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## **PARTIAL REPLACEMENT OF CHEMICAL N FERTILIZER IN BALADY MANDARIN ORCHARD THROUGH APPLICATION OF EXTRACTS OF YEAST, SEAWEED AND FARMYARD MANURE**

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### **ABSTRACT**

During 2010 and 2011 seasons about 50 % of inorganic N were partially replaced by yeast at 80 g/tree, seaweed extract at 0.25 % and farmyard manure extract at 10%. The study was focused on the different effects of these biostimulants on fruiting of Balady mandarin trees.

Result revealed that using yeast, seaweed and farmyard manure extracts considered good biostimulants for replacing a part of mineral N fertilizers. The superiority of these biostimulants on the fruiting was arranged as follows, in ascending order, yeast, farmyard manure and seaweed extracts.

The best results with regard to yield and fruit quality of Balady mandarin trees were obtained due to using inorganic N at 50 % of the suitable N plus spraying seaweed extract at 0.25 % four times.

### **INTRODUCTION**

Citrus is considered most important fruit crop in Egypt, as far as its acreage, production and exportation potentialities are concerned. The economic value puts citrus fruit on the top of all other important fruit crops in Egypt.

Poor cropping is considered to be a serious and major problem that faces Balady mandarin growers in middle Egypt. This problem

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could be attributed mainly to poor setting and/ or to extensive dropping of flowers and fruits. It has been reported that there are many factors are responsible for low yielding such as environmental conditions and malnutrition. Undesirable physiological changes occurred within the trees are considered as another important factor greatly responsible for reducing the production (Chandler, 1987).

It is well known that citrus needs large amounts of fertilizers especially nitrogen. So, the major problems facing growers are the high costs of excessive manufactured fertilizers needs for plants. Besides, these chemical fertilizers are considered as air, soil and water polluting agents during their production and utilization.

Using organic fertilizer in citrus means producing clean fruits and juice without chemicals and reducing at the lower extent the application of mineral fertilizers. Using organic fertilizers covers all forms of organic soil amendments and it depends on using recycled animal manure and farm residues to produce compost for enhancing biological cycles, improving soil fertility and avoiding all forms of pollution that may result from conventional agricultural techniques (Mengel, 1984, Dahama, 1999 and Obreza and Ozores, 2000).

Using biofertilizers or their extracts nowadays for fruit crops has called the attention of research workers as an alternative to synthetic auxins and mineral N fertilization. They are very safe for human, animal and environment. Clean cultivation is greatly achieved by using biofertilizers or their exudates (Kullk, 1990; Zeerban *et al.*, 2000 and Cabrera *et al.*, 2003).

Previous studied supported the beneficial of organic fertilizers on fruiting of fruit crops (Ebrahiem and Mohamed, 2000; Barun *et al.*, 2002; Sheta, 2002; Mohamed and Ragab, 2003; Sharawy, 2000; Ahmed, *et al.*, 2008 and Abdo, 2008).

As a general biofertilization along with different sources of N had an announced promotion on fruiting of fruit crops especially citrus (Hegab, *et al.*, 1997; Ebrahiem, *et al.*, 2000; Moustaffa and El-Hosseiny, 2001; Gobara, 2004; Hegab *et al.*, 2000; Gamal, 2006 and Hassan- Hoda, 2008).

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Application of seaweed extracts could achieve the following merits (according to Norric *et al.*, ٢٠٠٢ and Planes- Leyva *et al.*, ٢٠٠٣).

- ١- Enhancing growth and uptake of nutrients.
- ٢- Increasing the resistance of plants to unfavourable stress conditions namely low or high temperatures, diseases and pests.
- ٣- Enhancing physical and chemical properties of soil.
- ٤- Improving fruit setting and production of trees.
- ٥- Reducing dropping of flowers and fruits.
- ٦- They use as slow release fertilizers.
- ٧- They act as chelated compounds responsible for forming humus, since they contain mannitol and alginic acid.
- ٨- They use as a substitute for organic fertilizers.
- ٩- They activate microbial activities in the soil.
- ١٠- and they use as a seaweed soil conditioner.

