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FOLIAR APPLICATION OF POTASSIUM AND PHOSPHORUS ON TWO CITRUS CULTIVARS

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ABSTRACT

A field experiment was conducted with Valancia orange and Balady mandarin trees grew in clay loam soil at Orchard Sids Horticultural Research Station, Beni Suef Governorate, Egypt, for two consecutive seasons (2008 and 2009) to investigate the effects of foliar application of potassium thiosulphate (KTS) and ammonium polyphosphate (APP) on yield, leaf mineral content, external quality and Juice quality of Valencia orange and Balady mandarin. The obtained results indicated that KP4 (spraying 1% two times) treatment gave the highest weight, number of fruit and yield for each cultivars in the two seasons. All treatments significantly increased volume and diameter of fruits comparing to control. On the other hand rind thickness decreased significantly with different spray treatments .Increasing the rate and number of foliar application of KTS and APP increased TSS and TSS/acid ratio and decreased juice acidity . All treatments significantly increased N,P and K in the leaves of both cultivars comparing with the control .Different treatments significantly increased juice percent. As regards to cultivar,Valencia was better than Balady mandarin in all treatments in both seasons.Valencia cultivar gave the highest value of vitamin C compared with Balady mandarin under all spray treatments

Keywords: Foliar application, Ammonium polyphosphate, Potassium thiosulphate, Citrus.

INTRODUCTION

Citrus (Citrus sinesis L.) is one of the important fruit crop in the world, occupied the third position among the sub-tropical fruits. Citrus is the backbone of fruit crop cultivation in Egypt, since its plantations was nearly 416000 feddans according to (the yearly Bull. Agric. Economical Statistic, Ministry of Agriculture, 2010) which represents about 36 % of the total area of fruit trees. It has a great nutritional role in our daily food requirements, being a rich source of vitamin C (Gregory, 1993),

Potassium and Phosphorus play dominant roles in the mineral nutrition of citrus. The K and P requirement of citrus is often not as easily determined, because citrus can be grown within a wide range of K without showing visible symptoms and influence of vegetative growth (Koo, 1985).

Potassium and P deficiencies can be corrected through preplant soil application or partially corrected using mid-season siddress applications of K and P. Foliar applications of K and P may offer the opportunity of correcting these deficiencies more quickly and efficiently, especially late in the season when soil application of K and P may not be effective (Oasterhuis, 1997).

The foliar application of mineral nutrients by means of sprays offers a method of supplying nutrients to higher plants more rapidly than the methods involving root application. In semiarid regions, a lack of available water in the top soil and a corresponding decline in nutrient availability during the growing season are common phenomena. Even though water may still be available in

the subsoil, mineral nutrition becomes the growth-limiting factor. Under these conditions, soil application of nutrients is much less effective than foliar application. (Marschner, 1998).

It is expected that some research will continue with foliar application of P, particularly where fixation of soil-applied P is high. Also, foliar application of K fertilizer after initiation of the reproductive phase of growth has produced some marked yield in crops such as citrus (Engelstad and Terman, 1980).

The objective of this work was to investigate the effect of potassium thiosulfate (KTS) and ammonium polyphosphate (APP) as foliar application on yield, fruit quality and minerals composition of Balady mandarin and Valencia orange.

MATERIALS AND METHODS

This investigation was conducted during 2008 and 2009 seasons on 28-years old Valancia orange and Balady mandarin trees budded on troyer citrange rootstock, grown in an Orchard of Sids Horticultural Research Station, Beni Suef governorate, Egypt and planted at 4 x 4m apart.

The soil of the orchard is well drained clay loam in texture with a water table not less 2 meters. Some physical and chemical analysis of the tested soil at (0.0-90 cm soil depth) as well as some characters of potassium thiosulphate (KTS) and ammonium polysphosphate (APP) were analyzed according to Klute, (1986) and Page el al., (1982) and shown in Tables (1 and 2).

The selected trees were nearly uniform in vigour and healthy as possible. Horticultural practices such as irrigation, hoeing as well as pest fungi control were carried out as usual.

