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The Effect of the size of the bulbs and the type of fertilizer In the number and length of leaves and flower production in (*Lilium longiflorum)*

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Abstract

Due to the importance of *Lilium longiflorum* plant as crop produced for flowering bulbs of beautiful colors and aromatic scent, which gives purity and beauty to the environment in it, and spread it cultivated in America, Europe, and Japan as flowering plants and cut flowers, not to mention cultivation in the provinces of *Lilium longiflorum* plant as a Syria (Hama - Damascus – Lattakia)
The research was conducted to study the effect of the type of fertilizer and the bulbs' size planted on the number and length of leaves and the number of flowers of the fleshy lily plant under Hama's conditions. The experiment was designed according to the splinter sectors. The main factor is the type of fertilizer, and its number is(5) / sheepskin manure, poultry manure, metallic balanced, metallic high phosphorus, (without fertilization), the splinter factor, the size of the bulbs is / 2 / large bulbs with a circumference (21 - 25 cm), and small bulbs with a circumference (17 - 20 cm), and the following is shown :
1- Plants planted in soil fertilized with organic and mineral fertilizers significantly outperformed plants cultivated in soil that was not fertilized in the number and length of leaves, the ratio of flower stem and length, and the flowering number buds.
2- The lily plants responded positively to the organic fertilizer and the high-phosphorous mineral fertilization, as it led to a significant increase in each of the vegetative growth indicators (number of leaves, leaf length)
3- The treatment of using large bulbs (21-25 cm) was significantly superior to using small bulbs (17-20 cm) in all indicators of vegetative growth. At the same time, it was not significantly superior to the number of flowering buds.
4-The combined effect of both the large size of the bulb used in agriculture and the high-phosphorous mineral fertilizer showed significant superiority in most studied indicators.

Key words: *Lilium Longiflorum*, bulbs, mineral fertilizer, sheepskin manure, poultry manure, floral stem

Introduction

Lilium longflorum belongs to the sub-row of Liliaceae (Wilkins, 1980), and it is a winter bulb with a height ranging between (35 - 200 cm) (Khattab and Wasfi, 1988). The genus Lilium is very important as potted plants and cut flowers in field agriculture and greenhouses because of its great marketing importance (Song *et al*., 2005).

Explain (Sarah *et al.,* 2015) the great economic importance of the fleshy lily plant as one of the most important cuttings, and one of the most flowering and annual flowering plants that support the annual income of twenty million

dollars by selling it wholesale in the United States of America. The name of the genus "Lilium" is derived from the ancient Greek word Leirion which means Lilium, and it has been said that the name of the genus is derived from the word Li, which means white, relative to the color of the flowers of some types of Lilium (Khattab and Wasfi, 1988). The genus Lilium includes about 130 species, most of which originated in the northern temperate regions of the globe, and forty of these species are native to Japan

(Okawa ,2005) Japan is the native habitat of a frog-lily plant, and it is located in three small islands in southern Japan (Wilson, 1925).

According to (Miller 1992), the red-lily plant is characterized in white to yellow colors; the bulbs are a table (arranged) with a spherical shape, consisting of a huge number of scales and the base plate. The scales are oval (elliptical) spear to an inverted spear and contain the bulbs' reserve stock.
Lilium reproduces either sexually with freshly grown seeds or vegetative to preserve the cultivated variety's distinctive flower color, and vegetative propagation takes place in several plant parts (leaf scales, bulbets,), (Khattab and Wasfi, 1988).

As for the soil suitable for growing lily, it must be sterile, deep, well-ventilated, light or medium-textured, rich in organic matter and its acidity number (pH) from 6-6.5 in a semi-shady place (Khattab and Wasfi, 1988)

- The effect of bulb size on the number and length of leaves and the production flowers in *(Lilium longflorum*)

Zaccai and Lazare (2019) confirmed On the benefits of apical divisions of the bulb in changing environmental conditions, it leads to flowering and increases the bulb's size.

Growing plants of large bulbs give a thick flower market and flowers that are better in number and quality, and have more leaves and therefore a larger leaf flat than the growing plants of small bulbs (Lang and Heins, 1990).

