Journal of Plant Production

Journal homepage: www.jpp.mans.edu.eg
Available online at: www. jpp.journals.ekb.eg

Effect of Foliar Spray with Molybdenum and Iron on Vegetative Growth and Nutritional Status of Pear Trees

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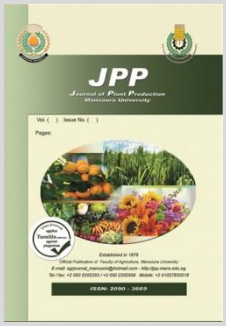

ABSTRACT

This investigation was carried out during 2018 and 2019 growing seasons on 12- year- old Le Conte pear trees (*Pyrus communis L.X Pyrus pyrifolia N.*) budded on *Pyrus betulaefolia* rootstock, planted at 5 × 5 meters apart in sandy soil under drip irrigation system. These study included effected of foliar spray with Mo at 1% and 3%, Fe 1000ppm at and 3000ppm on some Vegetative measurements and Nutritional status. The results showed that, foliar spray with the Mo at 3% and Fe at 1000ppm was the best in some vegetative growth measuremant i.e.(trunk diameter, shoot length, shoot diameter, no.of leaves per shoot and leaf area) and Nutrtional status i.e.(photosynthetic pigment, N, P, K, Fe, Mn, Zn, Ca and Mg). foliar spray with Mo at 3% and Fe at 3000ppm came in the second rank in this respect. Besides, foliar spray with each individual Fe at 3000ppm lonely without Mo, as well as foliar spray with Fe at 1000ppm and Mo at 3% alone were less effective in increasing these properties and subsequently arranged in the third rank in this respect. On the other hand, the untreated trees with any of the investigated treatments was the inferior one in this respect as it recorded the least value of these parameters, followed in ascending order by spraying with Mo at 1% during both seasons of study.

Keywords: Molybdenum- Iron- Vagative Growth- Pear Trees

INTRODUCTION

Pear (*Pyrus spp.*) is native to family Rosaceae. It is one of the most celebrated of deciduous fruits. "Le-Conte" pear cultivar budded on *Pyrus betulaefolia* rootstock is grown and widely spread in new reclaimed lands in Egypt. Pear fruits are greatly required for their high nutritive value and high net return.

Microelements deficiency is rarely caused through insufficient in the soil but usually because it is rendered unavailable for the uptake by alkaline soil conditions. Fruit trees grown in calcareous soils suffer from microelements deficiency mainly because the reduction of their availability as they form insoluble complex with the calcium carbonate (Swietlik, 2002). This problem of high pH of calcareous soils is often described as lime induced chlorosis. This problem affects photosynthesis reaction, nucleic acid metabolism and protein biosynthesis.

Foliar micronutrient is one method which enhances plant nutritional status during the growing season especially when the soil conditions are not suitable for the absorption of elements such as, high soil pH, presence of calcium carbonate and loss by washing Mohamad *et al.,* (2017). Microelements are essential for fruit trees growth, yield and fruit quality Atallah *et al*., (2010) stated that Fe, Zn and Mn are of the most important micronutrients for pears grown in calcareous or alkaline soils, in the Mediterranean zone climate.

Plants need iron to produce chlorophyll and to activate several enzymes including those involved in the oxidation /reduction processes of photosynthesis and respiration. Iron increases photosynthesis and carbohydrate synthesis and in reproductive growth of fruit in organs of the plant acts as a strong sink (Sohrab *et al*., 2013). Iron is also necessary for vital plant metabolic function such as chlorophyll synthesis, various enzymatic reaction, respiration and photosynthesis given that the main product of photosynthesis is sugar, so increasing the photosynthesis, lead to increase the sugar compounds and cause more soluble solids in fruit juice (Ram and Bose, 2000).

Molybdenum is a trace element essential for plant growth. However, apartfromits function innitrate reductase, there is little known about the function of molybdenum in higher plants (Agarwala *et al*., 1979). Molybdenum deficiency (Mo-deficiency) in Merlot is suggested to occur in cool, wet seasons (Williams *et al*., 2004) or when it is grown in low pH soils with high concentrations of adsorbing oxides such as iron, manganese and aluminium (Kaiser *et al*., 2005).