Yeast (*Saccharomyces cerevisiae*, L) is considered as one of the promising biofertilizer for many crops. The positive effect of yeast application could be due to its effect in activating photosynthesis process through enhancing the release of CO<sub>2</sub> as well as its higher own content from natural growth regulators namely IAA, GA<sub>3</sub> and cytokinins, amino acids and B- vitamins. Also, yeast is responsible for encouraging the uptake of different nutrients (Barnett *et al.*, ١٩٩٠).

The main target of this study was examining the effect of yeast, seaweed and farmyard manure extracts as a partial replacement of the inorganic N fertilizers on growth and fruiting of Balady mandarin trees. Adjusting the best proportion of organic N fertilization used with any of these biostimulants is considered another goal.

### **MATERIALS AND METHODS**

This study was conducted during ٢٠١٠ and ٢٠١١ seasons on twenty– seven uniform in vigour ٩- years old Balady mandarin trees (*Citrus reticulata*) budded on sour orange rootstock in a private orchard situated at eastern bank of Minia city, Minia Governorate where the soil is silty clay and well drained and with a water table not

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less than two meters deep. Tree spacing is 2 × 2 meters apart. Surface irrigation system was followed.

Horticultural practices were carried out as usual. Analysis of the tested soil at 0 to 90 cm depth was carried out according to the procedures that outlined by Peach and Tracey (1968) and the obtained data are shown in Table (1).

**Table 1: Analysis of the tested soil:**

Constituents	values
<b>Particle size distribution:</b>	
<b>Sand %</b>	: 5.0
<b>Silt %</b>	: 50.0
<b>Clay %</b>	: 45.0
<b>Texture%</b>	: Silty clay
<b>pH (1:2.5 extract)</b>	: 7.92
<b>E.C (1:2.5 extract) mmhos/ cm/ 25° C</b>	: 1.72
<b>O.M. %</b>	: 1.42
<b>CaCO<sub>3</sub> %</b>	: 2.22
<b>Total N %</b>	: 0.09
<b>Available P (ppm, Olsen)</b>	: 0.2
<b>Available K (ppm, ammonium acetate)</b>	: 402.2

The present experiment included the following nine treatments from inorganic N fertilizer proportions as well as extracts of yeast, seaweed and farmyard manure (F.Y.M):-

- 1- Application of the recommended rate of N (100 g N/ tree) according to Ragab (2006) completely via inorganic N source (2980 g ammonium nitrate/ tree/ year).
- 2- Application of 70 % the recommended rate of N through inorganic N source (2239 g ammonium nitrate/ tree/ year).
- 3- Application of 70 % the recommended rate of N through inorganic N source (2239 g ammonium nitrate/ tree/ year) plus yeast at 80 g/ tree/ year.

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- ٤- Application of ٧٥ % the recommended rate of N through inorganic N source (٢٢٣٩ g ammonium nitrate/ tree/ year) plus seaweed extract at ٠.٢٥ % (٢.٥ ml/ L).
- ٥- Application of ٧٥ % the recommended rate of N through inorganic N source (٢٢٣٩ g ammonium nitrate/ tree/ year) plus farmyard manure extract at ١٠ % (١٠٠ g/ L)
- ٦- Application of ٥٠ % the recommended rate of N through inorganic N source (١٤٩٣ g ammonium nitrate/ tree/ year).
- ٧- Application of ٥٠ % the recommended rate of N through inorganic N source (١٤٩٣ g ammonium nitrate/ tree/ year) plus yeast at ٨٠ g/ tree/ year.
- ٨- Application of ٥٠ % the recommended rate of N through inorganic N source (١٤٩٣ g ammonium nitrate/ tree/ year) plus seaweed extract at ٠.٢٥ %.
- ٩- Application of ٥٠ % the recommended rate of N through inorganic N source (١٤٩٣ g ammonium nitrate/ tree/ year) plus farmyard manure extract at ١٠ %.