The experiment involved the following five treatments:

1-(Control) Sprayed with water two times at May and June months.
2- (KP1) Spraying 0.25 Liter KTS + 0.25 Liter APP + 99.5 Liter of water at 0.5 % concentration, one time at May month.
3- (KP2) Spraying 0.5 Liter KTS + 0.5 Liter APP + 99 Liter of water at 1% concentration one time at May month
4- (KP3) Spraying 0.25 Liter KTS + 0.25 Liter APP + 99.5 liter of water at 0.5% concentration two times at May and June months
5- (KP4) Spraying 0.5 Liter KTS + 0.5 Liter APP + 99 liter of water at 1% concentration two times at May and June months.

Triton B as a wetting agent at 0.1 % was added to nutrient solutions and spray were done till runoff (15 L/tree). The experiment was set in a completely randomized block design each treatment was replicated three times, one tree per each for both Valencia orange and Balady mandarin. Trees budded on Troyer Citrange rootstock. The total chosen trees were 30 trees (15 trees for both Valencia orange and Balady Mandarin).

Twenty mature leaves (7-months old) were picked at random from non-fruiting shoots at the spring growth cycle per each tree at the first week of September. The leaf samples were dried in electrid oven at 70 °C, ground and digested according to Cottenie et al., (1982). The digests were then

subjected to measurement for nutrients (N, P and K) using procedures, according to A.O.A.C., (1990).

The obtained data were tabulated and statistically analyzed according to Snedecor and Cochran, (1990) using New L.S.D test.

At harvesting time for both seasons, the yield expressed in weight (Kg.) and the number of fruit per tree was recorded. Samples of ten fruit were randomly taken from each replicate for measuring average fruit weight (g.), fruit volume (cm3), fruit dimensions (diameter in cm), fruit peel thickness (mm), Juice %, total soluble solides (T. S. S.) %, total acidity %, (expressed as gm citric acid/100 ml, juice) T. S. S./acids ratio and ascorbic acids content (V.C. as mg/100 ml juice), according to A.O.A.C., (1990).

Table 1. Particles size distribution and chemical analysis of soil sample collected from the experimental sites.

Particle size distribution		Chemical analysis	
• Clay%	52.0	• pH (1-2.5)	7.6
• Silt%	35.5	• EC dS m-1	0.82
• Sand %	12.5	• CaCO3 %	2.5
• Texture class	Clay loam	• O.M %	1.9
		Available nutrients (mg kg-1)	N 60
			P 12
			K 280

Table 2. Technical data information of potassium thiosulphate (KTS) and Ammonium polyphosphate (APP)

Fertilizer	Analysis %				pH	Specific gravity	Colour
	N	P	K	S			
KTS	-	-	36	25	7.5	1.46	Clear
APP	15	52	-	-	6	1.41	Green

RESULTS AND DISCUSSION

Foliar applications of nutrients, conceptually over 100 years old, involves the use of soluble, liquid sources of fertilizers. Foliar fertilization results in rapid nutrient absorption and utilization has the advantage of allowing immediate correction of deficiencies.

1-Fruit yield:

Data in Table (3) show the effect of KTS and APP as foliar spray on fruit weight, fruit number and yield (weight/tree)of the two cultivars.

As for fruit weight and number, it is clear that all treatments significantly increased weight of fruit comparing with the control. It showed also that the highest weight at KP4 was recoded by Valencia cultivar at the second season (215 g). while the lowest weight was recorded by Balady cultivar (119 g), at control. The obtained data revealed also that weight of fruit and number was differed from variety to another. Yield of Valencia and Balady trees as affect by the different treatments is shown in Table (3). It is evident from these results that the average of tree yield for the two cultivars was considerably higher in the second season (77.23 kg) compared with the

first season (75.12 kg). Yield weight per tree was significantly increased by all treatments than control. KP4 gave the highest yield for each cultivars in the two seasons. On the other hand yield (Kg) for Balady cultivar was significantly higher than Valencia in both seasons. These results generally agree with the findings of Kouka et al., (2000) they reported that the combination between the high rate of N and K increased fruit yield and fruit quality of Balady orange trees.

