.0	225.4	234.4	223.6
M3		189.5	204.7	215.2	203.1
LSD 0.05		N.S			2.051

Table 5 : The effect of pruning levels, spraying CPPU and the addition of organic fertilizers and their interactions in the leaf content of nitrogen (%) of the Olivette Noier grape variety for the 2019 season

Leaf content of nitrogen (%)					
Pruning levels	**CPPU mg.L^{-1}**	**Organic fertilizer (ml.L^{-1})**			**M X C**
		E_1	**E_2**	**E_3**	
M_1	C_1	1.373	1.480	1.570	1.474
	C_2	1.616	1.826	2.130	1.857
	C_3	2.523	2.583	2.683	2.596
M_2	C_1	1.730	1.826	2.056	1.871
	C_2	1.953	2.213	2.320	2.162
	C_3	2.736	2.786	2.840	2.787
M_3	C_1	1.896	2.120	2.266	2.094
	C_2	2.413	2.466	2.526	2.468
	C_3	2.856	2.900	2.960	2.905
LSD 0.05			0.067		0.044
Organic fertilizer averages		2.122	2.244	2.372	
LSD 0.05			0.021		
C x E					
		E_1	E_2	E_3	C averages
C_1		1.666	1.808	1.964	1.813
C_2		1.994	2.168	2.325	2.163
C_3		2.705	2.756	2.827	2.763
LSD 0.05			0.042		0.031
M x E					
		E_1	E_2	E_3	M averages
M1		2.388	2.495	2.584	2.489
M2		2.140	2.275	2.405	2.273
M3		1.837	1.963	2.127	1.976
LSD 0.05			N.S		0.012

Table 6 : The effect of pruning levels, spraying CPPU and the addition of organic fertilizers and their interactions in the leaf content of phosphorus (%) of the Olivette Noier grape variety for the 2019 season

Leaf content of phosphorus (%)					
Pruning levels	CPPU mg.L^{-1}	Organic fertilizer (ml.L^{-1})			M X C
		E_1	E_2	E_3	
M_1	C_1	0.438	0.454	0.466	0.453
	C_2	0.597	0.608	0.665	0.623
	C_3	0.791	0.802	0.868	0.820
M_2	C_1	0.479	0.493	0.500	0.490
	C_2	0.683	0.693	0.701	0.692
	C_3	0.881	0.893	0.898	0.891
M_3	C_1	0.509	0.570	0.583	0.554
	C_2	0.759	0.769	0.782	0.770
	C_3	0.906	1.104	1.117	1.104
LSD 0.05			0.021		0.017
Organic fertilizer averages		0.671	0.710	0.731	
LSD 0.05			0.015		
C x E					
		E_1	E_2	E_3	C averages
C_1		0.475	0.506	0.516	0.499
C_2		0.680	0.690	0.716	0.695
C_3		0.859	0.933	0.961	0.918
LSD 0.05			0.013		0.011
M x E					
		E_1	E_2	E_3	M averages
M1		0.725	0.814	0.827	0.803
M2		0.681	0.693	0.700	0.685
M3		0.609	0.621	0.666	0.629
LSD 0.05			0.011		0.010

Table 7 : The effect of pruning levels, spraying CPPU and the addition of organic fertilizers and their interactions in the leaf content of potassium (%) of the Olivette Noier grape variety for the 2019 season

Leaf content of potassium (%)					
Pruning levels	**CPPU mg.L^{-1}**	**Organic fertilizer (ml.L^{-1})**			**M X C**
		E_1	**E_2**	**E_3**	
M_1	C_1	1.638	1.643	1.635	1.644
	C_2	1.793	1.847	1.857	1.833
	C_3	1.986	1.991	2.002	1.993
M_2	C_1	1.666	1.680	1.690	1.679
	C_2	1.867	1.877	1.893	1.879
	C_3	2.004	2.037	2.052	2.031
M_3	C_1	1.705	1.709	1.715	1.710
	C_2	1.954	1.964	1.976	1.964
	C_3	2.068	2.093	2.113	2.091
LSD 0.05		0.029			N.S
Organic fertilizer averages		1.853	1.871	1.883	
LSD 0.05		0.010			
C x E					
		E_1	E_2	E_3	C averages
C_1		1.670	1.677	1.686	1.678
C_2		1.871	1.896	1.909	1.892
C_3		2.019	2.040	2.055	2.038
LSD 0.05		N.S			0.018
M x E					
		E_1	E_2	E_3	M averages
M1		1.909	1.922	1.935	1.922
M2		1.846	1.865	1.878	1.863
M3		1.806	1.827	1.837	1.823
LSD 0.05		N.S			0.013

