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RESPONSE OF TRADITIONAL LEMON SEEDLING TO FOLIAR FERTILIZER NPK, SEAWEED EXTRACT AND GIBBERELLIN

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ABSTRACT

The study carried out in shelter houses University of Baghdad during 2019. The seedlings were planted in 5 kg flowerpot and sprayed with different concentrations of NPK (100, 150 mg/ liter⁻¹), seaweed extract Oligo-x (1, 2ml/ liter⁻¹) and gibberellin (100, 150 mg/ liter⁻¹). The results can be summarized that the foliar spray treatment with seaweed extract Oligo-x influenced significantly with concentration level (2 ml / L⁻¹) obtained maximum in leaf length (cm), leaf Width (cm), average of leaf area (cm²), average of leaf dry weight (gm.), percentage of chlorophyll and nitrogen, phosphor and potassium (N, P, K) in the leaves and percentage of carbohydrates and graft diameter (mm) in the stem, while the control treatment recorded the lowest average of these traits.

Keywords: Traditional Lemon, Floral NPK, Seaweed, Gibberellin.

Introduction

Lemon *Citrus limon* L. belong to the Rutaceae family and the north-east regions of India and south-west China are the original habitat of this species (Al-Khafaji, 1990; Al-Asu, Eesaf, 2014). The application of NPK foliar fertilizer led to an increase in vegetative growth of lemon seedlings (Taiz and Zeiger, 2006; Abdul Hussein and Zaid, 2016; Al-Khafaji, 2018). Brown algae is one of the most widely used types of marine algae in agriculture. Algae and seaweed extracts increase the growth of various plant because they contain natural growth regulators which encourage cell division and encourage root growth (Hegab, 2005; Abu-Al Yazid, 2011). Mandarins sprayed with different concentrations of seaweed extract Kelpak increased the vegetative growth of magnesium and nitrogen and total chlorophyll (Al-Falahy, 2017). Spraying sour orange *Citrus aurantium* with algae extract Agrosine caused an increase in the vegetative growth and total chlorophyll and total dissolved carbohydrates (Mohamed and Alsareeh, 2016). Spraying *Citrus aurantium* with Oligo seaweed increase vegetative growth and the proportion of carbohydrates in the stem and leaves and the content of nitrogen and chlorophyll in leaves (Al-Janabi and Elshabany, 2017). Growth regulators play a vital role in many important physiological activities in regulating the growth of plants, such as GA3 gibberellin, which promotes cell elongation and expansion, which leads to elongation of the stem, increasing its diameter, increasing leaf area, increasing plant efficiency in nutrient absorption and increasing vegetative growth (Yaakoob, 2013; Al-Khafaji, 2014; Dhaliwal and Rohela, 2016). Therefore, a research project was planned to study the effects of using floral fertilizer NPK, seaweed extract Oligo-x and gibberellin in

different concentration on traditional lemon seedlings to obtain well-developed seedlings in a short time.

Materials and Methods

The study carried in shelter -University of Baghdad during 2019. The seedlings were planted in 5 kg pots and sprayed with different concentrations:

- Spraying with distil water (control) as symbol A₀.
- Spraying with NPK with concentration (100, 150 mg liter⁻¹) as symbol A₁, A₂ respectively.
- Spraying with seaweed extract of Oligo-x (1, 2ml liter⁻¹) as symbol A₃, A₄ respectively.
- Spraying with gibberellin (100, 150 mg liter⁻¹) as symbol A₅, A₆ respectively.

The following parameters were measured:

- Leave area = 2/3 x length x width (Chou, 1966).
- Dry weight: Took five leaves and then dried the leaves in an electric oven at a temperature of 65° until the weight is confirmed and reweighted to calculate the dry weight.
- Total carbohydrates (Dubios *et al.*, 1956).
- Nitrogen % and phosphorus% (Jonhson, 1959).
- Potassium percentage% (Bahargava and Raghupathi, 1999).
- Estimated chlorophyll in leaves (Goodwin *et al.*, 1976)

Table 1 : Seaweed extract of Oligo-x Content liter⁻¹

Natural Growth Regulators		Others			
Indole acetic acid	% 0.002	Cytokinin	0.001%	Alanine%	0.026
Minerals				Phytin%	0.003
Phosphorus oxide		Phosphorus oxide % P ₂ O ₅	0.5	Menthol %	0.001
Nitrogen%	1	Iron%	0.1		
Amino Acids		Zinic%			
Glutamic acid%	0.0019				

Results and Discussion

Data obtained from Table (2) showed:

Leaf length cm: Significant increase in leaf length in T2, T3, T4, T5, T6 the maximum in T4 (8.56) and minimum in T0 (7.18).

Leaf width cm: Significantly increase in leaf width in T3 T4, T5, T6 the maximum in T4(5.30) and minimum in T0 (4.15).

