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THE EFFECTS OF APPLICATION OF YEAST EXTRACTS , SEAWEED AND FARMYARD MANURE AS A PARTIAL SUBSTITUTE FOR MINERAL FERTILIZATION ON FRUITING OF BALADY MANDARIN

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ABSTRACT: *This study was carried out during 2015 and 2016 seasons on mature Balady mandarin trees budded on sour orange rootstock at the Experimental Orchard, Department of Horticulture, Faculty of Agriculture, Menoufia University. 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 fruiting of Balady mandarin trees. Adjusting the best proportion of inorganic N fertilization used with any of these biostimulants is considered another goal. The experiment was arranged in a complete randomized block design with three replications, one tree for each, and it consisted of nine treatments. The obtained results could be summarized as follow :*

Increasing inorganic N percentages from 50 to 100 % either when applied alone or when applied with any of the three biostimulants (yeast, seaweed extract and farmyard manure) materially caused a gradual promotion on the yield expressed in weight (kg) and number of fruits per tree. A positive effect on the yield was observed with using the suitable N through 50 to 75 % inorganic N source in combined with using yeast, seaweed or farmyard manure extracts. The best biostimulants in this respect applied with inorganic N was seaweed extract followed by farmyard manure and yeast occupied the last position with using any of these biostimulants. They were remarkably enhanced with using the suitable N through 50 to 75% inorganic N in combined with using any biostimulants comparing with using N via inorganic source alone. The promotion on fruit quality was associated with increasing percentages of inorganic N from 50 to 100% as well as application of any of the three biostimulants. For improving yield quantitively and qualitatively as well as protecting our environment from pollution, it is advised to fertilize Balady mandarin trees grown under Menoufia region with the suitable N (1000 g/ tree/ year) through 50 % inorganic source plus spraying seaweed extract at 0.25 % four times (Feb., April, June and Aug.).

Key words: *Yeast, Seaweed, farmyard manure, Balady mandarin, Fruit quality .*

INTRODUCTION

Citrus is suggested to be one of the most important cash crops allover the world, especially in U.S.A and war temperate regions and grown successfully in Egypt. Citrus occupied the third position between fruit crops in the world after grapes and apples. The total production of citrus in the world reached 133 million metric tons (according to FAO statistics, 2016). Citrus is backbone of fruit crop cultivation in Egypt. During the last few years, citrus area has increased due to increasing demands of local consumption and exports, which is expected to boom in the future. Such extension in area encourage establishing more studies towards finding out an appropriate management for improving the production and fruit quality (Chandler,

1987). Citrus has high nutritional values because of its own higher amounts of sugars, minerals, vitamins, organic acid and antioxidants, and it used in various technological purposes such as canning, making juice, jams and other preserves. Prickles and Chutney are prepared from unripe fruits (Chandler , 1987) . Poor cropping is considered to be a serious and major problem that faces Balady mandarin growers in Egypt. This problem 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. Undersirable physiological changes occurred within the trees are considered as another important factor greatly responsible for reducing the production (Chandler, 1987) . Generally, N fertilization is an important and limiting factor for growth and productivity of citrus. Nitrogen has many functions in plant life. Being a part of proteins, N is an important constituent of protoplasm. It is responsible for the biosynthesis of enzymes, amino acids, plant pigments and encourages of cell division (Kannayan, 2002; El-Salhy *et al.*, 2010; Ahmed *et al.*, 2013). 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. Consequently, it has drown attention of researchers and citrus growers to use the organic fertilizers which are safe for human, animal and environment as a partial substitute for mineral source. Thus, it is preferred to use these natural fertilizers to avoid pollution and to reduce the costs of chemical fertilizers (Chandler, 1987) . Since considerable amounts of nitrogen applied to the soil are usually lost through many ways, accordingly, more amounts are usually applied to provide the plants with their nitrogen requirements for the optimum growth under Egyptian conditions (Mengel, 1984) . Pollution in one of the most problems affecting human health, especially when the edible part of the plant in polluted with any of pollution sources. In this respect, using synthetic auxins and fertilizers cause the accumulation of harmful residual substances like NO_3 and NO_2 in the citrus fruits. The questions in how to produce more save fruits for human health through avoiding the use of these chemicals. Using natural exudates and extracts of biofertilizers namely yeast and seaweed as well as farmyard manure instead of chemicals could be the way to improve growth, nutritional status, yield and quality of citrus. Using organic fertilizers 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 resides 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 and Dahama, 1999). 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 (El-Khayat and Abdel-Rehiem, 2013; Abou-Zeed, Eman *et al.*, 2014). The beneficial effects of the biofertilizer exudates are attributed to their own from natural hormones which are responsible for promoting growth and delaying leaf aging. They also

contain glutathione, lecithin, adenylic acid enzymes and co- enzymes, vitamins B1 (thiamin), B6 (pyridoxine) and glycine. Also they are very essential for the synthesis of protopeophyrin, the precursor of plant pigments and photosynthesis through enhancing the release of CO2 El– Haddad *et al.*, 1993; Kannaiyan, 2002 and Faraag, 2013).