It was found that the bulbs of the largest produce the largest number of flowers, a number of flower as this leads to an increase in the apical meristem diameter, the growing vegetative diameter of the bulbs, and the leafy area. This is proven (De Hertogh *et al*.,1976).

Jeug *et al.,* (2013) showed that the number of flowers could be increased by increasing the bulbs' size, specifically from the growing top of the bulb.

The effect of fertilizer type on the number and length of leaves and the production flowers in (*Lilium longflorum*):

The use of natural materials such as municipal fermented fertilizers is an appropriate alternative to mineral fertilizers (El-Akabawy, 2000)

(Moghadam *et al*., 2012) indicated that the adverse effects of planting lily plants could be reduced using organic fertilizers as they are natural substances that have no harm to the environment.

Organic fertilizers are a sustainable source of macronutrients and micronutrients and have great potential to dramatically improve plant growth when used as elements in horticultural soils and environmental media (Sahni *et al.*,2008)

Balode and Latvia (2018) pointed out the importance of using organic fertilizers with specific concentrations in plant growth *Lilium longiflorum***:**

, which is used with a particular concentration, leads to an increase in plant height and root length. Also, expanding their use above a specific limit negatively affects growth.

Seyedeh *et al*. (2015) emphasized that mineral and organic nutrition, especially in the growing period, is the most important and effective component of increasing the bulb size Easter lily,

Chandra *et al*. (2004) have shown that poultry glaucoma improves the soil's chemical properties compared to inorganic sources of nitrogen such as ammonium nitrate, and the use of such fertilizers is an integral part of sustainable agriculture (Anonymous, 2008).

As explained by Mahboubeh *et al.* (2013), the effect of the quality of organic fertilizers,

especially poultry manure residues on the growth of febrile lily, its positive effect on root length was observed as the dry weight of the roots reached 2.5 g while the plant to which no fermented fertilizer was added the dry weight of the roots did not exceed 0.4 g as for the height of the plant, it reached more than 60 cm in the fertilized plant compared to the non-fertilized plants which plant length did not reach 10 cm.

Also found (Singh and Jones ,1976) that poultry manure waste is the best organic waste added to the soil in increasing phosphorous readiness.

Organic fertilizers, especially poultry fertilizer and its nutrients, such as nitrogen, phosphorous, and potassium, are ready for absorption by plants by microorganisms in the soil.

These elements play a major role in the biological and physiological processes involved in cell division, cellular membrane synthesis, and food processing within the plant.

They lead to an increase in the rate of vegetative growth and foliar area (Delden, 2001).

A study by Abu Naqta and Butha (2010) on the effect of fertilizing with nutrients from organic sources showing increased productivity of confectionery grapes and increasing soluble solids, and another study by Al-Hamdani et al. (2011) on the Anna type apple trees to see the effect of organic fertilization (0, 5, 10, and 15 kg) / tree) and compound fertilization (0, 100, 200, and 300 g / tree) in yield amount, the results showed that organic fertilizer level (15 kg/tree) exceeded the rest of the treatments in average yield quantity and other studied characteristics.

The researchers also explained (NiedzielaJra *et al.*, 2008) the effects of deficiency of major nutrients (phosphorus-potash-nitrogen) and temperature regimes in vegetative growth and the number of lily-flower plants.

The justification for the research and its objectives:

Due to the unsuccessful cultivation of the febrile lily plant in Hama Governorate in many new fields and soils due to the farmers' lack of experience in the most important agricultural transactions to be followed and the most important of fertilization due to its great influence on plants and their production of flowers, the research objective was to the following:

1- Study the effect of the size of the bulbs used in agriculture on improving the number and length of leaves and the production flowers of *Lilium longflorum*

2-Studying the effect of many types of fertilizers (sheepskin manure, poultry manure, metallic balanced, metallic high phosphorus, in improving vegetative growth (number and length of leaves), quality,(*Lilium longiflorum)* and the number of *Lilium longiflorum* plants' flowers.