Leaf area cm² : The treatments T3 T4, T6 showed the significantly increase in leave area cm² the maximum in T4 (29.94) and minimum in A0 (19.66).

Leaf dry weight gm. (L.D.W) : The treatments (T3,T4) showed the significantly increase in leaf dry weight and T4 reached the highest rate (0.260) and A0 was the lowest (0.200).

These results comparable results were reported by (Al-Falahy, 2017; Al-Janabi and Elshabany, 2017) when spraying citrus with seaweed realized an increase in Leaf length cm Leaf width cm, Leaf, area cm² and dry weight.

Data obtained from Table(3) showed

Chlorophyll percentage : The leaf content of chlorophyll significantly increase in T2, T3 T4,T5,T6 the maximum in T4 (11.24) while the control treatment recorded the lowest (9.59).

Nitrogen percentage: The leaf content of nitrogen percentage significantly increase in T1, T2, T3 T4, T5, T6 the maximum in T4 (2.693), while the control treatment recorded minimum(1.393).

Phosphor percentage: The leaf content of phosphor significantly increase in T1, T2, T3, T4, T5, T6 and T4 reached the highest percentage(2.693), while the control treatment recorded the lowest percentage (1.393).

Potassium percentage: The treatments (T3 T4, T5, T6) showed the significantly increase in leaf content of potassium percentage and T4 reached the highest percentage (1.863) and the control treatment (A0) was the lowest percentage (1.356).

The result that the leaf content of chlorophyll, nitrogen, phosphor and potassium increased when fertilizing citrus with sea weeds agree with (Mohamed and Alsareeh, 2016; Al-Janabi and Elshabany, 2017).

Data obtained from (Table-4) showed:

Carbohydrate content : The stem content of carbohydrate showed the significantly increase in treatment (T2, T3 T4, T5, T6) and (T4) reached the highest (10.08) and the control treatment (A0) was the lowest (8.18).

Graft diameter (mm): The stem graft diameter) showed the significantly increase in treatment (A3,A4 and T4) reached the highest rate(11.44) and the (A0) was the lowest rate (9.22).

The stem content of carbohydrate and graft diameter were significantly increased by spraying seaweed extract of Oligo-x and these results similar to (El-Yazid, 2011; Al-Janabi and Elshabany, 2017).

Table 2 : Effect of foliar spray of NPK and Seaweed extract and Gibberellin on some leave characteristic of Traditional Lemon

Treatments	Leaf Length cm	Leaf Width cm	Leaf Area cm ²	L.D.W. gm.
T0	7.18	4.15	19.66	0.200
T1	7.42	4.28	20.96	0.203
T2	7.50	4.36	21.58	0.206
T3	7.82	4.75	25.55	0.221
T4	8.56	5.30	29.94	0.260
T5	7.47	4.56	22.48	0.210
T6	7.73	4.75	23.29	0.220
LSD 0.05	0.267	0.184	3.081	0.021

Table 3 : The effect of spraying with Floral NPK and seaweed extract and Gibberellin on the percentage of chlorophyll and N,P,K in the leaves

Treatments	Ch.%	N%	P%	K%
T0	9.59	1.393	0.206	1.356
T1	10.42	1.743	0.223	1.523
T2	10.57	1.763	0.220	1.573
T3	11.03	2.366	0.270	1.593
T4	11.24	2.693	0.276	1.863
T5	10.08	1.516	0.220	1.390
T6	10.26	1.586	0.203	1.360
LSD 0.05	0.326	0.177	0.013	0.281

Table 4 : The effect of spraying with Floral NPK and seaweed extract and Gibberellin percentage of carbohydrates and Graft diameter in the stem

Treatments	Car%	Graft diameter mm
T0	8.18	9.22
T1	8.78	9.46
T2	8.59	9.37
T3	9.78	10.55
T4	10.08	11.44
T5	9.23	9.53
T6	8.38	9.97
LSD 0.05	0.378	0.554

The result obtained that the seaweed extracts Oligo-x increase the efficiency and growth of plant because they contain growth regulators which increase the efficiency of metabolism within the leaf by increasing the efficiency of photosynthesis process and retain chlorophyll, increase cell division and root growth (Abu El Yazid, 2011; Hegab, 2005).

Conclusion

The result showed that the three factor of floral spray of NPK, seaweed extract Oligo-x and Gibberellin on traditional lemon seedlings in different concentration influence on lemon seedling especially seaweed extract Oligo-x with concentration level(2 mg L⁻¹) significantly increase leaf length, leaf width, average of leaf area, average of leaf dry weight, chlorophyll percentage, N, P, K percentage in leaves and carbohydrate percentage and graft diameter in stem this concentration could be used to obtain well-developed seedlings in a short time.

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