Table 3. Effects of foliar application of KTS and APP on Fruit weight, number of fruit and yield per tree

Treatments	First Season			Second Season		
	Variety		Mean	Variety		Mean
	V1	V2		V1	V2	
Fruit Weight (gm)						
Control	194	122	158.0	192	119	155.5
KP1	200	125	162.5	204	129	166.5
KP2	205	127	166.0	210	132	171.0
KP3	206	128	167.0	211	133	172.0
KP4	208	131	169.5	215	135	175.0
Mean	202.6	126.6	164.6	206.4	129.6	168
LSD0.05 V		2.79			3.19	
LSD0.05 T		5.57			4.09	
No. of Fruit/tree						
Control	350	615	482.5	340	607	473.5
KP1	352	618	485.0	360	627	493.5
KP2	355	621	488.0	362	629	495.5
KP3	355	622	488.5	362	630	496.0
KP4	357	626	491.5	366	635	500.5
Mean	353.8	620.4	487.1	358	625.6	491.8
LSD0.05 V		83.06			99.56	
LSD0.05 T		139.93			148.38	
Yield/tree (Kg)						
Control	67.91	75.03	71.47	66.00	72.30	69.15
KP1	70.39	77.25	73.82	73.14	80.25	76.70
KP2	72.79	78.87	75.83	75.70	82.36	79.03
KP3	73.14	79.61	76.38	76.06	83.12	79.59
KP4	74.24	82.00	78.12	78.32	85.03	81.68
Mean	71.69	78.55	75.12	73.84	80.61	77.23
LSD0.05 V		1.55			1.47	
LSD0.05 T		2.49			2.21	

Cultivar(V), Treatments(T),Valencia(V1) and Balady mandarin(V2)

2- External quality:

Data in Table (4) showed the effect of K and P with different rate and time as foliar application on physical properties of Valencia and Balady cultivars. As for volume and diameter of fruits, it is clear that both parameters gave the same trend, since all treatments significantly increased volume and diameter of fruits comparing to the control. On the other hand, rind thickness decreased significantly with different spray treatments.

The present results are in a general harmony with Okada et al., (1994) on Satsuma mandarin, who mentioned that fruit size increased as K fertilization increased. Also, Cicala and Catara (1994) on tarocco orange trees, noticed that there was significant correlation between leaf K content and fruit number, weight and rind thickness.

Table 4. Effects of foliar application of KTS and APP on the external quality of the Valancia and Balady mandarin

Treatments	First Season			Second Season		
	Variety		Mean	Variety		Mean
	V1	V2		V1	V2	
Fruit Volume (cm3)						
Control	200	119	159.5	203	120	161.5
KP1	210	128	169.0	216	133	179.5
KP2	225	134	179.5	230	140	185.0
KP3	228	137	182.5	232	141	186.5
KP4	232	143	187.5	238	148	193.0
Mean	219	132.2	175.6	223.8	136.4	180.1
LSD0.05 V		5.02			19.28	
LSD0.05 T		5.90			29.58	
Fruit Diameter (cm)						
Control	6.83	6.41	6.62	6.78	6.36	6.57
KP1	7.10	6.60	6.85	7.15	6.65	6.90
KP2	7.18	6.75	6.97	7.22	6.79	7.01
KP3	7.22	6.80	7.01	7.25	6.83	7.04
KP4	7.29	7.10	7.20	7.34	7.15	7.25
Mean	7.12	6.73	6.93	7.15	6.76	6.95
LSD0.05 V		0.080			0.079	
LSD0.05 T		0.115			0.105	
Rind thickness/Fruit (mm)						
Control	3.60	3.30	3.45	3.56	3.22	3.39
KP1	3.40	3.20	3.30	3.19	2.99	3.09
KP2	3.35	3.10	3.23	3.13	2.88	3.01
KP3	3.35	3.10	3.23	3.12	2.87	3.00
KP4	3.25	3.00	3.13	3.03	2.78	2.91
Mean	3.39	3.14	3.27	3.20	2.95	3.08
LSD0.05 V		0.062			0.140	
LSD0.05 T		0.081			0.250	

Cultivar (V), Treatments(T),Valencia(V1) and Balady mandarin(V2)

3- Juice quality:

It is clear from Table (5) that in both seasons for the two varieties, increasing folair application of K and P increased Juice TSS and TSS/acid ratio and decreased Juice acidity. However, no significant difference was obtained between treatments in the first season. On the other hand, Juice TSS and TSS/acid of Balady cultivar were significantly higher than Valencia. Generally, from the aforementioned results one can say that increasing the rate and number of foliar application of K and P to Valencia and Balady cultivars increased TSS and TSS/acid ratio and decreased juice acidity. From the results, it is clear that the highest value of TSS and TSS/acid and the lowest of acidity of fruits were obtained with KP4 for Balady cultivar. Where as TSS and TSS/acid ratio value were lowest with control for Valencia cultivar. The present results are in a general harmony with Qinzuannaw and Shanguo (1996) who noticed the role of potassium for improving fruit yield and quality of 16 years old Eureka lemon trees spread 4 times with KCl (1%). The treatment increased TSS content and ascorbic acid contents.

