

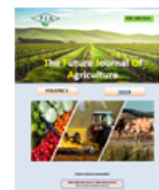


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RESPONSE OF SOUR ORANGE SEEDLINGS TO APPLICATION OF GIBBERELIC ACID AND NUTRIGREEN FERTILIZER

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ABSTRACT: The seedlings of Sour orange grown in plastic bags under the conditions of the Lath houses of the Horticulture Landscape Design were treated with two levels of gibberellic acid (75 and 100 mg L⁻¹) and three levels of liquid Nutrigreen fertilizer (2, 4 and 6 ml L⁻¹) as well as all Interactions between them in addition to the comparison treatment in order to improve the vegetative growth of the seedlings, the study was designed according to the complete random design (CRD) by three replicates and 4 seedlings per experimental unit and used the Dunkin polynomial test at a 5% error probability level to compare the averages of the treatments, the results confirmed the treatment of 100 mg L⁻¹ of gibberellic acid + 6 ml L⁻¹ of Nutrigreen fertilizer significantly outperformed the treatment of comparators as the increase in the main stem diameter and leaf content of chlorophyll, and the highest increase in seedlings length was obtained for the treatment of Nutrigreen fertilizer at a concentration of 6 ml L⁻¹ while recorded treatment 100 mg L⁻¹ of gibberellic acid + 4 ml L⁻¹ of Nutrigreen fertilizer the highest significant increase in the number of leaves as measured by the comparison treatment.

Key words: Sour orange, seedlings, gibberellic acid, liquid organic, fertilizer.

INTRODUCTION

The origin of *Citrus aurantium* L. is one of the appropriate assets for most types of citrus fruits, to provide its seeds in large quantities and to deepen the root group in the soil, as well as being a good and suitable origin for lands with medium and heavy textures as it tolerates high soil moisture and inappropriate environmental conditions compared to the rest of the assets, as well. It is compatible with most citrus fruits and varieties, and it is commonly used in Iraq (Alalaf, 2019). The vegetative growth of seedlings can be improved by spraying them with appropriate levels of plant growth regulators including gibberellic acid (GA₃), as it encourages elongation of plant branches by stimulating cell division and elongation or both by stimulating the

production of auxins (Hartmann *et al.*, 2011) as it is necessary in building Nucleic acid RNA and proteins retard the demolition of chlorophyll and consequently delay the aging of leaves, and stimulate some enzymes such as – amylaseα, Protease, Esterase, etc. which have a role in the different growth processes in the plant (Hopkins and Huner, 2005).

Nutrigreen fertilizer is one of the most important liquid organic fertilizers as it contains organic nitrogen that turns into mineral nitrogen due to the microorganisms present in the soil which is absorbed by the seedlings and works to increase the building of chlorophyll (Alalaf and Shayal Alalam, 2014) and the organic carbon that enters into the synthesis of all organic compounds and constitutes 50% of the dry weight of most plants. It also contains

organic matter, which is of great importance in improving the physical and biological properties of soil by breaking down heavy soil granules and improving their ventilation, as well as increasing the ability of the soil to retain water as well as containing 19 amino acid that increases the activity of various physiological activities in the plant, directly or indirectly through its role in forming nucleotides, vitamins, growth regulators and enzymes (Alalaf, 2019), amino acids are also involved in building cell membranes and encouraging root and chlorophyll formation (Nag *et al.*, 2001), which is reflected in improving the efficacy of photosynthesis (Singh, 1999), many researchers including Alalaf and Shayal Alalam (2014) in their experience of fig seedlings and Al-A'areji *et al.* (2014) in their study of Loquat seedlings and Alalaf (2019) in their study of local grafted orange seedlings indicated that the addition of liquid nitrogen fertilizer to fruit plants led to an improvement in the vegetative and root growth characteristics of the seedlings and the leaf content of mineral elements necessary for their growth.

This study was conducted to show the importance of foliar spray with liquid organic fertilizer Nutrigreen and gibberellic acid in the vegetative growth of Sour orange seedlings to obtain good seedlings and suitable for budding in the shortest possible time.

