Effect of foliar spray of urea and potassium citrate on fruiting of Barhee date palm

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Abstract

The objective of the present study is to investigate the promotive effect of spraying Barhee date palm bunches with urea and potassium citrate on yield and fruit physical and chemical characteristics. The present study was carried out during 2020, 2021 and 2022 seasons on 20 years old date palm grown in Agricultural research station farm that located at Kom Ombo, Aswan Governorate, Egypt. Inflorescences were sprayed with urea at 0.25 or 50% twice at 2 or 6 weeks of pollination. Also, bunches were sprayed with potassium citrate at 1 or 2% twice at 7 or 10 weeks of pollination. Spraying treatments were performed as urea or potassium citrate alone or combination of them, beside the control treatment (spraying with water only). The present results indicated that all spraying treatments significantly increased yield. Also, it improved fruit characteristics as compared with untreated palms. Spraying inflorescences with urea at 0.25 combined with potassium citrate at 1% were more effective treatments in increasing yield and improving physical and chemical properties of fruits.

Key words*:* Date palm, fruit yield, fruit quality, potassium citrate, urea.

Introduction

Date palm (*Phoenix dactylifera* L.) has long been one of the most important fruit crops grown in semiarid and arid- regions. In Egypt, many farmers rely on date palms cultivation and exportation of their fruit. According to **[1] ,** Egypt is considered the leading country among the top ten date producers (1,130,000 tons). 'Barhee' is one of the most commercial and soft fruit cultivars in Egypt. Moreover, major problems face date growers as low annually average of yield and fruit quality. Minerals element especially silicon and potassium have an important role for increasing yield and fruit quality, therefore determination the optimum levels for them is a necessity for date palm fertilization. Foliar application of macro and micro-nutrients is the key for improving fruit set, productivity, and quality of fruits, as well as it has a beneficial role in recovery of nutritional and physiological disorders in fruit trees **[2]**.

Nitrogen fertilization is one of the important tools to increase the fruiting of yield in fruit trees. The efficiency of nitrogen fertilizer under field conditions and surface irrigated soils rarely exceeds 50% and is usually ranged

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between 30 and 40% **[3]**. Low efficiency may be due to losses of N from soils as nitrate and nitrite by leaching or going up as nitrogen gases through nitrate reduction by volatilization. These huge amounts of chemicals caused many problems, such as nitrate pollution of ground water and environment, as well as depress the activities of both nitrogen fixation bacteria and phosphorus bacteria which work, actively, at low concentration of these substances **[4]**. In addition, alter the composition of fruits, vegetables and root crops and decrease their contents of vitamins, minerals, and other useful compounds. There is a very great danger that harmful residues may remain in food **[5, 6]**.

Many attempts were established to promote the production yield and fruit quality of the date palm by using unconventional methods. The excessive uses of nitrogen via mineral nitrogen fertilizers lead to the promotion of some vegetative growth characteristics at the expense of yield and fruit quality. Therefore, controlling and adjusting the amount of nitrogen given to the palms was conducted by using plant compost, farmyard manure and the biofertilizer have a pronounced stimulation on soils fertility, nitrogen fixation, biosynthesis of natural hormones, organic matter, vitamins and antibiotic root development the availability of most nutrients, water retention, microbial activity and enzymes and have an obvious reduction on soil pH, salinity pathogens and erosion **[6, 7, 8, 9]**

Potassium is very important for basic physiological functions, such as the formation of sugars, starch, the synthesis of proteins, cell division, growth, fruit formation and could improve fruit size, flavor, and color **[10]** Furthermore, it has been shown to promote plant disease reduction, and potassium stress can increase the degree of crop damage by bacterial and fungal diseases **11]** Potassium silicate is a source of highly soluble potassium and silicon. It is used in agricultural production systems primarily as a silica amendment, and has the added benefit of supplying small amounts of potassium **[12]**

So, the present study was planned to know the response of foliar application of urea or/and potassium citrate on yield and fruit quality of Barhee date palm cultivar.

Materials and Methods

The present study was carried out during 2020, 2021 and 2022 seasons on 20 years old Barhee date palm (*Phoenix dactylifera* L.) grown in Agricultural Research Station form that located at Kom Ombo, Aswan Governorate, Egypt. The texture of soil is silty clay and its analysis was done according to **[13],** and the obtained data are given in Table (1). The selected palms were healthy, nearly uniform in growth vigor and fruiting, and received regular horticultural practices. In addition, pruning was performed to maintain bunch/mature leaves ratio to 1:8, respectively. The number of spathes per palm was edited to 12 bunches by removing excess earliest, latest, and smallest inflorescence. Pollination was carried out using the same pollen grain source during both seasons of the study. Five date palms were selected and divided into nine treatments in five replicates (each replicate as one palm) and arranged in a randomized complete block design as follows:

Table (1): Mechanical, physical, and chemical analysis of the tested orchard soil.