Effects of Mo-treatment on vine molybdenum status and vegetative growth In Australia, own-rooted Merlot vines have a reputation as being difficult to establish in the first few years. Young Merlot vines commonly show vegetative symptoms such as zig-zag shoot growth, inky epidermis and rolled leaves with burnt margins. Collectively, this has become known as the 'Merlot problem' (Robinson and Burne, 2000).

The main goal from this work study the effect of Mo and Fe foliars spray on vegetative growth and nutritional status of Le-Conte pear trees.

MATERIALS AND METHODS

This investigation was carried out during 2018 and 2019 growing seasons on 12- year- old Le-Conte pear trees (*Pyrus communis L.*X *Pyrus pyrifolia N.*) budded on *Pyrus betulaefolia* rootstock, planted at 5 × 5 meters apart (168 trees / feddan) in sandy soil under drip irrigation system and grown at El-Kassasien Horticultural Research Station, Ismailia

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DOI: 10.21608/jpp.2020.110574

Governorate. Twenty seven fruitful "Le-Conte" pear trees were carefully selected and devoted for this work.

Those trees were similar in their growth vigor, size, shape and diseases - free as well as they received the same Horticulture managements adopted in such Station, included the organic fertilization with compost at the rate of 25kg/tree on December and NPK mineral fertilizers which were added at the recommended rate by the Ministry of Agriculture (450, 100 and 500 g N, P and K per tree/ year, respectively) in the two seasons of study through drip irrigation system. The chemical fertilizers doses were added as soil applications into three equal doses at first week of March, second week of May and first week of July. ammonium nitrate (NH_4NO_3, 33.5 % N) was used as a source of nitrogen at1321g, mono Calcium phosphate (15.5 % PO_5) at 645 g and potassium sulphate (high dissolve, 50% K_2O) was used as a source of potassium at1000g of both seasons.

Mechanical and chemical analysis of orchard soil have been carried out prior to the first season according to the methods described by Piper (1947) and Jackson (1967) as shown in Table (1).

Table 1. Physical and chemical analysis of the experimental orchard soil.

Physical characteristics %		Chemical characteristics	
Field capacity	11.77	$CaCO_3$ %	12.25
Available water	7.54	Organicmatter %	0.08
Wilting point	4.23	pH	7.50
Coarse sand	67.01	EC (ds/m)	2.14
Fine sand	9.5	Ca(mg/100g)	0.14
Silt	0.7	Na (mg/100g)	0.34
Clay	5.2	K (mg/100g)	0.16
Texture class	Sandy	Cl (mg/100g)	0.30

Rate and method of the investigated materials application will be summarized briefly as follows:

Molybdenum Foliar Spray

Agro leen (Commeriac name) was used as source of Mo which contains (3 %Mo and 1 % Br). Mo was used in two doses 0.5 and 1.5 cm/L, each dose was sprayed in early flowering, after fruit set and one month after fruit harvesting.

Iron as Foliar Spray

Ferrous sulphate ($FeSO4.7H_2O$) was used as source of iron in two concencentrations 1 and 3 g/L, each one was sprayed three different times, early flowering, after fruit set and one month after fruit harvesting.

The two investigated materials including:

Molybdenum and Iron were arranged and designed in different combinations in order to build up the skeleton of the following eight investigated treatments beside the control.