Materials and methods

The research was carried out in a private nursery on the Orontes banks in the city of Hama for the agricultural season (2018). Within the first stability zone.

1- Plant Material:

Bulb (*Lilium longiflorum*) used "Nellie White".

Taken from a private nursery near the Orontes banks, which have been in the nursery for more than forty years. Its circumference oscillates in two categories (17-20 cm) and (21-25 cm).

2- **Fertilizers:**

The following types of fertilizers were used in the research:

The first treatment: sheepskin manure.

The second treatment: poultry manure.

The third treatment: compound mineral fertilizer ((NP_1K (25 kg per dunum urea at a concentration of (46%), 25 kg per dunum superphosphate with a concentration of (46%) and 15 kg per acre of potassium sulfate at a concentration of (50%).

The fourth treatment: high chemical phosphorous fertilizer ((NP_2K (25 kg per dunum urea at a concentration of (46%), 30 kg per dunum superphosphate with a concentration of (46%) and 15 kg per acre of potassium sulfate at a concentration of 50%)

Fifth treatment: witness (without fertilization)

3-Preparing the land for cultivation:

The experiment plot is prepared with an area of (105 m 2), containing (10) experimental plots; each experimental plot with an area of (10.5 m 2) includes three lines (repeaters); thus, the number of lines planted on the experiment ground (30 lines).

Irrigation or watering the land of experience several times to allow the appearance of weeds and get rid of them before planting, then plowed at a depth of (30 cm) twice consecutively and perpendicularly, then prepared the lines for planting and the distance between the lines 60 cm.

4-Prepare lily bulbs for planting.

360 bulbs were prepared and were of two different sizes:

The first: 180 bulbs with a circumference (17-20 cm).

The second: 180 bulbs with a circumference (21-25 cm).

It was sterilized with a fungicide (Bavstein Top) (containing carbendazim at a rate of 50%), where it was used at a rate of 100-200 cm per 200 liters of water for two hours, then the bulbs were dried in preparation for planting.

5- Bulb cultivation:

bulbs are planted in the upper third of the line, in a hole at a depth (30 cm), the bulbs are far from each other (30 cm), and a distance (60 cm) between the line and the other.

Design the experiment:

The experiment was designed according to the random, the main factor of fertilization treatments number (5) (/ sheepskin manure, poultry manure, metallic balanced, metallic high phosphorus, (without fertilization), and the splinter factor size of bulbs number 2 (first (17-20 cm), And the second (21-25 cm), with three replicates, and each repeater contains 12 bulbs

The results were statistically analyzed using the Genestat 12 statistical analysis program, and the averages were compared by calculating the value of the least significant difference (L.S.D) at the level of 5%

The studied indicators:

Average readings were taken:

1- Indications of vegetative growth

-Number of leaves formed on the plant (leaf): The leaves formed on the plant were counted at the beginning of forming the flowering stems of (12) plants.

-leaves length (cm): The distance from the beginning of leaf formation on the bulb to the leaf's top when the flower stalk begins.

2- Flower growth indicators (flower production)

-Percentage of the flowering stem (%): is the product of dividing the number of flowering plants formed by experimental unit plants by the number of bulbs grown in them.

The number of flower buds (bud / stem of the flower): the flower buds formed on the plant's flower stalk from the beginning of the flower buds on the plant until the flowering season begins (the first bud opens).

Result and discussion

The effect of the type of fertilizer and the size of the bulbs planted on the growth of flowers of *lilium longiflorum:*

1- **The effect of the type of fertilizer and the bulbs' size planted on the number of leaves formed on the febrile lily plant (leaf/plant).**
Table (1) showed that the fertilizer type affects the number of leaves, as the fertilizer plants significantly exceeded a high mineral fertilizer phosphorus. Over the rest of the treatment, the number of leaves reached 28.14 (leaf/plant), while the fertilization in poultry manure achieved 23.15) leaf/ Plant) an insignificant increase on both balanced mineral fertilization (22.84 leaves/plant), and sheepskin manure fertilization 22.52 (leaf/plant), which in turn significantly outperformed the non-fertilized plants (control)