Characters	Values	Characters	Values
Particle size distribution		P (ppm Olsen method)	20.00
Sand %	10.60	K (ppm ammonium acetate)	419.00
Silt %	58.00	Mg (ppm	79.00
Clay %	31.40	S (ppm)	6.90
Texture grade	Silty clay	B (ppm hot water extractable)	0.27
pH (1:2.5 extract)	8.00	EDTA extractable micronutrients (ppm)	
E.C (1:2.5 extract) dSm^{-1}/25°C	0.91	Zn	1.31
Organic matter %	2.09	Fe	11.00
$CaCO_3$ %	1.22	Mn	10.18
Macronutrients values		Cu	1.60
Total N%	0.11		

1-Control treatment (sprayed with water only).

2-Spraying inflorescences with urea at 0.25%.

3-Spraying inflorescences with urea at 0.50%.

4-Spraying bunches with potassium citrate at 1%.

5- Spraying bunches with potassium citrate at 2%.

6- Spraying inflorescences with 0.25% urea and 1% potassium citrate.

7- Spraying inflorescences with 0.25% urea and 2% potassium citrate.

8- Spraying inflorescences with 0.50% urea and 1% potassium citrate.

9- Spraying inflorescences with 0.50% urea and 2% potassium citrate.

All spraying treatments were thoroughly applied on bunches using hand sprayer (5 liters capacity). Urea were sprayed for two times at two and six weeks after pollination, whereas, potassium citrate were sprayed after seven and ten weeks of pollination. The response of "Barhee" date palms to urea or potassium citrate, and their combinations were evaluated through the following determinations:

Yield components i.e., fruit retention, bunch weight and yield/palm were estimated.

The fruit retained percentage was calculated at harvest. Five inner and outer strands per bunch after harvest time. The percentage of fruit retention were calculated using the following equation:

$$Fruit\ retention\ \% = \frac{Total\ number\ of\ retained\ fruits\ strand}{Number\ of\ retained\ fruits\ /\ strand\ and\ flowersno.flower\ scars}\ x\ 100$$

Bunches were harvested at the first of August when the fruits reached Khalas stage. The average yield weight/palm and bunch weight were recorded in kilograms.

Fruit physical characteristics:

At the peak of color, fruit were randomly picked from each bunch to determine the physical properties such as fruit weight (g), fruit dimensions (cm) (Length and diameter), pulp weight (g) and flesh %.

Fruit chemical characteristics:

Chemical properties i.e., total soluble solids content (T.S.S.) % was determined using hand refractometer, also percentage of total acidity as gm citric acid/100gm fruit weight and total tannins. Reducing sugars %, non-reducing sugars % and total sugars % were determined according to **[14].**

Statistical analysis:

The obtained data during three studied seasons were subjected to analysis of variance according to **[15].** Means were differentiated using values of new LSD at 5% level.

Results

1- Yield components:

Results given in Table (2) indicate that yield components i.e. fruit retention, bunch weight and yield kg/palm significantly affected by different treatments as compared to control. Regarding fruit retention, it can be noticed that, all spraying treatments significantly increased fruit retention as compared with unsprayed ones (control). In this respect, the best treatments that gave the highest significant fruit retention (38.33 and 39.78% as an av. of the three studied seasons) due to 2% potassium citrate or 2% potassium citrate plus 0.5% urea, respectively, followed by 0.25% urea plus 2% potassium citrate or 0.50 urea plus 1% potassium citrate which achieved (37.82 and 38.07%) as an av. of the three studied seasons, respectively. Control palms gave the lowest significant fruit retention, where it recorded (33.41% as an av. of the three studied seasons). No significant differences were found due to spray potassium alone or potassium plus urea whatever any concentration of spraying solution. So, in general economic view, that the results suggested to spray potassium citrate alone or in combination urea at lower concentration.