T1. Water spray (untreated control)
T2. Mo 0.5 cm / L / tree / dose
T3. Mo 1.5 cm / L / tree / dose
T4. Fe 1g / L / tree / dose
T5. Fe 3g / L / tree / dose
T6. Mo 0.5 cm / L / dose + Fe 1g / L / tree / dose
T7. Mo 0.5 cm / L / dose + Fe 3g / L / tree / dose
T8. Mo 1.5 cm / L / dose + Fe 1g / L / tree / dose
T9. Mo 1.5 cm / L / dose + Fe 3g / L / tree / dose

The extent to which trees responded to the treatments was examined by stadying the following factors:

1. Vegetative measurements:

Vegetative growth measurements of Le-Conte pear trees as affected by the differential investigated nine fertilization treatments were evaluated through determining the response of the following parameters: increase percentage of trunk diameter (ITD), length and diameter of new shoots, number of leaves per shoot , average leaf area and its fresh, dry weight. Hence, four main branches well distributed around the tree periphery (each toward one direction) were carefully chosen and labeled then the following growth parameters were estimated:

The increase percentage in trunk diameter (ITD %):

Trunk diameter for each individual tree was measured twice at height about 20 cm from the trunk base. The first (initial) measurement was done on the 1st week of Dec, (2017,2018) for both seasons just before fertilizer addition, while the second one (final) was preformed at the end of each experimental season early Nov, (2018,2019) years for1st and 2nd season, respectively. The increase percentage of trunk diameter (ITD) was calculated according to the following equation:

$$\textbf{ITD} = \frac{\textbf{final trunk diameter} - \textbf{initial trunk diameter}}{\textbf{Initial trunk diameter}} \times 100$$

Average shoots length and thickness (diameter):

Both shoot length (cm.) and diameter in mm for 40 shoots per each individual tree (10 from every direction/labeled limbs) were determined when the length was ceased in the last week of August then the average was calculated during each experimental season i.e., 2018 and 2019 years.

Average number of leaves per shoot:

Total number of leaves which have been already developed on each of the forty tagged shoots per each individual tree (replicate) were counted and recorded in the last week of August, and then the average number of leaves per shoot was estimated

Average leaf area and its Fresh and dry weight:

In mid-August 2018&2019 years during1st and 2nd seasons respectively, samples of twenty mature leaves were collected by picking the fifth one from the top (5th node) of the previously labeled shoots, then leaf area was measured by using the planimeter (model cl-203, incUSA). These leaves were wiped with a damp cloth to eliminate dust and weighted in fresh then oven dried at 70 °C till constant weight, and later leaf dry weight in g was estimated.

2. Leaf nutritional status (leaf chemical composition):

Leaf photosynthetic pigment content:

Representative fresh leaf samples of the same physiological age and position (at the 4-6th leaf from the base) were taken in mid of August and photosynthetic pigments (chlorophyll a, b and carotene) were calorimetrically determined according to Mackinney (1941).

Leaf mineral contents:

Leaf nutrient contents (macro and micro elements) were determined in the oven dried leaf samples (4-6th leaf from the base) which were collected in the last week of August. Then the following analyses were estimated:

Total Nitrogen (g/100g DW):

Total nitrogen content of dried leaves samples was determined by the modified micro-Kjeldahl method as described by Plummer (1971).

Total phosphorus (g/100g DW):

Total leaf phosphorus content was determined using a Spekol spectrophotometer at 882.0 UV according to the method described by Murphy and Riely (1962).

Leaf K, Ca, Mg, Fe, Zn and Mn contents: were determined by using the Atomic Absorption Spectrophotometer (3300) according to Jackson (1973) and Wild *et al.,* (1985).

Leaf nutrient elements contents were expressed as a ratio of the leaf dry weight, i.e., percentage for the macro-elements (N, P, K, Ca and Mg) and part per million (ppm) with micro-nutrient elements (Fe, Zn and Mn).

Statistical Analysis:

All the obtained data in the two seasons of study were statistically analyzed using the analysis of variance (ANOVA) according to Snedecor and Cochran (1980). However, M.Static program was used to compare between means of treatments according to (Waller and Duncan, 1969) at probability of 5%.