Table 5. Effects of foliar application of KTS and APP on Juice quality of Valancia and Balady mandarin

Treatments	First Season			Second Season		
	Variety		Mean	Variety		Mean
	V1	V2		V1	V2	
TSS (%)						
Control	10.70	13.00	11.85	10.27	12.51	11.39
KP1	11.00	13.20	12.10	11.43	13.62	12.53
KP2	11.60	13.40	12.50	12.06	13.84	12.95
KP3	11.60	13.45	12.33	12.08	13.86	12.97
KP4	11.90	13.60	12.75	12.37	14.04	13.21
Mean	11.36	13.33	12.35	11.64	13.57	12.61
LSD0.05 V		0.165			0.262	
LSD0.05 T		1.08			0.715	
Acidity (%)						
Control	1.40	1.30	1.35	1.32	1.27	1.30
KP1	1.30	1.20	1.25	1.17	1.13	1.15
KP2	1.25	1.10	1.18	1.12	1.04	1.08
KP3	1.20	1.10	1.15	1.09	1.02	1.06
KP4	1.10	1.06	1.08	0.98	0.97	0.98
Mean	1.25	1.15	1.20	1.14	1.09	1.11
LSD0.05 V		0.157			0.054	
LSD0.05 T		0.249			0.075	
TSS/Acid (ratio)						
Control	7.65	10.01	8.83	7.79	9.87	8.83
KP1	8.50	11.01	9.76	9.79	12.06	10.93
KP2	9.28	12.20	10.74	10.80	13.36	12.08
KP3	9.66	12.24	10.95	11.10	13.61	12.36
KP4	10.81	12.96	11.89	12.65	14.52	13.59
Mean	9.18	11.68	10.43	10.43	12.68	11.56
LSD0.05 V		0.363			0.576	
LSD0.05 T		1.010			0.875	

Cultivar (V), Treatments(T),Valencia(V1) and Balady mandarin(V2)

4- Leaf mineral contents:

Data in Table (6) show the effect of KTS and APP as foliar sprays on leaf mineral content of Valenica and Balady cultivars.

Nitrogen, phosphorus and potassium contents in the leaves of both cultivars was significantly affected in the two seasons. Generally, all treatments enhanced NPK contents in the leaves compared with the control and the highest value was recoded by KP4 treatment. While the control gave the lowest value for Valencia.

This was true in the both cultivars during the two seasons. The previous results are in agreement with that obtained by Abd El-Migeed et al., (2000) who reported that N, P and K contents of Hamlin orange could be enhanced by NPK sprays.

Table 6. Nitrogen, Phosphorus and Potassium (%) in Valancia and Balady mandarin under different foliar treatments

Treatments	First Season			Second Season		
	Variety		Mean	Variety		Mean
	V1	V2		V1	V2	
Nitrogen						
Control	1.80	1.95	1.88	1.79	1.94	1.87
KP1	2.00	2.20	2.10	2.04	2.26	2.15
KP2	2.17	2.39	2.28	2.19	2.46	2.33
KP3	2.20	2.45	2.33	2.23	2.50	2.37
KP4	2.38	2.55	2.47	2.41	2.60	2.51
Mean	2.11	2.31	2.21	2.13	2.35	2.24
LSD0.05 V		0.081			0.069	
LSD0.05 T		0.062			0.084	
Phosphorus						
Control	0.210	0.220	0.215	0.190	0.210	0.200
KP1	0.246	0.260	0.253	0.253	0.267	0.260
KP2	0.262	0.280	0.271	0.270	0.285	0.277
KP3	0.263	0.284	0.274	0.271	0.289	0.280
KP4	0.284	0.299	0.292	0.291	0.310	0.301
Mean	0.253	2.69	0.261	0.255	0.272	0.264
LSD0.05 V		0.012			0.006	
LSD0.05 T		0.018			0.009	
Potassium						
Control	1.81	1.94	1.88	1.78	1.90	1.84
KP1	2.11	2.21	2.16	2.24	2.33	2.29
KP2	2.25	2.30	2.28	2.38	2.44	2.41
KP3	2.27	2.33	2.30	2.39	2.45	2.42
KP4	2.42	2.49	2.45	2.54	2.62	2.58
Mean	2.17	2.25	2.21	2.27	2.35	2.31
LSD0.05 V		0.049			0.042	
LSD0.05 T		0.048			0.046	