Concerning bunch weight, results in the same table reveal that, all urea or potassium citrate combinations had a positive effect on bunch weight as compared with the control. Urea at 0.25 or 0.50 plus, citrate at 1 or 2% gave the highest bunch weight (16.88, 17.00, 17.05 and 17.22) followed by potassium citrate at 1 or 2% (16.38 and 16.39 as an av. of the three studied seasons). On the other hand, control treatment recorded the lowest bunch weight (12.36 kg as an av. of the three studied seasons). Moreover, the other treatments were intermediate in this respect. The recorded bunch weight was (12.36, 14.69, 14.95, 16.38, 16.39, 16.88, 17.00, 17.05 and 17.22 kg as an av. of the three studied seasons) due to T1 to T9, respectively. Then, the corresponding percentage of bunch weight due to treatments over untreated ones attained (18.85, 20.95, 32.52, 32.61, 36.57, 37,54, 37.94 and 39.32%), respectively.

Moreover, 0.50% urea plus potassium citrate at either 1 or 2% recorded the maximum yield per palm since it was 204.6 and 204.6 kg as av. of the three studied seasons, respectively, followed by urea at 0.25 plus 1 or 2% potassium citrate which recorded 202.6 and 204.0 as av. of the three studied seasons, respectively. Meanwhile, control treatment recorded the lowest value in this respect, since it was 148.4 kg as an av. three studied seasons. On

the other hand, the other treatments were in between range. Hence, the increment percentage of yield/palm attained (36.52, 37.47, 37.87 and 37.87% as av. of the three studied seasons) due to spray bunches with 0.25 urea plus 1% potassium citrate (T6), 0.25 urea plus 2% potassium citrate, 0.50 urea plus 1% potassium citrate and 0.5% urea plus 2% potassium citrate compared to unsprayed ones (control), respectively.

No significant differences were recorded as a result of increasing the concentration of spraying urea or potassium solutions, whether individually for each or spraying or together. Therefore, from an economic standpoint, it is preferable to spray urea or potassium citrate at a lower concentration, whatever individually or mixed.

Table (2): Effect of urea and potassium spraying on yield components of Barhee date palm during 2020, 2021 and 2022 seasons.

Charac. / Treat.	Fruit retention (%)				Bunch weight (k)				Yield/palm (kg)			
	2020	2021	2022	Mean	2020	2021	2022	Mean	2020	2021	2022	Mean
T1	30.11	86.20	33.92	**33.41**	9.88	14.10	13.11	**12.36**	118.6	169.2	157.3	**148.4**
T2	32.25	39.34	36.18	**35.92**	11.63	16.85	15.60	**14.69**	139.6	202.2	187.2	**176.3**
T3	32.66	39.84	36.90	**36.47**	11.92	17.50	15.43	**14.95**	143.0	210.0	185.2	**179.4**
T4	33.72	41.18	37.33	**37.41**	12.85	18.96	17.33	**16.38**	154.2	227.5	208.0	**196.6**
T5	34.42	41.87	38.70	**38.33**	13.00	18.60	17.56	**16.39**	156.0	223.2	210.7	**196.6**
T6	33.40	40.65	37.88	**37.31**	13.25	19.50	17.90	**16.88**	159.0	234.0	214.8	**202.6**
T7	33.85	41.25	38.19	**37.82**	13.56	19.23	18.22	**17.00**	162.7	230.8	218.6	**204.0**
T8	34.21	41.64	38.55	**38.07**	13.36	19.25	18.54	**17.05**	160.3	231.0	222.5	**204.6**
T9	34.83	42.40	39.11	**39.78**	13.82	19.63	18.20	**17.22**	165.8	235.6	218.4	**204.6**
New LSD 5%	**1.85**	**2.34**	**1.98**		**0.65**	**0.84**	**0.79**		**6.99**	**9.85**	**9.36**	

T1- Control (water spray). T2- 0.25% urea. T3- 50% urea. T4- 1% potassium citrate

T5- 2% potassium citrate. T6- 0.25% urea 1% potassium citrate. T7- 0.25% urea + 2% potassium citrate

T8- 0.5% urea + 1% potassium citrate T9- 0.5% urea + 2% potassium citrate

2- Fruit quality:

A- Fruit physical characteristics:

Results in Tables (3 and 4) indicate that fruit weight, fruit dimensions and flesh percentage were significantly affected by different treatments during three seasons of the study. In general, spraying urea at 0.25 or 0.50% followed by spraying potassium citrate at 1 or 2% significantly increased the previously studied traits compared to unsprayed ones (control). Moreover, potassium citrate at 2% plus urea at 0.25 or 50% were achieved higher fruit weight (15.30 and 15.31 g), flesh % (91.79 and 91.66%) and fruit length (3.60 and 3.62 cm as av. of the three studied seasons) compared with the other treatments and control, while the control recorded the lowest value in the respect of fruit weight (12.30 g), flesh % (87.46%) and fruit length (3.18 cm) as an av. of three studied seasons.