RESULTS AND DISCUSSION

1. Vegetative growth measurements:

Regarding some Vegetative growth measurements of Le-Conte pear trees in response to foliar spray Mo and Fe, data presented in Tables (2 and 3) indicate that, there were significant differences among the studied treatments. Hence, the best values of the studied parameters were detected with Mo and Fe foliar spray (Mo at 3% and Fe at 1000ppm) treatment was in the top of the treatments evaluation. followed by Mo and Fe foliar spray(Mo at 3% and Fe at 3000ppm) came in the second rank in this respect. In addition, sprayed trees with Fe (T4 and T5) came after the abovementioned two treatments (T6 and T7) and an subsequently occupied the third rank in this respect. On the other way around, the reverse was true with untreated trees (control-T1) which exhibited the lowest value of some Vegetative growth measurements. as it was the inferior one in this respect followed in ascending order by Mo at 0.5cmL /tree (T2).These results coincided with those found by Asaad (2014) sprayed "Anna" apple trees with three concentrations of Sitofex (5 ppm, 10 ppm and 15 ppm) accompanied by three concentrations of mixed micronutrients (10 gm Fe + 7 gm Mn + 3.5 gm Zn /20 L water, 10 gm Fe + 7 gm Mn + 7 gm Zn/20 L water and l0 gm Fe + 7gm Mn + l 0.5gm Zn/20L water) recorded the highest values of vegetative growth parameters (shoot diameter, shoot length).Also, Abd-Elmegeed *et al.,* (2013) on "Le-Conte" pear trees (*Pyrus communis x Pyrus pyrifolia*). indicated that, application of Potassium sulphate at 0.1%, Copper sulphate at 0.02%, Sequestrated zinc at 0.04%, Sequestrated iron at 0.06% and Mixed nutrients applied three times during the growing season starting immediately after fruit set and at 21 days intervals. They mentioned that, mixed nutrition's gave the highest results in this trend. This treatment resulted in the best vegetative growth parameters.

Table 2. Effect of foliar spray with molybdenum and iron on increment (%) in trunk diameter, shoot length and shoot diameter of "Le-Conte" pear trees during 2017-2018 and 2018-2019 experimental seasons.

Parameters	Increment % in trunk diameter		Shoot length(cm)		Shoot diameter(cm)	
Seasons / Treatments	2018	2019	2018	2019	2018	2019
T1- Water spray (untreated control)	17.71 d	17.85c	38.47 d	38.93	0.57 e	0.57 e
T2- Mo 0.5 cm / L / tree / dose	17.95 c	18.21bc	43.07 d	43.43	0.63 d	0.64 d
T3- Mo 1.5 cm / L / tree / dose	18.00 c	18.44b	42.53 d	43.13	0.64 d	0.65 d
T4- Fe 1gm / L / tree / dose	18.00 c	18.36b	43.60d	44.17	0.67cd	0.68 cd
T5- Fe 3gm / L / tree / dose	17.95 c	18.14bc	43.70 d	44.10	0.66cd	0.67 cd
T6- Mo 0.5 cm/L + Fe 1g/L	18.16 bc	18.49 b	51.80 c	52.56 c	0.70 c	0.71 c
T7- Mo 0.5 cm/L + Fe 3g/L	18.06 c	18.41 b	60.33 b	61.02 b	0.75 b	0.76 b
T8- Mo 1.5 cm/L + Fe 1g/L	18.71 a	19.11 a	69.23 a	70.17 a	0.82 a	0.83 a
T9- Mo 1.5 cm/L + Fe 3g/L	18.26 b	18.55 b	68.30 a	68.97 a	0.80 a	0.81 a

Table 3. Effect of foliar spray with molybdenum and iron on No. of leaves/ shoot, average leaf area (cm^2), ,leaf fresh weight (g) and Leaf dry weight of "Le-Conte" pear trees during 2017-2018 and 2018-2019 experimental seasons.