Discussion

The pruning levels increase the number of total leaves by leaving levels of eyes on the vine, and the reason is due to the increase in the numbers of the main branches at the high pruning level as shown in Table 1. Therefore, the relationship is directly between the number of branches and the number of main leaves because with the increase in the number of eyes, the number of branches formed on vine increases (Poenaru, 1980; Atrushi, 2009; Farhan *et al*., 2018). Whereas the increase in the percentage of dry matter in leaves as shown in Table 2 was due to the increase in leaf area through production food by photosynthesis and increasing the carbohydrates produced in the leaves. Additionally, the increase in the leaf chlorophyll content at the lower level of pruning as shown in Table 4 was due to the increase in the leaf area as shown in Table 3. Besides the efficiency of the leaves in production chlorophyll by drawing nitrogen to it and thus the synthesis of amino acids and proteins and synthesis vital parts of the vine, including green plastids that contain half total nitrogen content 70% of the leaf nitrogen that contributes to the synthesis of chlorophyll pigments (As-Sahaf, 1989; Author, 2014; Al-Obaidi, 2017). However, the increase in nitrogen, phosphorus, and potassium as shown in Tables 5-6-7 at the low pruning level, it may be due to an increase in the productivity and sizes of leaves, which improved the photosynthesis process. Since phosphorous is necessary for normal growth and photosynthesis and regulates many processes of metabolism and absorbs by a high level from the plant tissue. (Tucker, 1999; Ameer, 2013; Al Duri, 2014; Al Bayati, 2015). Pruning works on penetrates the light inside the vine, which increases the efficiency of photosynthesis, and these results are consistent with (Atrushi, 2009; Farhan *et al*., 2018). The increase in the number of leaves as shown in Table 1 due to the role of cytokinin in the formation of axillary buds on vegetative growth and thus developing of the chloroplast, which in turn affects physiological processes such as photosynthesis and respiration. As well as, the transfer of nutrients from the root to the leaf that leads to an increase in the leaf area as shown in Table 3 by increasing the cells division, their differentiation, elongation, and delays in aging (Zhang and Whiting, 2013; Zeng *et al*., 2016). Moreover, the increase in dry weight of leaves as shown in Table 2, may due to an increase in the internal hormonal content. Cytokinin stabilizes the CO_2 molecule in the photosynthesis process by affecting the effectiveness of carbonic anhydrase enzyme, which increases the absorption of CO_2, and this increases the dry weight (Bhat *et al*., 2011; Sadeghi and Shekafandeh, 2014). Chlorophyll increasing as a result of forming chloroplasts with light, forming a chlorophyll pigment, preventing its decomposition and increasing the efficiency of photosynthesis, which leads to an increase in the number of leaves that reflects positively on the amount of chlorophyll (Davies, 2004; Samurai, 2016; Al-Mamouri, 2018). In addition, Cytokinin has a physiological and vital role in stimulating the vital activities of trees in increasing root growth, which increases the susceptibility of the vine to absorb nutrients. Similarly, it increases the opening of stomata, which increases transpiration, and this speeds up the process of absorption and water evaporation, so the elements accumulate in leaves (Cakmakc *et al*., 2006; Al-Mamouri, 2018). It also plays a role in increasing vital functions, secondary metabolism and carbonic fixation, which facilitates the movement of the elements, thus increasing the leaf content of K-P-N (Paridan and Anniekak, 2009; Samurai, 2016), and these results are consistent with (Bhat *et al*., 2011; AL-ahbaby, 2016). The increase in the number of leaves and the leaf area as shown in Tables 1-3 was due to that the liquid organic fertilizer containing the major elements, some amino and organic acids. As well as, vitamins, plant hormones substance that have a role in encouraging elongation and division of cells, improving the physical characteristics by increasing the readiness of nutrients and their absorption by the root hairs of vines. Likewise, a fertilizer containing NPK elements contribute effectively to increase the vital processes of forming the basic compounds of photosynthesis and respiration processes, which leads to the accumulation of produced materials in plant tissues. Also, it transfers the surplus of them to the plant parts and the shoot and thus positively reflected on the increase of the dry matter in the leaves as shown in Table 2, (Osman *et al*., 2010; Hammoud *et al*., 2013; Al-Amir 2017). The increasing in leaf content of chlorophyll as shown in Table 4 is due to the role of this fertilizer in processing nutrients for the plant, especially nitrogen, as it is included in the synthesis of amino acids and protein that contribute to synthesis vital parts, including plastids (Taiz *et al*., 2006; Kaabi, 2015). The organic fertilizer also increases the leaf content of these elements by increasing the activity and effectiveness of microorganisms and bacteria, especially *Azotobactor chroococcum*, which increases the root absorption of these elements and their transmission to the vegetative parts of the vine (El-Shenawy and Fayed, 2005; Al-Bayati, 2015). Finally, it also works to reduce the pH, which increases the readiness of nutrients at the root hairs region (Al-Araji and Al-Hamdani, 2012) and increases its absorption and transmission to the parts of the vine and then increases the leaf content of these elements, these results are consistent with (Hammoud *et al*., 2013; Birjely and Al-Atrushy,2017).

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