(19.15 leaves/plant), This may be due to the emergence of the role of the nitrogen component when fertilizing with high phosphorous mineral fertilizer and fertilizing with poultry blue, which rapidly degrades in the soil and is absorbed by the plant, which leads to encouraging vegetative growth and increasing the number of leaves (Bennett, 1993) The nitrogen component in balanced mineral fertilization and sheepskin manure fertilization has the same function, as it encourages vegetative growth, which increases the number of leaves but with a smaller percentage. This, in turn, confirms the role of organic and mineral fertilization in increasing the vegetative system by increasing the activity of the developing vegetative summit (De Hertogh *et al*., 1976) Table (1) also showed that the bulb's size has a significant effect on the number of leaves. This is the abundance of multiple nutrients in large bulbs (Lang and Heins, 1990) and (Miller, 1993).

Table (1): The effect of the type of fertilizer and the size of the bulbs planted on the number of leaves formed on *Lilium longiflorum* (leaf/plant)

average type of fertilizer	without fertilization	metallic high phosphorus	metallic balanced,	poultry manure	sheepskin manure	type of fertilizer / bulb size
18.54 b	12.53 c	24.95 a	19.29 b	18.89 b	17.06 bc	small
27.79 a	25.78 a	31.33 a	26.40 a	27.42 a	28.00 a	large
	19.15 c	28.14 a	22.84 bc	23.15 b	22.52 bc	average bulb size

L.S.D(P<= 5%) bulb size = 3.83 type of fertilize = 2.42
bulb size * type of fertilize = 5.42

Concerning the mutual interaction between the size of bulbs and the type of fertilizer, the highest value of the number of leaves (31.33 leaves/plant) resulted from the cultivation of large bulbs in fertilized soil with high phosphorous mineral fertilizer, and the lowest value (12.53 leaves/plant) from the cultivation of small-sized bulbs in soil not fertilized at all.

2- The effect of fertilizer and the size of the bulbs planted on the length of leaves formed on the febrile lily plant (cm)

Table (2) showed that the type of fertilizer affects the size of the fleshy lily leaves. The two high-phosphorous and balanced mineral fertilization treatments respectively (22.17 and 21.55 cm) achieved a significant superiority over the treatment of poultry manure fertilization (19.33 cm), which in turn significantly outperformed the treatment of fertilization (17.67 cm), and all treatments were significantly superior to the control (13.92 cm). This confirms the supply of the plant with the nitrogen component that leads to increased protein formation. This encourages leaves with large surfaces that perform the carbohydrate process with high efficiency (Eghball, 2002).

Table (2) also shows that the bulb's size has a significant effect on the length of the leaves. This is because plants resulting from large bulbs containing larger nutrients give stronger plants in terms of leaf length and number, and this corresponds to Lang and Heins, (1990).

Table (2): The effect of type of fertilizer and the bulbs' size planted on the length of the leaves of *Lilium longiflorum* (cm).

average type of fertilizer	without fertilization	metallic high phosphorus	metallic balanced,	poultry manure	sheepskin manure	type of fertilizer / size
14.66 b	13.17 e	16.33 d	16.33 d	14.1 d e	13.33 e	small
23.19 a	14.67 d e	28.00 a	26.77 a b	24.5 b c	22.00 c	large
	13.92 d	22.17 a	21.55 a	19.3 b	17.67 c	average bulb size

L.S.D(P<= 5%) bulb size = 2.06 type of fertilize = 1.3

bulb size * type of fertilize = 2.91

Concerning the interaction between the size of bulbs and the type of fertilizer, the highest leaf length value (28 cm) was produced in plants resulting from the cultivation of large bulbs and fertilizers with high-phosphorous mineral fertilizer. The lowest value (13.17 cm) was produced when plants were produced from small-sized bulbs grown in the land is completely un-fertilized.