Parameters	No. of leaves/shoot		Average leaf area (cm^2)		Leaf fresh weight (g)		Leaf dry weight (g)	
Seasons / Treatments	2018	2019	2018	2018	2018	2019	2018	2019
T1- Water spray (untreated control)	17.33 e	17.67 e	26.17 d	26.15 d	7.04 e	7.08 e	3.73 c	3.97 c
T2- Mo 0.5 cm / L / tree / dose	19 de	19.33de	26.28 d	26.39 d	7.70 de	7.77 d	4.37 b	4.43 b
T3- Mo 1.5 cm / L / tree / dose	19 de	19.67cde	26.77bcd	26.93bcd	8.27 cd	8.38cd	4.69 b	4.72 b
T4- Fe 1gm / L / tree / dose	19.67cde	20.00cde	26.41 cd	26.59cd	8.41bcd	8.48bcd	4.50 b	4.57 b
T5- Fe 3gm / L / tree / dose	21.33bcd	21.67bcd	27.23bcd	27.35bcd	8.47bcd	8.53bcd	4.87 b	4.92 b
T6- Mo 0.5 cm/L + Fe 1g/L	23 ab	23.33ab	27.63 bc	27.76bc	8.97 bc	9.05bc	4.80 b	4.87 b
T7- Mo 0.5 cm/L + Fe 3g/L	21 bcd	21.67bcd	27.90 b	28.10b	9.31 b	9.39 b	4.53 b	4.59 b
T8- Mo 1.5 cm/L + Fe 1g/L	24 a	24.67 a	29.94 a	30.19 a	11.05 a	11.11 a	5.80 a	5.89a
T9- Mo 1.5 cm/L + Fe 3g/L	22 abc	22.33bc	29.54 a	29.70 a	10.64 a	10.73 a	5.74 a	5.79a

2. Leaf nutritional status:

Leaf photosynthetic pigments.

Concerning leaf photosynthetic pigments (chl. A, B and carotenoids) content of le-conte pear trees as impacted by the different investigated treatments , data presented in Table (4) obviously display that, parameters were significantly responded to the tested treatments. Hence, the highest values of investigated parameters were associated with the two following treatments: when the trees were foliar spray with Mo at 3 % + Fe at 1000 ppm and Mo 3% + Fe 3000 ppm, as such treatments maximized leaf (chl. A, B and carotenoids) content.

Meanwhile, sprayed trees with Mo and Fe (T7 and T6) reflected an acceptable increment of chlorophyll A, B and carotenoids and in turn both treatments ranked the second in this respect. In addition, sprayed trees with Fe alone (Fe 1000 ppmT4 and Fe 3000 ppm T5) and Mo alone (Mo 3% T3 and Mo 1% T2) occupied the third rank in this respect. Such trend was true during both seasons of study. On the other hand, the least value of leaf chl. A, B and carotenoids content was observed with either untreated trees (T1) a content during both seasons of study. These results are in accordance with those found by Eman *et al.,* (2010) on Le Conte Pear trees reported

that, application of 1000 g of magnetite/tree had the highest levels of total leaf chlorophyll content. Also, El-Sheikh *et al*., (2007). on "Florida Prince and Desert Red" peach trees combinations of chelate at the rate of 0.7g/L Fe, 0.3 g/L Zn and 0.3 g/L Mn or combinations of Zn, Mn, Fe sulphate at 0.5 g/L. indicated that, spraying the tress twice or thrice yearly was more effective than spraying once a year and control in improving chlorophyll a, b content of both peach trees.

Table 4. Effect of foliar spray with molybdenum and iron on chlorophyll a and b and Carotenoids (mg/100g.f.w) of "Le-Conte" pear trees during 2017-2018and 2018-2019 experimental seasons.