Each treatment was replicated three times, one tree per each. The source of inorganic N fertilizers was ammonium nitrate (٣٣.٥ % N). It was splitted into three equal batches and added on the middle of February and two months intervals (mid. of April and June). The amount of yeast (٨٠ g/ tree/ year) was divided into four equal batches (٢٠ g/ tree/ batch) and added via soil on the middle of February, April, June and August.

Chemical analysis of yeast is shown in Table (A) according to Gaser- Aisha *et al.*, (٢٠٠٦)

**Table (A): Chemical analysis of the tested yeast**

N %	Fats %	Ash %	Vitamin B <sub>1</sub> (١٠٠ g)	Riboflavin B <sub>2</sub> (١٠٠ g)	Niacin B <sub>3</sub> (١٠٠ g)	B <sub>7</sub> - vitamin (١٠٠ g)	B <sub>12</sub> - vitamin (١٠٠ g)
٧.٣	٣.٥	٦.٧	٢.٣٣ mg	٥.٤١ mg	٣٦.٧ mg	٤.٤١ mg	٠.٠٢ mg

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Seaweed and farmyard manure (0.2% N) extracts were sprayed four times at the same previous dates of using yeast. Triton B as a wetting agent was applied at 0.05% and added to all natural extracts. Spraying was done till runoff (10 L/ tree).

Completely randomized block design was followed for statistical analysis of the present investigation.

Twenty mature leaves were taken from the middle parts of the shoots to determine the leaf area according to Ahmed and Morsy (1999).

Fifty mature leaves seven months age from non- fruiting shoots in the Spring growth cycle (1<sup>st</sup> week of Sept.) were taken (according to Summer, 1980). The leaves were dried at 70°C and digested using H<sub>2</sub>S<sub>4</sub> and H<sub>2</sub>O<sub>2</sub>. In the digested solutions nutrients namely N, P, K and Mg on dry weight basis were determined according to the procedures outlined by (Wilde *et al.*, 1980).

Harvesting was achieved during the regular harvesting time prevailing under Minia region conditions (mid of Nov.) during the two seasons when T.S.S./ acid reached at least 1. Yield per tree expressed in weight (kg.) and number of fruits per tree was recorded.

To determine the following physical and chemical characters of the fruits, ten fruits at picking date were taken at random from constant height and from all directions of each tree:

- 1- Fruit weight (g.) and dimensions (height and diameter in cm.) and then fruit shape was estimated by dividing height by diameter.
- 2- Percentages of fruit peel weight and juice.
- 3- Fruit peel thickness (cm.).
- 4- Percentage of total soluble solids by handy refractometer.
- 5- Percentage of total acidity (as g citric acid/ 100 ml juice) by titration against 0.1 N sodium hydroxide using phenolphthalein as an indicator (A.O.A.C., 1990).
- 6- Percentages of total and reducing sugars according to Lane and Eynon (1960) volumetric method (A.O.A.C, 1990).
- 7- L- ascorbic acid content (as mg/ 100 ml juice) by using 2,6 dichlorophenol indophenol dye (A.O.A.C, 1990).

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### **Statistical analysis:**

All the obtained data during the course of this study in the two successive seasons, ۲۰۱۰ and ۲۰۱۱ were tabulated and statistically analyzed. The differences between various treatment means were compared using new L.S.D. parameter at ۵ % according to Mead *et al.* (۱۹۹۳).