The main objective of this study was elucidating the effect of yeast, seaweed and farmyard manure extracts as apartial replacement of the inorganic N fertilizers on fruiting of Balady mandarin trees. In addition adjusting the best proportion of organic N fertilization used with any of these biostimulants was also investigated.

MATERIALS AND METHODS

This study was conducted during 2015 and 2016 seasons on twenty-seven uniform in vigour Balady mandarin trees (*Citrus reticulate*) budded on sour orange rootstock, planted at 5x5 meters in the Orchard of the Horticultural Experiment Station, Faculty of Agriculture at Shebin El-kom, Menoufia Governorate. The soil of the orchard is clay loam with a water table not less than two meters deep. Surface irrigation system was followed. The soil PH was 6.5 in average.

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

Horticultural practices such as fertilization with 20 cubic meters farmyard manure (F.Y.M.) per feddan and 200 Kg per feddan calcium super phosphate (15.5 % P_2O_5) at the mid. of December every year. Irrigation hoeing as well as pest and fungi control were carried out as usual. Potassium sulphate fertilizer (48% K_2O) was applied at a rate of 200 Kg / feddan in two split doses before first bloom (mid of March) and middle of July.

1- Experimental work:

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 (1000 g N / tree) according to (Ragab, 2006) completely via inorganic N source (5000 g ammonium sulphate / tree / year) .

2- Application of 75 % of the recommended rate N through inorganic N source (3750 g ammonium sulphate / tree / year) .

3- Application of 75 % of the recommended rate N through inorganic N source plus yeast at 80 g / tree / year .

4- Applicatin of 75 % of the recommended rate N through inorganic N source plus seaweed extract at 0.25 % (2.5 ml / L) .

5- Applicatin of 75 % of the recommended rate N through inorganic N source plus farmyard manure extract at 10 % (100 g / L) .

6- Applicatin of 50 % of the recommended rate N through inorganic N source (2500 g ammonium sulphate /tree / year) .

7- Applicatin of 50 % of the recommended rate N through inorganic N source plus yeast at 80 g / tree / year .

8- Applicatin of 50 % of the recommended rate N through inorganic N source plus seaweed extract at 0.25 % .

9- Applicatin of 50 % of the recommended rate N through inorganic N source plus farmyard manure extract at 10 % .

Each treatment was replicated three times, one tree per each. The source of inorganic N fertilizer was ammonium sulphate (20 % N). It was splitted into three equal batches and added on the middle of March and at two months intervals (mid of May and July). The amount of yeast (80 g / tree / year) was divided into four equal batches (20 g / tree / batch) and added via soil on the middle of February, April, June and August.

Chemical analysis of yeast is shown in Table (1) according to Gaser – Aisha *et al .,* (2006).

Seaweed (0.25 N) and farmyard manure (10 % N) extracts were sprayed four times at the same previous dates of using yeast. Triton B as wetting agent was applied at 0.05 % and added to all seaweed and farmyard manure extracts. Spraying was done till runoff (20 L / tree).

2- Experimental design:

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

3- Different measurements:

Measurements of yield and fruit quality:

Harvesting was achieved during the regular harvesting time prevailing under Menoufia region conditions (mid of December) during the two seasons when T.S.S. / acid reached at least 8 : 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 (gm) 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 citrie acid / 100 ml juice) by titration against 0.1 N sodium hydroxide using phenolphthalein as an indicator (A . O . A . C ., 1995) .

6- Percentages of total and reducing sugars according to Lane and Eynon (1965) volumetric method (A.O.A.C., 1995) .

7 – L- ascorbic acid content (as mg / 100 ml Juice) by using 2 , 6 dichlorophenol indophenol dye (A . O . A . C ., 1995) .

Table (1) : Chemical analysis of the tested yeast.

N %	Fats %	Ash %	Vitamin B1 (100g)	Riboflavin B_2 (100g)	Niacin B_4 (100g)	Vitamin B_6 (100g)	Vitamin B_{12} (100g)
7.3	3.5	6.7	2.33 mg	5.41 mg	36.7mg	4.41 mg	0.02 mg

4- Statistical analysis :

All the obtained data during the course of this study in the two successive seasons , 2015 and 2016 were tabulated and statistically analyzed . The differences between various treatment means were compared using New L . S . D . parameter at 5% (according to Mead *et al.,* (1993) .