Parameters	Chlorophyll a (mg/100g.f.w)		Chlorophyll b (mg/100g.f.w)		Carotenoids (mg/100g.f.w)	
Seasons / Treatments	2018	2019	2018	2019	2018	2019
T1- Water spray (untreated control)	0.61 d	0.61 e	0.51 d	0.51 d	0.53 d	0.54 d
T2- Mo 0.5 cm / L / tree / dose	0.64 c	0.64 d	0.55 bc	0.57 bc	0.56cd	0.56 d
T3- Mo 1.5 cm / L / tree / dose	0.65 c	0.66 cd	0.58 b	0.59 b	0.59 c	0.59 c
T4- Fe 1gm / L / tree / dose	0.67 c	0.67 c	0.58 b	0.58 b	0.59 c	0.59 c
T5- Fe 3gm / L / tree / dose	0.66 c	0.65 d	0.54 c	0.55 c	0.55cd	0.56 d
T6- Mo 0.5 cm/L + Fe 1g/L	0.76 b	0.77 b	0.67 a	0.68 a	0.68 b	0.69 b
T7- Mo 0.5 cm/L + Fe 3g/L	0.75 b	0.75 b	0.66 a	0.67 a	0.67 b	0.68 b
T8- Mo 1.5 cm/L + Fe 1g/L	0.80 a	0.81 a	0.69 a	0.70 a	0.73 a	0.74 a
T9- Mo 1.5 cm/L + Fe 3g/L	0.79 a	0.80 a	0.68 a	0.69 a	0.70 b	0.71 b

Leaf mineral content:

With respect to leaf mineral content of le-conte pear trees i.e.,N, P, K, Ca, Mg, Fe, Zn and Mn as affected by the different investigated treatments, data presented in Table (5 and 6) indicated that, sprayed with Mo and Fe foliar spray each at (3% Mo + Fe 1000 ppm T8).was the most effective treatment in enhancing and maximizing leaf mineral content.

Meanwhile, spraying with Mo and Fe foliar spray each at 3% Mo + Fe 3000 ppm T9 as well as spraying with either Mo and Fe (T6) came in the second rank in this respect during both seasons of study. In addition, sprayed trees with Fe alone (Fe 1000 ppmT4 and Fe 3000 ppm T5) or Mo alone (Mo 3% T3) and Mo alone (Mo 1% T2) occupied the third rank in this respect. On the other hand, the least value of leaf mineral content was recorded with untreated trees (T1).such trend was true during both seasons of study. These results are in harmony with those reported Naiema (2008) reported that foliar spraying with Aminofert (20% amino acids, 12% organic acids and 3.6% chelated micro-element), and a mixture of chelated (Fe, Zn, and Mn) caused a pronounced increase in leaf N,Fe,Zn and Mn, while leaf P decreased in Le-Conte pear trees.

Table 5. Effect of foliar spray with molybdenum and iron on N, P,K, Ca and Mg (%) of "Le-Conte" pear trees during 2017-2018 and 2018-2019 experimental seasons.

Parameters	N %		P %		K %		Ca %		Mg %	
Seasons / Treatments	2018	2019	2018	2019	2018	2019	2018	2019	2018	2019
T1- Water spray (untreated control)	2.13 d	2.13 d	0.169 c	0.165 e	2.12 e	2.13 f	1.22 d	1.22 e	0.136 e	0.136 e
T2- Mo 0.5 cm / L / tree / dose	2.197 c	2.20 c	0.170 b	0.171 d	2.21 d	2.21 e	1.31 c	1.32 d	0.142 d	0.143 d
T3- Mo 1.5 cm / L / tree / dose	2.227 c	2.24 c	0.173 b	0.174 cd	2.23cd	2.24 de	1.34 c	1.34 d	0.145 d	0.145 d
T4- Fe 1gm / L / tree / dose	2.23 c	2.23 c	0.173 b	0.174 cd	2.22 d	2.22 e	1.37 c	1.38 cd	0.143 d	0.144 d
T5- Fe 3gm / L / tree / dose	2.213 c	2.22 c	0.174 b	0.175 cd	2.21 d	2.22 e	1.34 c	1.34 d	0.142 d	0.143 d
T6- Mo 0.5 cm/L + Fe 1g/L	2.327 b	2.33 b	0.177 b	0.178 c	2.25 c	2.26 d	1.42 b	1.42 c	0.151 c	0.153 c
T7- Mo 0.5 cm/L + Fe 3g/L	2.320 b	2.33 c	0.176 b	0.177 cd	2.28 b	2.29 c	1.46 b	1.47 b	0.152 c	0.152c
T8- Mo 1.5 cm/L + Fe 1g/L	2.396 a	2.40 a	0.188 a	0.189 a	2.40 a	2.40 a	1.62 a	1.63 a	0.166 a	0.167a
T9- Mo 1.5 cm/L + Fe 3g/L	2.347 b	2.35 b	0.183 a	0.184 b	2.38 a	2.38 b	1.58 a	1.59 a	0.161 b	0.161b

Table 6. Effect of foliar spray with molybdenum and iron on Fe, Zn and Mn (ppm) of "Le-Conte" pear trees during 2017-2018 and 2018-2019 experimental seasons.