These results showed that no significant differences were seen due to increase the concentration of spraying urea or potassium citrate solutions, whatever, alone of each or in combination spraying. So, from an economic standpoint it could be suggested to spray urea or potassium citrate at a lower concentration whatever individually or in combination.

Table (3): Effect of urea and potassium spraying on fruit weight and flesh of Barhee date palm during 2020, 2021 and 2022 seasons.

Charac. / Treat.	Fruit weight (g)				Flesh (%)			
	2020	2021	2022	Mean	2020	2021	2022	Mean
T1	11.28	13.46	12.15	**12.30**	87.15	87.80	87.42	**87.46**
T2	12.36	14.93	14.18	**13.82**	90.45	90.11	89.85	**90.13**
T3	12.63	15.18	14.45	**14.09**	89.85	90.33	90.00	**90.06**
T4	13.10	15.67	14.89	**14.55**	90.58	91.20	91.83	**91.20**
T5	13.25	16.00	15.13	**14.79**	91.38	91.85	91.56	**91.53**
T6	13.31	15.86	15.13	**14.77**	91.25	91.93	91.53	**91.57**
T7	13.82	16.39	15.68	**15.30**	91.49	92.08	91.82	**91.79**
T8	13.60	16.18	15.35	**15.04**	91.30	92.00	91.75	**91.68**
T9	13.88	16.43	15.62	**15.31**	91.33	91.93	91.72	**91.66**
New LSD 5%	**0.52**	**0.68**	**0.58**		**2.49**	**2.68**	**2.35**	

Table (4): Effect of urea and potassium spraying on fruit length and fruit diameter of Barhee date palm during 2020, 2021 and 2022 seasons.

Charac. / Treat.	Fruit length (cm)				Fruit diameter (cm)			
	2020	2021	2022	Mean	2020	2021	2022	Mean
T1	3.11	3.22	3.20	**3.18**	2.18	2.22	2.20	**2.20**
T2	3.32	3.44	3.40	**3.39**	2.38	2.43	2.40	**2.40**
T3	3.35	3.46	3.41	**3.41**	2.39	2.46	2.43	**2.43**
T4	3.42	3.53	3.50	**3.48**	2.45	2.51	2.50	**2.49**
T5	3.45	3.57	3.52	**3.51**	2.49	2.55	2.52	**2.52**
T6	3.51	3.64	3.61	**3.59**	2.53	2.59	2.57	**2.56**
T7	3.54	3.62	3.63	**3.60**	2.55	2.61	2.59	**2.58**
T8	3.55	3.65	3.62	**3.61**	2.59	2.63	2.62	**2.61**
T9	3.57	3.65	3.63	**3.62**	2.61	2.65	2.63	**2.63**
New LSD 5%	**0.18**	**0.20**	**0.16**		**0.12**	**0.13**	**0.10**	

Moreover, the increment percentage of fruit weight due spraying urea and potassium citrate compared to unsprayed one (control) attained (12.36, 14.55, 18.24, 20.24, 20.08, 24.39, 22.28 and 24.47%), respectively.

B- Fruit chemical characteristics:

It is clear from the results in Tables (5, 6 and 7) that spraying potassium citrate and urea either alone or in combinations, significantly resulted in improving fruit chemical properties as well as in terms of increasing fruit T.S.S. %, sugar contents and decreasing the acidity and tannins in relative to the control treatment. As for TSS %, and sugar contents, the results in Tables (5 and 6) reveal that using foliar application of potassium citrate at 2% followed by potassium citrate at 2% plus 0.25 or 0.5 urea in descending order gave better results (39.1 and 33.41%), (38.79 and 33.27) and (38.86 and 33.50% as an av. of the three studied seasons) for TSS and total sugars due to T5, T7 and T9, respectively. On the other hand, control scored the lowest value in this respect (36.60 and 31.25%), respectively.

Moreover, no significant differences were found due to spray potassium at 1 or 2% whatever, alone or in combination with urea at 0.25 or 0.50%. So, from economic view, it is suggested spraying 1% potassium citrate alone or in combination with 0.25% urea to get best date quality.