RESULTS AND DISCUSSION

1- Effect of some inorganic N fertilizer as well as yeast, seaweed and farmyard extract treatments on the yield :

Data concerning the effect of some inorganic N fertilizer as well as yeast, seaweed and farmyard manure extract treatments on the number of fruits per tree and yield (Kg) of Balady mandarin trees during 2015 and 2016 seasons are shown in Table (2) . It is noticed from the obtained data that yield expressed in number of fruits/ tree and weight (Kg) was significantly varied according to the different inorganic N and biostimulants treatments. Yield was significantly increased with using the suitable N through 50 to 75% inorganic N along with yeast, seaweed or farmyard manure comparing with using inorganic N alone at 50 to 75%. There was agradual promotion on the yield with increasing percentage of inorganic N source from 50 to 100% with or without application of any of the three biostimulants. Using yeast at 80g/ tree/ year, seaweed extract at 0.25 % or farmyard manure at 10 % beside inorganic N source at 50 to 75 % in ascending order was very effective in improving the yield. The best biostimulant added with inorganic N source at 50 to 75 % 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 un significant reduction on the yield was observed with reducing percentages of inorganic N from 75 to 50 % 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 50% inorganic plus spraying seaweed extract at 0.25 % four times. Under such promised treatment, yield per tree reached 54.1 and 87.8 kg compared with 30.9 and 46.6 kg yield produced by the trees that received N completely via inorganic N from during 2015 and 2016 seasons, respectively. The lowest yield was recorded on the trees that fertilized with N as 50 % inorganic N source alone. These results were true during the two experimental seasons. 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 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 Sheta (2002) on Washington Navel orange trees. The results of Abd El- Motty Elham *et al.*, (2010) who worked in different mango cvs supported the present results. The promotive effect of seaweed extract on the yield was confirmed by the results of Irizar- Garza *et al.*, (2003) on Valencia orange fruits ; Hegab and *et al.*, (2005) on Balady orange fruits as well as Ahmed *et al.*, (2008) on Washington Navel orange fruits.

Table (2): Effect of inorganic N fertilizer as well as yeast, seaweed and farmyard manure (F. Y. M.) extract on number of fruits/tree, yield/tree and some physical characteristics of the fruits of Balady mandarin trees during 2015 and 2016 seasons.

Treatments	No. of fruit per tree		Yield /tree (kg)		Fruit weight (g)		Fruit height (cm)		Fruit diameter (cm)	
	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016
1- Inorganic N at 100 %	295	505	30.9	46.6	104.7	92.3	5.2	5.0	6.2	6.0
2- Inorganic N at 75 %	279	486	27.7	42.3	99.3	87.0	5.0	4.9	5.8	5.6
3- Inorganic N at 75 % + yeast	319	592	39.3	66.4	123.2	112.2	5.5	5.3	6.8	6.3
4- Inorganic N at 75 % + seaweed	394	675	56.5	89.8	143.4	133.0	5.9	5.8	6.9	6.7
5- Inorganic N at 75 % + F.Y. M.	334	627	45.1	77.6	135.0	123.8	5.6	5.5	6.8	6.6
6- Inorganic N at 50 %	264	449	24.4	36.1	92.4	80.4	4.9	4.7	5.6	5.7
7- Inorganic N at 50 % + yeast	314	590	38.5	60.7	122.6	102.9	5.4	5.3	6.6	6.3
8- Inorganic N at 50 % + seaweed	384	670	54.1	87.8	140.9	131.1	5.9	5.8	6.9	6.7
9- Inorganic N at 50 % + F. Y. M.	330	624	44.2	76.5	133.9	122.6	5.6	5.4	6.8	6.6
New L. S. D. at 5 %	15.0	19.0	3.5	3.9	6.1	5.8	0.10	0.11	0.09	0.10

2- Effect of some inorganic N fertilizer as well as yeast, seaweed and farmyard manure extract treatments on some physical and chemical characteristics of the fruits:

Data in Tables (2,3 and 4) show the effect of some inorganic N fertilizer as well as yeast, seaweed and farmyard manure extract treatments on fruit weight, juice %, total soluble solids %, total acidity %, T. S. S/ acid ratio and vitamin C content in the fruit of Balady mandarin trees during 2015 and 2016 seasons. It is clear from the obtained data that combined application of inorganic N source at 50 to 75 % of the suitable N and any from of the three biostimulants (yeast, seaweed extract and farmyard manure) significantly improved both physical and chemical characteristics of the fruits in terms of increasing fruit weight, juice %, total soluble solids %, T. S. S / acid, and vitamin C content and reducing total acidity % rather than applied of inorganic N at 50 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 0.25 % followed by farmyard manure and yeast. A slight and unsignificant effect on fruit quality was observed with reducing

inorganic N percentages from 75 to 50 % 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 50 % inorganic N source plus seaweed extract at 0.25 %. Using the suitable N as 50 % inorganic N source alone (without stimulant) gave unfavourable effects on quality parameters. These results were true during the two experimental seasons. 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. These results regarding the beneficial effect of organic manure on both physical and chemical characteristics of fruits are in approval with those obtained by Wassel *et al.*, (2007) and Abdo (2008) on Balady mandarin fruits. These results with regard to the beneficial effect of yeast on fruit quality were confirmed by the results of Hegab *et al.*, (1997) on Valencia orange fruits and Ebrahiem *et al.*, (2000) on Balady mandarin fruits as well as Sheta (2002) on Washington Navel orange fruits.

Similar results concerning the promoting effect of seaweed extract on quality of fruits were announced by Irizar-Garza *et al.*, (2003) on Valencia orange fruits; Hegab and *et al.*, (2005) on Balady orange fruits as well as Ahmed *et al.*, (2008) on Washington Navel orange fruits. The same trend was noticed by Ebeid- Sanaa (2007) on Hindy Bisinnara mango fruits.

Table (3) : Effect of inorganic N fertilizer as well as yeast, seaweed and farmyard Manure (F.Y.M.) extract on some physical and chemical characteristics of the fruits of Balady mandarin trees during 2015 and 2016 seasons.

Treatments	Fruit shape		Fruit peel thickness (cm)		Fruit peel %		Juice %		Total soluble solids %	
	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016
1- Inorganic N at 100 %	0.84	0.83	0.37	0.33	23.8	22.7	56.0	57.1	11.3	11.1
2- Inorganic N at 75 %	0.86	0.88	0.33	0.30	21.6	20.4	54.0	55.2	11.6	11.6
3- Inorganic N at 75 % + yeast	0.80	0.84	0.28	0.24	20.1	18.7	58.2	59.3	12.1	12.0
4- Inorganic N at 75 % + seaweed	0.86	0.87	0.23	0.21	18.1	16.9	61.9	62.9	12.8	12.6
5- Inorganic N at 75 % + F.Y. M.	0.82	0.83	0.26	0.23	18.7	17.3	60.4	61.5	12.5	12.4
6- Inorganic N at 50 %	0.88	0.82	0.30	0.26	20.1	18.5	52.0	53.1	11.9	11.7
7- Inorganic N at 50 % + yeast	0.82	0.84	0.27	0.24	19.0	17.6	58.1	59.1	12.2	12.1
8- Inorganic N at 50 % + seaweed	0.86	0.87	0.21	0.19	15.3	14.9	61.7	62.8	12.9	12.8
9- Inorganic N at 50 % + F. Y. M.	0.82	0.82	0.24	0.22	17.8	16.1	60.3	61.3	12.6	12.5
New L. S. D. at 5 %	N.S.	N.S.	0.02	0.03	1.0	0.9	1.5	1.6	0.03	0.03

Table (4): Effect of inorganic N fertilizer as well as yeast, seaweed and farmyard manure (F. Y. M.) extract on some chemical characteristics of the fruit of Balady mandarin trees during 2015 and 2016 seasons.

Treatments	Total acidity %		T. S. S. /acid		Total sugars %		Reducing sugars %		Vitamin C content (mg/ 100 ml/ juice)	
	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016
1- Inorganic N at 100 %	1.47	1.49	7.69	7.45	7.56	7.51	3.77	3.73	34.0	34.7
2- Inorganic N at 75 %	1.45	1.46	8.00	7.85	7.76	7.69	3.87	3.86	32.7	33.5
3- Inorganic N at 75 % + yeast	1.38	1.38	8.77	8.69	8.04	7.87	4.00	3.99	34.5	35.0
4- Inorganic N at 75 % + seaweed	1.29	1.29	9.92	9.77	8.50	8.41	4.24	4.20	38.8	39.7
5- Inorganic N at 75 % + F.Y. M.	1.32	1.32	9.47	0.39	8.32	8.29	4.15	4.14	37.4	37.6
6- Inorganic N at 50 %	1.41	1.42	8.44	8.24	7.97	7.85	3.98	3.96	31.6	32.3
7- Inorganic N at 50 % + yeast	1.37	1.38	8.91	8.77	8.06	7.99	4.02	4.01	35.1	35.3
8- Inorganic N at 50 % + seaweed	1.28	1.29	10.00	9.92	8.51	8.42	4.25	4.21	38.9	39.9
9- Inorganic N at 50 % + F. Y. M.	1.31	1.32	9.62	9.47	8.35	8.30	4.17	4.15	37.5	37.8
New L. S. D. at 5 %	0.02	0.02	0.35	0.30	0.12	0.11	0.08	0.07	1.2	1.1