Cultivar(V), Treatments(T),Valencia(V1) and Balady mandarin(V2)

5- Juice content and Vitamin C:

Data in Table (7) show the effect of KTS and APP as foliar application on Juice percentage and vitamin C of Valencia and Balady mandarin fruits. As for Juice, it is clear that different treatments significantly increased Juice % comparing with the control, since KP4 treatment recorded the highest Juice % for Valencia cultivar. As regards to cultivar, Valencia was better than Balady in all treatments in both seasons.Similarly, foliar spray of KTS and APP on Valencia and Balady cultivars significantly increased vitamin C in the fruit Juice in both seasons. Valencia cultivar gave the highest value of vitamin C compared with Balady mandarin under all spray treatments. The greater amount of vitamin (59.75) was recorded in KP4 for Valencia during the second season. These results are in line with the previous work of Hearn, (1993) who reported that optimum supplies of K and P increases content of citrus fruit.

Table 7. Effects of foliar application of KTS and APP on Juice content and Vitamin C of Valancia and Balady mandarin

Treatments	First Season			Second Season		
	Variety		Mean	Variety		Mean
	V1	V2		V1	V2	
Juice Percentage (%)						
Control	51.50	32.50	42.00	49.95	31.44	40.70
KP1	52.10	34.20	43.15	54.18	36.23	45.21
KP2	52.80	35.10	43.95	54.89	37.17	46.03
KP3	63.10	35.80	44.45	55.16	36.82	45.99
KP4	53.40	36.70	45.05	55.49	38.77	47.13
Mean	52.58	34.86	43.72	53.93	36.09	45.01
LSD0.05 V	0.911			0.789		
LSD0.05 T	1.58			1.217		
Vitamin C content						
Control	52.40	35.70	44.05	51.66	35.50	43.58
KP1	54.40	36.32	45.36	56.36	37.03	46.70
KP2	56.40	37.20	46.80	57.69	37.95	47.82
KP3	56.40	37.40	46.90	58.10	38.14	48.12
KP4	58.20	38.50	48.35	59.75	39.23	49.49
Mean	55.56	37.02	46.29	56.71	37.57	47.14
LSD0.05 V	0.891			1.08		
LSD0.05 T	1.120			1.06		

Cultivar (V), Treatments(T),Valencia(V1) and Balady mandarin(V2)

REFERENCES

A. O. A. C., 1990. Official Methods of Analysis Association of Official Analytical Chemists, 15th Ed. Inc Wash D.C.

Abd-El-Migeed, M. M. M.; Mostafa, E. A. M. and Saleh, M. M. S. 2000. Effect of some macro nutrients sprays on mineral status, yield and fruit quality of Hamlin orange trees grown under Rafah conditions. J. Agric, Sci, Mansoura Univ., 25: 403-411.

Cicala, A. and V. Catara. 1994. Potassium fertilization effects on yield, fruit quality and mineral composition of Turocco orange trees. Proceedings of the international Society of Citriculture. 2: 618-620.

Cottenie, A., M. Verloo, M. Kictens, G. Velghe and R. Camerlynch, 1982. Chemical Analysis of Plants and Soil. Laboratory of Agro-Chemistry. State Univ. Gent, Belgium.

Engelstad, O. P. and G. L., Terman 1980. Agronomic effectiveness of phosphate fertilizers. P. 311-332. In: The Role of Phosphorus in Agriculture. (Ed: F. E. K. Hasawneh). USA

Gregory, T. F. 1993. Ascorbic acid bioavailability in foods and supplements. Nutr. Rev., 51: 301-303.

Hearn, C. J. 1993. The influence of cultivar and high nitrogen and potassium fertilization on fruit quality traits of young orange trees. Proceedings of Florida state Horticulture Society 106: 8-12.