## **RESULTS AND DISCUSSION**

### **۱. Effect of some organic N fertilizer as well as yeast, seaweed and farmyard manure extract treatments on the leaf area.**

It is clear from the obtained data in Table (۲) that application of the suitable N through ۵۰ to ۷۵ % plus yeast, seaweed or farmyard manure significantly was accompanied with stimulating the leaf area rather than application of N via inorganic N alone at ۵۰ to ۱۰۰ %. There was a gradual and significant stimulation on the leaf area with increasing inorganic N levels from ۵۰ to ۱۰۰ %. Application of yeast at ۸۰ g/ tree/ year, farmyard manure at ۱۰ % or seaweed extract at ۰.۲۵ % along with inorganic N, in ascending order was significantly very effective in enhancing the leaf area. Application of seaweed extract at ۰.۲۵ % was superior to the application of the other two bistimulants namely yeast and farmyard manure. Reducing inorganic N source from ۷۵ to ۵۰ % with the application of any of the three bistimulants, caused insignificant reduction on the leaf area. Using inorganic N at ۱۰۰ % of the suitable N resulted in significant reduction on the leaf area comparing with using N through ۵۰ to ۷۵ % via inorganic N at ۵۰ to ۷۵ % plus yeast, seaweed extract or farmyard manure. The minimum values were recorded on the trees that received the suitable N via ۵۰ % inorganic N source alone. Supplying the trees with N via ۷۵ % inorganic N source plus seaweed extract at ۰.۲۵ % gave the maximum values.

The promoting effect of farmyard manure on growth characters might be attributed to its positive action on lowering soil pH and soil salinity as well as improving both physical and chemical characteristics of soil and uptake of elements. The beneficial effect of farmyard manure on growth characters might be attributed to its

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benefits in enhancing soil organic matter and water holding capacity (Miller *et al.*, 1990).

The beneficial effect of seaweed extract on growth characters could be ascribed to its effect in enhancing soil fertility, humic substances, as well as its higher content from different nutrients, amino acids, antioxidants and natural hormones (Norric *et al.*, 2002 and Planes- Leyva *et al.*, 2003).

The positive action of yeast on growth characters might be attributed to its effect in activating photosynthesis process through enhancing the release of CO<sub>2</sub> as well as its higher own content from natural hormones as IAA, GA<sub>3</sub> and Cytokinins plant pigments, amino acids and B vitamins (Barnett *et al.*, 1990).

These results concerning the promotive action of organic fertilizers on growth characters are in harmony with those obtained by Mohamed and Ragab (2003) on Balady mandarin trees and Ahmed *et al.*, (2008) on Washington Navel orange trees.

The results regarding the beneficial effect of yeast on growth characters are in harmony with those obtained by Hegab *et al.*, (1997) on Valencia orange trees. In Washington Navel orange trees, the same conclusion was observed by Moustaffa and El- Hosseiny (2001).

The stimulating effect of seaweed extract on growth characters was confirmed by the results of Cabrera *et al.*, (2003) on Valencia orange trees, Gamal (2006) and Ahmed *et al.*, (2008) on Washington Navel orange trees and Hegab *et al.*, (2000) and Hassan- Hoda (2008) on Balady orange trees.

#### **2. Effect of some organic N fertilizer as well as yeast, seaweed and farmyard manure extract treatments on the leaf content of N, P, K and Mg**

It is clear from the obtained data in Table (2) that those different nutrients in the leaves (N, P, K and Mg) were significantly varied according to inorganic N fertilizer as well as yeast, seaweed and farmyard manure extracts treatments. These nutrients were significantly improved with application of the suitable N through 0 to 100 % inorganic N source aside from seaweed, yeast or farmyard manure extracts comparing with using inorganic N source at 0 to 100



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% out of the suitable N without using the three previous biostimulants. Reducing inorganic N source from 100 to 50 % of the suitable N and at the same time using any of the three biostimulants succeeded significantly for enhancing these nutrients in the leaves. Generally, increasing N regardless the application of the three biostimulants was significantly followed by a gradual promotion on N and a progressive reduction on the other nutrients. Out of the three biostimulants, using seaweed extract at 0.20 % surpassed the application of the two another biostimulants namely yeast and farmyard manure. Farmyard manure extract occupied the second position in this respect and the yeast ranked the last arrangement in this connection. Fertilization of the trees with N as 50 % inorganic N with the neglect of using the three biostimulants gave the minimum values of these nutrients. Supplying the trees with N as 50 % inorganic N plus spraying of seaweed extract at 0.20 % gave the maximum values of N. The maximum values of N, P, K and Mg in the leaves were observed on the trees that fertilized with N as 50 % inorganic plus application of seaweed extract at 0.20 %. The minimum values of N were recorded on the trees received N as 50 % inorganic N without using any of biostimulants. Application of the suitable N without application of these biostimulants as 100 % inorganic N source was followed by minimizing all nutrients except N.