MATERIALS AND METHODS

The study was carried out in the Lath houses of the Department the Horticulture Landscape Design / College of Agriculture and Forestry, University of Mosul, Iraq during the 2019 growing season. Sour orange seedlings were seeded with a one-year-old seed, nearly homogeneous (height 28-30 cm and diameter of its main stem at a height of 5 cm from the soil surface 3 mm) planted in polythene plastic bags (capacity of 5.00 kg of soil) and filled with mixture soil. Gibberellic acid was added as a spray on the vegetative system at two levels (75 and 100 mg L⁻¹), while liquid organic fertilizer was added to the soil Nutrigreen (its components are shown in Table 1) with three levels (2, 4 and 6 ml L⁻¹) in addition to the

comparison and overlap treatment between them, and so the number of transactions is 12 treatments. The seedlings were sprayed with levels of gibberellic acid with two types which are 4/15 and 5/15 until full wetness in the early morning and 1 cm 3/5 liter of the spreading material (20-Tween) was added to the homogeneity of the solution distribution over leaves, while liquid fertilizer Nutrigreen was added in two dates 4/16 and 5/16 to the soil by dissolving 2 ml of each in 1 liter of water to prepare a concentration of 2 ml L⁻¹ then divide this focus on the number of seedlings in a single treatment (4) seedlings so that each seedling obtained 250 ml, as well as for the levels 4 and 6 ml.

Table 1. Components of liquid nitrogen fertilizer

Component	percentage
Organic nitrogen	8.00
Organic nitrogen dissolved in water	8.00
Organic carbon	23.50
That is, the total organic matter	39.50
Amino acids (19 amino acids)	50.00
The total organic matter contained in the compost	89.50

The implementation of this study was followed by a complete random design (CRD) with two factors and three replicates, using 4 seedlings per experimental unit, and thus the total number of seedlings in this study was 144 seedlings. At the beginning of October of the same season, the following characteristics were measured: the increase in the length of the main stem (cm) by the tape measure, the increase in the diameter of the main stem (mm) by the foot (Vernier) and the increase in the number of leaves/ seedlings by measuring these characteristics at the beginning of the experiment And the end and record the difference between the two readings, the content of chlorophyll in the papers by the device SPAD meter (Felixloh and Bassuk, 2000).

Statistical analysis

All the obtained data were tabulated and subjected for the proper statistical analysis; by analysis of variance (ANOVA) using the statistical package SAS program (SAS, 2001). Duncan's multiple range test was used to separate treatment means to found significantly different in the analysis of variance at the level of error probability 5% (Duncan, 1955).

RESULTS AND DISCUSSION

The effect of foliar spray with gibberellic acid and Nutrigreen fertilizer and their interaction between the increase in the length and diameter of the main stem and the number of leaves and the chlorophyll content in the leaves for Sour orange seedlings: It is evident from the results of Table (2) that the treatment of organic fertilizer with Nutrigreen at a concentration of 6 ml L⁻¹ recorded the highest moral value as the main stem length of the seedlings amounted to 52.44 cm, but it did not significantly outperform except the comparison treatment, which gave the lowest significant value of this trait reached 40.95 cm, the highest significant value was obtained for the two characteristics of the increase in the main stem diameter and the leaf content of chlorophyll at 4.22 mm and 50.92 SPAD as a result of the treatment of 100 mg L⁻¹ of gibberellic acid + 6 ml L⁻¹ of Nutrigreen fertilizer while the lowest values of these two attributes reached 2.92 mm and 38.03 SPAD for the comparison treatment. The increase was significant as the number of sheets as a result of the treatment of 100 mg L⁻¹ of gibberellic acid + 4 ml L⁻¹ of fertilizer Nutrigreen reaching 54.21 leaves while recorded a transaction comparison less the value of the recipe was 24.86 leaves.