Second: The effect of the type of compost and the size of bulbs on the production flower of *(Lilium longflorum)*

1-The effect of the type of fertilizer used and the size of cultivated bulbs on the percentage of flowering market formation on *Lilium longiflorum* (%):

It is noted from Table (3) that there are no significant differences in the percentage of flowering market formation between the factors of balanced mineral fertilization, high mineral phosphorous fertilization, and sheepskin manure, respectively (0.83, 0.82, 0.79%). The balanced mineral fertilization treatment was significantly superior to the treatment of poultry manure fertilization. (0.74%), and all treatments outperformed the control (0.31%), and this confirms what Bennett (1993) reached on the importance of mineral elements in flowering, as phosphorous, such as nitrogen, is an essential part of photosynthesis, as it stores energy and is involved in the formation of fats and building protein and sucrose play an important role in increasing flowers and the proportion of nodes, as well as in the growth of roots (cell division) and the ripening of seeds and fruits.

Table (3): The effect of the type of fertilizer used and the size of cultivated bulbs on the percentage of flowering market formation on *Lilium longiflorum* (%):

average type of fertilizer	without fertilization	metallic high phosphorus	metallic balanced,	poultry manure	sheepskin manure	type of fertilizer / bulb size
0.62 b	0.34 e	0.76 bed	0.73 cd	0.62 d	0.67 D	small
0.78 a	0.38 e	0.89 abc	0.94 a	0.87 abc	0.92 Ab	large
	0.31 c	0.82 ab	0.83 a	0.74 b	0.79 Ab	average bulb size

L.S.D(P<= 5%)
bulb size 0.12= type of fertilize 0.08 =
0.17=bulb size * type of fertilize

It is also evident from the table (3) that the size of the bulb has a significant effect on the percentage of flower stem formation, as the plants produced from growing large bulbs (78%) were significantly superior to plants resulting from the cultivation of small bulbs (62%), and this may be because growing plants of large-sized bulbs are rich in nutrients and give more flowers and better quality (Lazare and Zaccai, 2016).

As for the interaction between the size of bulbs and the type of fertilizer in the ratio of flower stalk formation, the highest value (94%) was reached by plants resulting from large bulbs grown on fertilized ground in a balanced mineral fertilizer, and the lowest value (34%) when plants were produced from small-sized bulbs cultivated land is not fertilized at all.

2- The effect of the type of fertilizer used and the bulbs' size planted on the number of flowering buds on *Lilium longiflorum*.

Table (4) showed that the fertilizer type affects the number of flowering buds. The treatment of poultry manure fertilization (3.78 buds) achieved an insignificant increase over the treatment of high-phosphorous mineral fertilization (3.74 buds). It significantly increased the rest of the treatments, as did the mineral fertilization treatment. Balanced (3.64 buds), a significant increase in the treatment of sheepskin manure fertilization (3.24 bud) and a significant difference over the control (2.25 bud), which indicates the role of the phosphorous element in flowering and the number of flowering sprouts (Bennett), 1993) significantly in the treatment of fertilization in poultry manure and fertilization. High phosphorus and then treatment of balanced mineral fertilization and sheepskin manure fertilization, and the result is close to what he reached (Saravanan *et al*.,2017)

About the effect of the mixture of organic and inorganic fertilizers on the number of flowering buds.

It is also noted from Table 4) that the number of flowering buds was not significantly affected by the size of the cultivated bulbs, as the number of flowering buds in plants growing from large bulbs was small (3.52 bud), while in growing plants of small bulbs reached (3.24 bud) This may be due to his findings (Ragaa and Taha, 2012).

Table (4): The effect of the type of fertilizer used and the size of bulbs on the number of flowering buds formed on the flowering stem in; *Lilium longiflorum* (bud):

average type of fertilizer	without fertilization	metallic high phosphorus	metallic balanced,	poultry manure	sheepskin manure	type of fertilizer / bulb size
3.24 a	2.39 de	3.17 cd	3.56 abc	3.39 bc	3.69 Abc	small
3.52 a	2.11 e	4.31 a	3.72 abc	4.17 ab	3.28 C	large
	2.25 c	3.74 a	3.64 b	3.78 a	3.24 b	average bulb size

L.S.D(P<= 5%)
bulb size 0.59 = type of fertilize= 0.37
bulb size * type of fertilize = 0.84

About the mutual effect between the size of bulbs and the type of fertilizer on the number of flowering buds, the highest value of the number of flowering buds (4.21 bud) in plants resulting from large bulbs grown in fertilized soil reached a high phosphorous mineral fertilizer. The lowest value (2.11 bud) in plants Resulting from small-sized bulb grown on completely unfertilized soil.