The great stimulation on different nutrients in the leaves in response to application of organic N, yeast and seaweed was mainly attributed to their essential role on enhancing root development and reducing soil pH in favour of increasing the availability of nutrients (Miller *et al.*, 1990; Barnett *et al.*, 1990 and Dahama, 1999). The higher content of these biostimulants from different nutrients gave another explanation.

The present results regarding the effect of organic N source on enhancing nutrients are in agreement with those obtained by Ebrahiem and Mohamed (2000) on Balady mandarin trees; Obreza and Ozores (2000) on Valencia orange trees; Zeerban *et al.*, (2000) on Washington Navel orange trees and Sharawy (2000) on Balady lime trees.

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**Table 1: Effect of some organic N fertilizer as well as yeast, seaweed and farmyard manure (F.Y.M.) extract treatments on the leaf area (cm<sup>2</sup>) and percentages of N, P, K and Mg in the leaves of Balady mandarin trees during 2010 and 2011 seasons.**

Treatments	Leaf area (cm <sup>2</sup> )		Leaf N %		Leaf P %		Leaf K %		Leaf Mg %	
	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
1- Inorganic N at 100 %	4.33	4.5	1.7	1.78	0.19	0.27	1.51	1.53	0.21	0.2
2- Inorganic N at 75 %	6.95	7.2	1.71	1.79	0.23	0.25	1.58	1.59	0.25	0.25
3- Inorganic N at 75 % + yeast	8.77	8.85	2.1	2.17	0.23	0.25	1.71	1.72	0.21	0.23
4- Inorganic N at 75 % + seaweed	9.36	9.53	2.29	2.36	0.25	0.25	1.76	1.77	0.28	0.2
5- Inorganic N at 75 % + F.Y.M.	9.11	9.18	2.2	2.28	0.28	0.29	1.78	1.79	0.25	0.26
6- Inorganic N at 50 %	6.71	9.78	1.51	1.59	0.29	0.21	1.55	1.56	0.27	0.28
7- Inorganic N at 50 % + yeast	8.73	8.8	1.79	1.86	0.28	0.29	1.85	1.86	0.27	0.25
8- Inorganic N at 50 % + seaweed	9.21	9.28	1.99	2.08	0.55	0.56	1.97	1.98	0.27	0.5
9- Inorganic N at 50 % + F.Y.M	9.09	9.17	1.9	1.97	0.57	0.57	1.97	1.93	0.25	0.27
New L.S.D at 5 %	0.18	0.17	0.1	0.15	0.12	0.13	0.15	0.15	0.12	0.12

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These results concerning the effects of yeast on enhancing nutrients are in good agreement with those obtained by Gobara (٢٠٠٤) on Zaghloul date palms.

These results regarding the effect of seaweed extract on enhancing nutrients in the leaves are in close agreement with those obtained by Barun *et al.*, (٢٠٠٢) on Sweet orange trees; Hassan- Hoda (٢٠٠٨) on Balady orange trees and Ahmed *et al.*, (٢٠٠٨) on Washington Navel orange trees.