Klute, A. 1986. "Methods of Soil Analysis", Part 1, 2nd ed., Am. Soc. Agron. Inc., Soil Sci. Soc. Am., Madison, Wisconsin USA.

Koo, R. C. J. 1985. Potassium nutrition of citrus. P. 1078-1085. In: Proc., Symp. On Potassium in Agriculture. (Ed. R.D. Munson). 7-10 July 1985. Atlanta. USA.

Kouka, H. A.; M.S. Meligi; I.A. Mousa, and F. G. Nakhlla. 2000. Effect of some nitrogen and potassium fertilization rate on yield, fruit quality and vegetative growth of balady orange trees under conditions of sandy soil and drip irrigation, Minufiya J. Agric. Res., 25 No. 1: 183-202.

Marschner, H. 1998. Mineral Nutrition of Higher Plants. Second Edition Academic Press Limited London NW 17 DX 680 P.

Ministry of Agriculture, A. R. E. 2010. Economic Affairs Sector. Bulletin of the Agricultural Statistics. Part (1).

Okada, N., A. Ooshiro and T. Ishida. 1994. Effect of the level of fertilizer application on the nutrient of mandarin trees. Procceding of the International Society of Citr.: 2: 575-579.

Oosterhuis, D. M. 1997. Potassium nutrition of cotton in the U. S. A. with particular reference to foliar fertilization. Proc. FAO-IRCRNC: (Cotton nutrition & growth regulators: 20-23 March, 1995, Egypt, pp. 101-124.

Page, A.L., R.H. Miller, and D.R. Kenney, 1982. "Methods of Soil Analysis". Part 2, 2nd ed., Am. Soc. Agron. Inc., Soil Sci. Soc. Am., Madison, Wisconsin USA.

Qinzuannaw, Y.K and H.E. Shanguo. 1996. The role of potassium in preventing leaf drop and improving fruit yield and quality of lemon. Journal of southwest Agricultural University, 18: 20-23.

Snedecor, G. W. and W.G. Cochran. 1990. Statistical Methods. The Lowa state Univ. 7th ed. pp. 507.

تأثير الرش بالفوسفور والبوتاسيوم علي صنفين من الموالح

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أجريت تجربة حقلية باستخدام أشجار برتقال (الفالينشيا) وأشجار اليوسفي (البلدي) في تربة طميية طينية بمحطة سدس للبحوث الزراعية بمحافظة بني سويف ، خلال موسمين متعاقبين (٢٠٠٨ ، ٢٠٠٩) وذلك لدراسة تأثير الرش الورقي لكلا من ثيوسلفات البوتاسيوم (KTS) و بولي فوسفات الامونيوم (APP) علي المحصول والمحتوي المعدني للاوراق وجودة الثمرة الخارجية وجودة العصير وذلك لكل من برتقال الفالينشيا واليوسفي البلدي.

وأوضحت النتائج أن معاملة KP4 أعطت أعلي وزن وأعلي عدد من الثمار وأعلي محصول لكل من الصنفين وفي كلا الموسمين.

كما أوضحت النتائج أن كل المعاملات تؤدي إلي زيادة معنوية في كل من قطر وحجم الثمرة وذلك مقارنة بالكنترول. ومن ناحية أخري فإن سمك القشرة إنخفض معنويا مع معاملات الرش المختلفة.

كما أوضحت النتائج أن زيادة معدل وعدد رشات كل من الـ APP, KTS يؤدي إلي زيادة المواد الصلبة الكلية ويؤدي إلي زيادة نسبة المواد الصلبة الكلية إلي الحموضة ، كما انه يؤدي إلي إنخفاض حموضة العصير.

ومن النتاج نجد أن كل المعاملات تؤدي إلي زيادة معنوية في كلا من الـ N, P, K في أوراق كلا من الصنفين وذلك مقارنة بالكنترول. كما نجد أن المعاملات المختلفة تؤدي إلي زيادة معنوية في نسبة العصير. وبمقارنة الأصناف وجد أن برتقال الفالينشيا أفضل من اليوسفي البلدي وذلك في كل المعاملات وفي كلا الموسمين ، ومن النتائج نجد أن الفالينشيا أعطي أعلي قيمة من فيتامين C وذلك مقارنة باليوسفي البلدي تحت كل المعاملات.

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