Conclusions:

1- Plants planted in soil fertilized with organic and mineral fertilizers significantly outperformed plants cultivated in soil that was not fertilized in the number and length of leaves, the ratio of flower stem and length, and the flowering number buds.

2- The lily plants responded to organic fertilizers and high-phosphorous mineral fertilization, which led to a significant increase in each of the indicators of vegetative growth (number of leaves, length of leaves).

3- The treatment of using large bulbs (21-25 cm) was significantly superior to the treatment of using small bulbs (17-20 cm) in the number and length of leaves and the percentage of flower stem formation

4- The combined effect of both the large bulb size used in agriculture and the high-phosphorous organic mineral and mineral fertilizer showed significant superiority in most of the studied indicators.

Suggestions:

1- We recommend Hami lily farmers in Hama city to use organic and mineral fertilization, especially high phosphorous, because it positively affects vegetative growth and the number and quality of flowers.

1- We suggest that farmers use large bulbs because they give better results in terms of vegetative growth and flowering indicators, thus achieving better flower production.

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تأثير حجم الأبصال ونوع السماد في عدد وطول أوراق وإنتاج الأزهار في نبات الزنبق الحموي (*Lilium longiflorum*)

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المستخلص

نظراً لأهمية نبات الزنبق الحموي *L.longiflorum* كمحصول تزيني منتج للأبصال المزهرة ذات الألوان الجميلة والرائحة العطرية الفواحة مما يعطي نقاء وجمال للبيئة المتواجد فيها, والمنتشرة زراعته في أمريكا وأوروبا واليابان كنباتات أصص مزهرة وأزهار قطف ، ناهيك عن زراعته في محافظات سورية (حماه –دمشق – اللاذقية)

أجري البحث بهدف دراسة تأثير نوع السماد وحجم الأبصال المزروعة على عدد وطول الأوراق وعدد أزهار نبات الزنبق الحموي تحت ظروف مدينة حماه ، فقد صممت التجربة وفق القطاعات المنشقة ، العامل الرئيس نوع الأسمدة وعددها / 5 / (زبل الغنم ، زرق الدواجن ، معدني متوازن ، معدني عالي الفوسفور ، شاهد (دون تسميد) ، والعامل المنشق حجم الأبصال وعددها /2/ أبصال كبيرة محيطها (21 - 25 سم) , وأبصال صغيرة محيطها (17 – 20 سم) , وتبين التالي:

٣- تفوقت النباتات المزروعة في تربة مسمدة بالسماد العضوي و المعدني معنوياً على النباتات المزروعة في تربة لم يتم تسميدها في عدد الأوراق وطولها ونسبة تشكل الساق الزهرية وطولها وعدد البراعم الزهرية .

٤- استجابت نباتات الزنبق الحموي بشكل إيجابي للسماد العضوي وللتسميد المعدني عالي الفوسفور ، فقد أدى إلى زيادة معنوية في كل من مؤشرات النمو الخضري (عدد الأوراق ، طول الورقة)

٥- تفوقت معاملة استخدام الأبصال الكبيرة الحجم (21 - 25 سم) بدلالة معنوية على معاملة استخدام الأبصال صغيرة الحجم (17- 20 سم) في جميع مؤشرات النمو الخضري في حين لم تتفوق معنوياً بعدد البراعم الزهرية .

٦- أظهر التأثير المشترك لكل من الحجم الكبير للبصلة المستخدمة في الزراعة والسماد المعدني عالي الفوسفور تفوقاً معنوياً في أغلب المؤشرات المدروسة .

الكلمات المفتاحية: الزنبق الحموي ، الأبصال ، السماد المعدني ، زبل الأغنام ، زرق الدواجن ، السوق الزهرية..