#### **٣. Effect of some organic N fertilizer as well as yeast, seaweed and farmyard manure extract treatments on the yield.**

It is noticed from the obtained data in Table (٣) that yield expressed in number of fruits/ tree and weight (kg.) was significantly varied according to the different inorganic N and biostimulants treatments. It was significantly increased with using the suitable N through ٥٠ to ٧٥ % inorganic N along with yeast, seaweed or farmyard manure comparing with using inorganic N alone at ٥٠ to ٧٥ %. There was a gradual promotion on the yield with increasing percentage of inorganic N source from ٥٠ to ١٠٠ % with or without application of any of the three biostimulants. Using yeast at ٨٠ g/ tree/ year, seaweed extract at ٠.٢٥ % or farmyard manure at ١٠ % beside inorganic N source at ٥٠ to ٧٥ % in ascending order was very effective in improving the yield. The best biostimulant added with inorganic N source at ٥٠ to ٧٥ % of the suitable N in this respect was seaweed extract followed by farmyard manure extract. Yeast application ranked the last position in this respect. A slight and insignificant reduction on the yield was observed with reducing percentages of inorganic N from ٧٥ to ٥٠ % when accompanied with using any biostimulants. Therefore, the recommended treatment that responsible for producing an economical yield consisted from application of the suitable N via ٥٠ % inorganic plus spraying seaweed extract at ٠.٢٥ % four times. Under such promised treatment, yield per tree reached ٥٢.٨ and ٨٦.٣ kg compared with ٢٩.٤ and ٤٥.١ kg yield produced by the trees that received N completely via inorganic N from during ٢٠١٠ and ٢٠١١ seasons, respectively. The

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lowest yield was recorded on the trees that fertilized with N as 0% inorganic N source alone.

The great benefits of organic source, yeast and seaweed extracts on the yield of Balady mandarin trees were ascribed to their essential roles on enhancing growth characters and nutritional status of the trees in favour of balancing C/N ratio in favour of fruiting state. In addition, the effect of these biostimulants on enhancing number of fruits per tree as well as fruit weight could result in improving the yield.

These results regarding the promoting effect of organic N source on the yield are in accordance with those obtained by Mohamed and Ragab (2003); Ragab (2006) and Abdo (2008) on Balady mandarin trees.

The great promotion on the yield in response to application of yeast was emphasized by the results of Moustafa and El- Hosseiny (2001) and Sheta (2002) on Washington Navel orange trees.

The promotive effect of seaweed extract on the yield was confirmed by the results of Cabrera *et al.*, (2003) on Valencia orange fruits; Hegab *et al.*, (2009) on Balady orange fruits as well as Gamal (2006) and Ahmed *et al.*, (2008) on Washington Navel orange fruits.

#### **4. Effect of some organic N fertilizer as well as yeast, seaweed and farmyard manure extract treatments on some physical and chemical characteristics of the fruits.**

It is clear from the obtained data in Tables (3 & 4 & 5) that combined application of inorganic N source at 0 to 100% of the suitable N and any form of the three (yeast, seaweed extract and farmyard manure) significantly improved both physical and chemical characteristics of the fruits in terms of increasing fruit weight and dimensions (height & diameter), juice %, total soluble solids %, T.S.S/acid, total and reducing sugars % and vitamin C content and reducing fruit peel weight and thickness and total acidity rather than applied of inorganic N at 0 to 100% alone. The promotion on fruit quality was associated with using yeast, farmyard manure and seaweed extract with inorganic N fertilization, in ascending order. The best biostimulant in this respect was seaweed extract at 100% followed by farmyard manure and yeast. A slight and insignificant effect on

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fruit quality was observed with reducing inorganic N percentages from 100 to 0% especially when applied with any biostimulant. The present treatments had no significant effect on fruit shape. From economical point of view, the best results with regard to physical and chemical characteristics of fruit were obtained with amending the trees with N as 0% inorganic N source plus seaweed extract at 0.20%. Using the suitable N as 0% inorganic N source alone (without biostimulant) gave unfavourable effects on quality parameters.

The great favourable effects of organic manure, yeast and seaweed extract on quality of fruits were mainly attributed to its effect in enhancing plant pigments and the biosynthesis of carbohydrates. The promotive effects of these biostimulants on cell division did not neglect in this respect.