Regarding acidity % and tannins contents, all spraying treatments were reduced such studied traits as compared with the control, and lower values in this respect (0.123 and 0.197%) and (0.122 and 0.196% as an av. of three studied seasons) were obtained by potassium citrate at 2.0% (T5) or 2% potassium citrate plus 0.25 urea (T7), respectively. Meanwhile, control treatment gave the highest value in this respect (0.134 and 0.224% as an av. of three studied seasons).

In general, the lowest percentage of fruit chemical properties were found in control. On the other hand, spraying potassium citrate at 1 or 2% alone followed by potassium citrate at 2% plus 0.25 urea recorded the highest value in this respect. No significant differences were found due to spray potassium alone or potassium plus urea whatever any concentration of spraying solution. So, in general economic view, it is suggested to spray potassium citrate alone or in combination urea at lower concentration to get high yield with good dates quality.

Table (5): Effect of urea and potassium spraying on TSS and total sugars of Barhee date palm during 2020, 2021 and 2022 seasons.

Charac. / Treat.	TSS (%)				Total sugars (%)			
	2020	2021	2022	Mean	2020	2021	2022	Mean
T1	36.53	36.16	37.11	**36.60**	31.42	30.56	31.76	**31.25**
T2	38.25	37.85	38.86	**38.32**	33.11	32.15	33.43	**32.90**
T3	38.50	38.08	38.95	**38.51**	33.25	32.35	33.58	**33.06**
T4	38.71	38.30	39.10	**38.70**	33.50	32.55	33.74	**33.26**
T5	38.92	38.55	39.55	**39.01**	33.63	32.68	33.92	**33.41**
T6	38.63	38.21	39.05	**38.03**	33.45	32.49	33.75	**33.23**
T7	38.70	38.32	39.35	**38.79**	33.48	32.51	33.81	**33.27**
T8	38.73	38.30	39.11	**38.71**	33.52	32.50	33.80	**33.27**
T9	38.81	38.35	39.43	**38.86**	33.67	32.75	34.08	**33.50**
New LSD 5%	1.18	1.23	1.26		1.11	0.93	1.15	

Table (6): Effect of urea and potassium spraying on reducing and non-reducing sugars of Barhee date palm during 2020, 2021 and 2022 seasons.

Charac. / Treat.	Reducing Sugars %				Non-reducing Sugars %			
	2020	2021	2022	Mean	2020	2021	2022	Mean
T1	23.30	22.96	23.46	**23.24**	8.12	7.60	8.30	**8.01**
T2	24.38	23.94	24.53	**24.28**	8.73	8.21	8.90	**8.61**
T3	24.33	23.92	24.50	**24.25**	8.92	8.40	9.08	**8.47**
T4	24.62	24.25	24.79	**24.55**	8.88	8.30	8.95	**8.71**
T5	24.69	24.31	24.87	**24.62**	8.94	8.37	9.05	**8.79**
T6	24.62	24.25	24.81	**24.56**	8.83	8.24	8.94	**8.67**
T7	24.55	24.18	24.73	**24.49**	8.93	8.33	9.08	**8.78**
T8	24.63	24.20	24.81	**24.55**	8.89	8.30	8.99	**8.73**
T9	24.68	24.35	24.95	**24.66**	8.99	8.40	9.13	**8.84**
New LSD 5%	**0.81**	**0.78**	**0.83**		**0.28**	**0.23**	**0.25**	

Table (7): Effect of urea and potassium spraying on acidity and total tannins of Barhee date palm during 2020, 2021 and 2022 seasons.

Charac. / Treat.	Acidity %				Tannins %			
	2020	2021	2022	Mean	2020	2021	2022	Mean
T1	0.133	0.139	0.129	**0.134**	0.223	0.231	0.219	**0.224**
T2	0.126	0.131	0.122	**0.126**	0.204	0.211	0.200	**0.205**
T3	0.124	0.128	0.120	**0.124**	0.201	0.207	0.199	**0.202**
T4	0.123	0.129	0.120	**0.124**	0.199	0.205	0.195	**0.200**
T5	0.122	0.127	0.119	**0.123**	0.197	0.203	0.192	**0.197**
T6	0.123	0.128	0.120	**0.124**	0.200	0.205	0.196	**0.200**
T7	0.122	0.127	0.118	**0.122**	0.196	0.202	0.191	**0.196**
T8	0.123	0.128	0.119	**0.123**	0.201	0.206	0.197	**0.201**
T9	0.122	0.126	0.118	**0.122**	0.197	0.203	0.195	**0.198**
New LSD 5%	**0.005**	**0.004**	**0.005**		**0.006**	**0.005**	**0.005**	