Parameters	Fe (ppm)		Zn (ppm)		Mn (ppm)	
Seasons / Treatments	2018	2019	2018	2019	2018	2019
T1- Water spray (untreated control)	83.47 f	83.90f	40.10 e	40.38e	41.90 f	42.13f
T2- Mo 0.5 cm / L	86.34 e	86.97ef	43.07 d	43.34d	44.33e	44.72e
T3- Mo 1.5 cm / L	87.79 de	88.14ef	43.43 d	43.84cd	46.48d	46.88d
T4- Fe 1gm / L	89.11 d	89.76d	44.57 c	44.76c	47.20d	47.59d
T5- Fe 3gm / L	89.73 d	93.66d	46.32 b	46.65b	46.54d	46.94d
T6- Mo 0.5 cm/L + Fe 1g/L	99.53 c	100.47c	46.53 b	46.96b	48.61c	48.86c
T7- Mo 0.5 cm/L + Fe 3g/L	98.68 d	99.29c	47.47 b	47.75b	49.10c	49.51c
T8- Mo 1.5 cm/L + Fe 1g/L	109.67 a	110.58a	49.93 a	50.26a	53.56a	54.02a
T9- Mo 1.5 cm/L + Fe 3g/L	105.19 b	105.89b	49.07 a	49.73a	51.92b	52.32b

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تأثيرالرش بالموليبدينوم والحديد على النمو الخضرى والحالة التغذوية لأشجار الكمثرى

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تم اجراء هذه التجربة خلال موسمين الدراسة 2018و2019 على أشجار الكمثرى الليكونت عمر 12 عام المطعوم على اصل البتشيلفوليا المنزرعه على مسافه 5× 5 أمتار في التربة الرملية تحت نظام الري بالتنقيط . وذلك لدراسة تأثير الرش الورقي بالمولبدينم بمعدل 0.5 سم / لتر و 1.5سم/ لتر ، والحديد1 جم/ لترو 3جم / لتر على بعض القياسات الخضرية والحالة الغذائية لاشجار الكمثرى الليكونت وأظهرت النتائج أن الرش الورقي مع المولبدينم بمعدل 1.5سم/ لتر والحديد بمعدل 1 جم/ لتر كان الأفضل في بعض قياسات النمو الخضري مثل. (قطر الجذع ، طول الفرخ ، قطر الفرخ ، عدد الأوراق في كل فرخ ومساحة الورقة) والحالة الغذائية مثل(صبغات الكلوروفيل ، نيتروجين ، فوسفور ، بوتاسيم ، حديد ، منجنيز ، زنك ،ماغنسيم,كالسيم) و جاء الرش الورقي بالمولبدينم بمعدل 1.5سم/ لتر والحديد عند 3 جم/ لتر في المرتبة الثانية في هذا الصدد .إلى جانب ذلك ، كان الرش الورقي مع الحديد منفردا عند 3 جم/ لتر بدون المولبدينم ، وكذلك الرش الورقي بالحديد بمعدل 1 جم/ لتر و المولبدينم بمعدل 0.5 سم / لتر فقط أقل فاعلية في زيادة هذه الصفات وبالتالي تم ترتيبه في المرتبة الثالثة في هذا الصدد .من ناحية أخرى ، كانت الأشجار غير معاملة بأي من المعاملات التي تم دراستها هي الأقل شأنا في هذا الصدد حيث سجلت أقل قيمة لهذه القياسات ، متبوعة بترتيب تصاعدي بالرش با لمولبدينم بمعدل 0.5 سم / لتر خلال موسمي الدراسة.