**Table 3: Effect of some organic N fertilizer as well as yeast, seaweed and farmyard manure (F.Y.M.) extract treatments on the number of fruits/ tree, yield/ tree and some physical and chemical characteristics of the fruits of Balady mandarin trees during 2011 and 2012 seasons.**

Treatments	No. of fruits per tree		Yield/ tree (kg.)		Fruit weight (g.)		Fruit height (cm.)		Fruit diameter (cm.)	
	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012
1- Inorganic N at 100 %	791.0	600.0	79.2	28.1	11.2	9.2	8.18	8.2	7.20	7.0
2- Inorganic N at 100 %	778.0	280.1	77.2	2.8	98.2	88.0	8.0	2.82	8.78	8.87
3- Inorganic N at 100 % + yeast	718.0	890.0	77.8	72.9	12.1	11.0	8.27	8.20	7.87	7.20
4- Inorganic N at 100 % + seaweed	790.0	772.0	88.0	88.2	12.1	12.1	8.92	8.76	7.92	7.71
5- Inorganic N at 100 % + F.Y.M.	730.0	722.0	22.7	77.1	12.2	12.2	8.70	8.22	7.80	7.89
6- Inorganic N at 0 %	770.0	221.0	22.9	22.7	88.0	78.8	2.88	2.72	8.87	8.72
7- Inorganic N at 0 % + yeast	770.0	882.0	77.0	89.2	119.2	118.0	8.21	8.28	7.88	7.29

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<b>Λ- Inorganic N at 0% + seaweed</b>	38.0	66.0	02.6	86.2	13.0	128.9	0.91	0.70	7.92	7.70
<b>9- Inorganic N at 0% + F.Y.M</b>	33.0	62.0	02.7	70.0	13.0	12.0	0.09	0.02	7.79	7.07
<b>New L.S.D at 0%</b>	10.0	19.0	2.1	2.0	7.1	0.7	0.1	0.11	0.09	0.1

**Table 1:** Effect of some organic N fertilizer as well as yeast, seaweed and farmyard manure (F.Y.M.) extract treatments on some physical and chemical characteristics of the fruits of Balady mandarin trees during 2010 and 2011 seasons.

Treatments	Fruit shape		Fruit peel thickness (cm.)		Fruit peel %		Juice %		Total soluble solids %	
	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
1- Inorganic N at 1% %	1.81	1.81	1.36	1.33	13.7	13.1	66.0	67.1	11.2	11.1
2- Inorganic N at 4% %	1.87	1.87	1.32	1.29	11.6	10.3	63.0	62.2	11.6	11.6
3- Inorganic N at 4% % + yeast	1.83	1.81	1.27	1.21	10.0	18.7	67.2	68.3	12.0	11.9
4- Inorganic N at 4% % + seaweed	1.86	1.86	1.22	1.19	18.0	16.7	70.9	71.9	12.7	12.6
5- Inorganic N at 4% % + F.Y.M.	1.82	1.83	1.26	1.22	18.6	17.3	69.1	70.6	12.1	12.3
6- Inorganic N at 6% %	1.88	1.87	1.29	1.26	10.0	18.6	61.0	62.1	11.8	11.7
7- Inorganic N at 6% % + yeast	1.83	1.83	1.26	1.23	18.9	17.6	67.1	68.1	12.1	12.0
8- Inorganic N at 6% % + seaweed	1.86	1.86	1.20	1.19	16.2	11.8	70.7	71.8	12.8	12.7
9- Inorganic N at 6% % + F.Y.M	1.82	1.83	1.23	1.21	17.7	16.3	69.3	70.3	12.6	12.1
New L.S.D at 5% %	NS	NS	0.2	0.3	1.0	0.9	1.6	1.7	0.3	0.3



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**Table 4: Effect of some organic N fertilizer as well as yeast, seaweed and farmyard manure (F.Y.M.) extract treatments on some chemical characteristics of the fruits of Balady mandarin trees during 2011 and 2012 seasons.**