Discussion

Nitrogen fertilization is one of the important tools to increase fruit trees yield. It plays a key role in nutrition of fruit trees that is a necessary element for chlorophyll, protoplasm, and nucleic acids **[16, 17]**. Nitrogen fertilization effects depending on the nutrient status of cultivated soil, as well as applied amount, sources, and methods of application **[18]**

The results of this study are in same line with those obtained by **[19, 20, 21, 22, 23].** They concluded that the direct application of nutrient elements on inflorescences and fruit is one of the best tools for date palm production. Foliar fertilization has the advantage of low application rates, uniform distribution of fertilizer materials and quick responses to applied nutrients.

Potassium is important in the formation and function of proteins, fats, carbohydrates and chlorophyll and in maintaining the balance of salts and water in plant cell **[7].** It activates many different enzymes involved in plant growth and vigor. Also, it enhances root growth, drought and salinity resistance, sugars translocation and respiration reduction, as well as water loss as resulted regulating the opening and closing of stomata. Potassium is essential for photosynthesis, water and nutrient transport and plant cooling, energy loss and different disorders **[24].** Hence, using potassium improves qualitative aspects of production such as color, taste consistency and preservation of many fruits **[25].** It showed a main role in controlling cell water content, carbohydrates biosynthesis and mobilization in plant tissues, then play a serious role in fruit retention **[23, 26].**

The increment in fruit physical characteristics may be due to the potassium application, where it plays an important role in pH stabilization, osmoregulation, enzyme, activation, protein synthesis, stomatal movement,

photosynthesis, cell extension and important soluble in expanding cell. These results are since potassium activates the enzymes involving in sugar biosynthesis and helps in translocation of sugars **[27]**

The importance role of potassium fertilization on the fruiting of date palm was confirmed by the results of **[23, 28, 29, 30, 31].** They concluded that potassium is very effective in improving fruiting especially when applied with the optimum rate of N and P fertilizers. Spraying the potassium was very effective in improving the yield and fruit quality.

Conclusion

From the current study, it can be concluded that fruit yield and fruit physical and chemical characteristics were improved significantly by twice foliar application of inflorescences with 0.25% urea or 1% potassium citrate alone or in combination. These treatments were the best and the most effective treatments in enhancing yield and improving fruit quality of Barhee date palms.

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تأثير رش اليوريا وست ارت البوتاسيوم على إثمار نخيل البلح البرحي

أجريت هذه الدراسة خلال ثلاثة مواسم متتالية 2020 و2021 و 2022 بالمزرعة البحثية التابع لمركز البحوث الزراعية – كوم أمبو – أسوان – مصر، بهدف دراسة تأثير رش اليوريا وسترات البوتاسيوم علي إثمار نخيل البلح البرحي حيث تم رش اليوريا بتركيز 0,25 أو 50% بعد 2 و 6 أسابيع من التلقيح. بينما رشت سترات البوتاسيوم بتركيز 1 أو 2% وذلك بعد 7 أو 10 أسابيع من التلقيح.

وقد أظهرت النتائج التالي:

- سبب الرش باليوريا أو سترات البوتاسيوم في حالة فردية أو معاً زيادة معنوية في نسبة الثمار الباقية ووزن السوباطة وبالتالي وزن المحصول/نخلة مقارنة بعدم الرش (معاملة المقارنة).
- سبب الرش باليوريا بتركيز 0,25 أو 50% أو سترات البوتاسيوم بتركيز 1 أو 2% سواء في حالة فردية أو معاً زيادة معنوية في وزن وأبعاد الثمرة ونسبة اللحم. كذلك محتواها من المواد الصلبة الذائبة أو السكريات مع قلة الحموضة والتانينات مقارنة بعدم الرش.
- لم تسجل فروق معنوية بين استخدام اليوريا أو سترات البوتاسيوم سواء فردية أو خليطة وكذلك استخدام تركيز 0,25 أو 50% - 1 أو 2% ولذا من الناحية الاقتصادية يفضل استخدام التركيز الأقل (0,25% يوريا و 1% سترات البوتاسيوم).

من نتائج هذه الدراسة فإنه يوصي بأهمية رش سوباطات البلح البرحي باليوريا بتركيز 0,25% مع سترات البوتاسيوم بتركيز 1% وذلك مرتين خلال فترة نموالثمار وذلك لانتاج محصول عال ذو خصائص ثمرية جيدة.