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تأثيرات إستخدام مستخلصات الخميرة والأعشاب البحرية والسماد البلدي كبديل جزئي للتسميد المعدني على إثمار أشجار اليوسفي البلدي

مجدي رابح محمد، عاطف محمد حجازي، عبد الله السيد حسن، إيناس أشرف الخيال

قسم البساتين – كلية الزراعة – جامعة المنوفية – مصر

الملخص :

أجريت هذه الدراسة خلال موسمي ٢٠١٥، ٢٠١٦ علي أشجار يوسفي بلدي مثمرة ومطعومة علي أصل النارنج في مزرعة كلية الزراعة – قسم البساتين بشبين الكوم . وكان الهدف الرئيسي لهذه الدراسة هو إختبار تأثير المعاملة بمستخلصات الخميرة والأعشاب البحرية والسماد البلدي كبديل جزئي للأسمدة النيتروجينية الغير عضوية علي إثمار أشجار اليوسفي البلدي وكذلك تحديد أفضل نسبة من التسميد النيتروجيني الغير عضوي تستخدم مع أي مادة من هذه المنشطات العضوية. ولقد تم تكرار كل معاملة ثلاثة مرات بمعدل شجرة لكل مكررة . وتم إجراء التحليل الإحصائي لهذه التجربة بإستخدام نظام القطاعات الكاملة العشوائية .

ويمكن تلخيص أهم النتائج كما يلي:

كان هناك تحسن تدريجي في كمية محصول الشجرة معبراً عنه في صورة وزن بالكليوجرام وعدد ثمار للشجرة بزيادة النسبة المستخدمة من السماد النتروجيني الغير عضوي من ٥٠ إلى ١٠٠ % إما بمفردها أو مع أي من المنشطات الطبيعية الثلاثة (الخميرة أو الأعشاب البحرية أو السماد البلدي) وكان هناك تأثير إيجابي علي كمية محصول الشجرة عند إستخدام الكمية المثلي من النتروجين في صورة سماد نيتروجيني غير العضوي بنسبة ٥٠ إلي ٧٥٪ جنبا إلي جنب مع إستخدام مستخلصات الخميرة أو الأعشاب البحرية أو السماد البلدي . وكان أفضل منشط طبيعي يستخدم مع النتروجين العضوي في هذا الصدد هو مستخلص الأعشاب البحرية يليه السماد البلدي ثم الخميرة مرتبة ترتيبا تنازليا . كان هناك تحسن واضح في الخصائص الطبيعية والكيميائية للثمار مع إستخدام الكمية المناسبة من النيتروجين علي صورة سماد نيتروجيني غير عضوي بنسبة ٥٠ إلي ٧٥٪ جنبا إلي جنب مع إستخدام أي من هذه المواد المنشطة الطبيعية وذلك بالمقارنة بإستخدام السماد النيتروجيني الغير عضوي فقط . وكان هذا التحسن في خصائص جودة الثمار مرتبطا بزيادة النسبة المئوية المستخدمة من السماد النيتروجيني الغير عضوي من ٥٠ إلي ١٠٠٪. مع إستخدام أي من هذه المواد المنشطة الطبيعية.

لأجل تحسين كمية المحصول كما ونوعا بالإضافة إلي حماية البيئة من التلوث فإنه ينصح بتسميد أشجار اليوسفي البلدي النامية تحت ظروف محافظة المنوفية بالكمية المناسبة من النيتروجين (١٠٠٠ جرام/الشجرة/السنة) من خلال ٥٠٪ سماد نيتروجيني غير عضوي جنبا إلي جنب مع رش مستخلص الأعشاب البحرية بتركيز ٠.٢٥٪ أربعة مرات (في منتصف شهر فبراير ، منتصف شهر إبريل ، منتصف شهر يونيو ، منتصف شهر أغسطس.

السادة المحكمين

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أ.د/ طلعت على أبوسيد أحمد كلية الزراعة – جامعة الزقازيق