Treatments	Total acidity %		T.S.S/ acid		Total sugars %		Reducing sugars %		Vitamin C content (mg/ 100 ml juice)	
	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012
1- Inorganic N at 100 %	1.470	1.477	7.6	7.6	7.6	7.47	7.76	7.71	77.6	77.7
2- Inorganic N at 76 %	1.446	1.467	8.0	7.9	7.7	7.77	7.86	7.84	77.7	77.9
3- Inorganic N at 76 % + yeast	1.376	1.387	8.7	8.6	7.98	7.96	7.98	7.97	77.0	77.7
4- Inorganic N at 76 % + seaweed	1.387	1.389	9.9	9.8	8.44	8.41	8.77	8.18	78.3	79.0
5- Inorganic N at 76 % + F.Y.M.	1.316	1.377	9.4	9.3	8.76	8.77	8.17	8.17	77.9	77.6
6- Inorganic N at 60 %	1.411	1.418	8.4	8.3	7.91	7.87	7.96	7.94	77.1	77.8
7- Inorganic N at 60 % + yeast	1.371	1.380	8.8	8.7	8.00	7.97	8.00	7.99	77.6	77.7
8- Inorganic N at 60 % + seaweed	1.381	1.390	9.9	9.8	8.46	8.41	8.77	8.19	78.3	79.0
9- Inorganic N at 60 % + F.Y.M	1.311	1.370	9.6	9.4	8.79	8.76	8.16	8.17	77.0	77.7
New L.S.D at 5 %	0.077	0.070	0.3	0.3	0.11	0.11	0.08	0.07	1.1	1.1

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These results regarding the beneficial effect of organic manure on both physical and chemical characteristics of the fruits are in approval with those obtained by Mohamed and Ragab (٢٠٠٣) and Abdo (٢٠٠٨) on Balady mandarin fruits.

These results with regard to the beneficial effects of yeast on fruit quality were confirmed by the results of Hegab *et al.*, (١٩٩٧) on Valencia orange fruits and Ebrahiem *et al.*, (٢٠٠٠) on Balady mandarin fruits as well as Sheta (٢٠٠٢) on Washington Navel orange fruits.

Similar results concerning the promoting effect of seaweed extract on quality of the fruits were announced by Ahmed *et al.*, (٢٠٠٨) on Washington Navel orange fruits.

As a conclusion, it is advised to use inorganic N at ٥٠ % of the suitable N plus spraying seaweed extract four times at ٠.٢٥ % for improving the yield quantitatively and qualitatively of Balady mandarin trees.

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الاستبدال الجزئي للسماد النيتروجيني الكيماوي في بساتين اليوسفي  
البلدي عن طريق استخدام مستخلصات الخميرة- الأعشاب البحرية  
□ والسماد البلدي

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خلال موسمي ٢٠١٠ / ٢٠١١ تم استبدال ٥٠ % من النيتروجين الغير  
عضوي جزئيا بالخميرة بمعدل ٨٠ جرام للشجرة ومستخلص الأعشاب البحرية بتركيز  
٠.٢٥ % ومستخلص السماد البلدي بتركيز ١٠ % ولقد تركزت الدراسة على اختبار  
التأثيرات المختلفة لهذه المنشطات الطبيعية على إثمار أشجار اليوسفي البلدي.  
وقد أشارت نتائج هذه الدراسة أن استخدام مستخلصات الخميرة والأعشاب  
البحرية والسماد البلدي تعتبر منشطات جيدة لاستبدال جزء من الأسمدة النيتروجينية  
المعدنية وكانت الأفضلية لهذه المنشطات الطبيعية على الإثمار هي مستخلصات  
الخميرة والسماد البلدي والأعشاب البحرية مرتبا ترتيبا تصاعديا.  
وكانت أفضل النتائج المتحصل عليها بخصوص كمية المحصول وخصائص  
الجودة للثمار في أشجار اليوسفي البلدي عند استخدام السماد النيتروجيني الغير  
عضوي بنسبة ٥٠ % من الكمية الموصى بها بالإضافة الى رش مستخلص  
الأعشاب البحرية بتركيز ٠.٢٥ % أربعة مرات.