The moral superiority of the treatments used is special (100 mg L⁻¹ of gibberellic

acid + 6 ml L⁻¹ of Nutrigreen fertilizer) and (100 mg L⁻¹ of gibberellic acid + 4 ml L⁻¹ of Nutrigreen fertilizers) and (6 ml L⁻¹ of Nutrigreen fertilizer) with the studied characteristics may explain the importance of gibberellic acid in the division or breadth of salami cells or both and encourage cambium activity by increasing the division of cambium cells and increasing its growth in addition to stimulating some enzymes such as – amylasea and Protease and Esterase and others that have a role in the different growth processes in the plant (Hopkins and Huner, 2005), as it is necessary in building RNA and proteins and retarding Demolishing chlorophyll which leads to an increase in the efficiency of plant growth processes such as height and diameter of seedlings.

As for the importance of liquid organic fertilizer, Nutrigreen is due to its contain of organic nitrogen, which turns into mineral nitrogen due to the microorganisms present in the soil, which is absorbed by the seedlings as it increases the building of chlorophyll (Al-A'areji *et al.*, 2014) as well as its role in improving Soil properties and increase the readiness of major and minor nutrients and their absorption by plant roots and thus increase their growth (Khaled and Fawy, 2011), in addition to containing amino acids that increase the activity of various physiological activities in the plant directly or indirectly through their role in the formation of nucleotides vitamins, growth regulators and enzymes which is an essential component of living matter and protoplasm and interference in the construction of cellular membranes and promote the formation of roots and chlorophyll, which is reflected positively in the efficiency of the optical structure (Singh, 1999) and thus improve the characteristics of the studied vegetative growth.

Table 2. Effect of adding Nutrigreen fertilizer and foliar spray with gibberellic acid and their interaction in increasing the length and diameter of the main stem and number of leaves and the content of chlorophyll in the leaves for Sour orange seedlings

Treatments	Increase in length of main (cm)	Increase in main diameter (mm)	Increase in the number of leaves (leaf/ seedlings)	The chlorophyll content in the SPAD leaves
Control	40.95 B	2.92 B	24.86 B	38.03 B
Gibberellic acid 75 mg L ⁻¹	44.92 AB	3.86 A	35.97 AB	40.67 AB
Gibberellic acid 100 mg L ⁻¹	48.25 AB	3.72 A	39.44 AB	40.23 AB
Nutrigreen fertilizer 2 ml L ⁻¹	48.21 AB	3.71 A	44.56 A	45.91 AB
Nutrigreen fertilizer 4 ml L ⁻¹	48.00 AB	3.76 A	44.24 A	46.81 AB
Nutrigreen fertilizer 6 ml L ⁻¹	52.44 A	3.89 A	45.66 A	46.81 AB
Gibberellic acid 75 mg L ⁻¹ + Nutrigreen fertilizer 2 ml L ⁻¹	48.80 AB	3.80 A	45.52 A	44.96 AB
Gibberellic acid 75 mg L ⁻¹ + Nitrogreen fertilizer 4 ml L ⁻¹	50.34 A	3.87 A	48.52 A	47.88 AB
Gibberellic acid 75 mg L ⁻¹ + Nutrigreen fertilizer 6 ml L ⁻¹	52.10 A	3.98 A	49.11 A	46.14 AB
Gibberellic acid 100 mg L ⁻¹ + Nutrigreen fertilizer 2 ml L ⁻¹	51.85 A	3.70 A	53.53 A	49.69 AB
Gibberellic acid 100 mg L ⁻¹ + Nutrigreen fertilizer 4 ml L ⁻¹	50.86 A	4.09 A	54.21 A	52.06 A
Gibberellic acid 100 mg L ⁻¹ + Nutrigreen fertilizer 6 ml L ⁻¹	49.16 A	4.22 A	51.94 A	50.92 A

** The averages followed by different letters and for each attribute indicate the presence of significant differences between them at the 5% probability level according to the Duncan polynomial test.

CONCLUSIONS

We conclude from the results of this study the positive effect of using the levels of gibberellic acid and liquid fertilizer Nutrigreen to improve the characteristics of the vegetative growth of Sour orange seedlings under study, so the study recommends their use in nurseries to obtain strong seedlings and suitable for budding in the shortest possible time.

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