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EFFECT OF SLOW RELEASE NITROGEN FERTILIZERS WITH FOLIAR POTASSIUM AND CALCIUM APPLICATION DURING FRUIT DEVELOPMENT ON GROWTH, YIELD, SUGAR CONTENT, NITRATE ACCUMULATION AND STORAGE ABILITY IN MELON

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ABSTRACT

Melon (*Cucumis melo* L.) Passport cultivar was cultivated in clay loam soil during the seasons 2006 and 2007. Five slow release urea sources 46%N which were bentonite coated urea (bentonite-cu), bitumen coated urea (bitumen-cu), wax coated urea (wax-cu), rock phosphate coated urea (rock phosphate-cu) and calcite coated urea (calcite-cu) taken from Egyptian Fertilizer Development Center, beside traditional urea as a control, under recommended nitrogen rate (100 kg N/faddan), were evaluated. Foliar potassium and calcium application at concentrations (2.5 gm/liter and 5 gm/liter respectively) were sprayed at stage of fruit development. Yield, sugar content, nitrate accumulation, NPK and Ca content and storage ability in melon were calculated. The two trials were carried out in the Agricultural Experimental Station Farm of Kaha location, Kulybia Governorate. Obtained results show that there were significant differences in results between normal fertilizer and slow release fertilizer on plant and dry weight in both seasons. Moreover, bitumen-cu or wax–cu gave the highest yield and marketable fruit yield and enhanced fruit quality at harvest. However, nitrate content in fruits were higher in control plants than in other treatments. Application of potassium and calcium with slow release fertilizer gave the highest values of nitrogen, phosphorus, potassium and calcium contents in leaves. Using calcium or potassium as a foliar application with bitumen-cu or wax–cu as nitrogen sources improved fruits storability by decreasing weight loss and decay percentage and maintained fruit quality (firmness, T.S.S, ascorbic acid content) during storage at 5°C. This improved was much pronounced by the application of calcium fertilizer with bitumen–cu or wax–cu.

It can be concluded that it is advisable to use slow release fertilizer especially bitumen–cu or wax–cu urea with potassium foliar application to obtaining the higher fruit marketable yield with highest percentage of total soluble sold and less nitrate content in fruit as well as improving fruits storability by decreasing weight loss and decay percentage during storage at 5°C.

INTRODUCTION

Melon (*Cucumis melo* L.) is a popular crop in Egypt long time ago. It is considered a new commercial crop for local consumption and export. Yield and quality are strongly influenced by different cultural practices, among these important cultural variable is fertilizer. Application of nitrogen fertilizers is most important for raising the production of melon. Several forms of nitrogen fertilizers are used in Egypt, they include forms of nitrate, ammonium and urea. The high solubility and mobility of soluble nitrogen fertilizer in soil are not always advantage. Loss from such material was very high and ranged from 40 to 70% of that added to soil (Hegazy, 1985) and considered as an environmental hazard. However, in the last decades slow release nitrogen fertilizers have been developed with the objective of reducing leaching losses thus supplying N available for a more lasting period. In addition, the controlled release fertilizer such as coated urea has been used in lower rate than urea or ammonium nitrate; it would significantly reduce the potential of ground water contamination by nitrate, Johnson (1991), El-Asdoudi (1993) and Ramadan (2004).

Jacob and Uexüll, 1960, noted the main function of potassium is the maintenance of the physiological state of swelling of the plasma colloids which is necessary for the normal course of all metabolic processes, by maintaining the balance between anabolism respiration and transpiration, it keep the water economy of the plant in equilibrium and reduces the tendency to wilting, probably this is connected with the promotion of carbon dioxide assimilation, the formation condensation and transportation of the sugar, and the synthesis of protein and fats. Also, the absorption and reduction on nitrate, cell division and many other processes are stimulated by an adequate supply of potash, furthermore; potassium regulates the activities of many enzymes and ferment. Thus, the activity of the respiration ferments is reduced by potassium, whereby respiration losses are suppressed and anabolism is promoted. This also results in the better utilization of the available water. Recent investigations indicate that potassium performs a specific function in the energy metabolism of plant. Moreover, potassium can also exert a favorable effect on root development.

In addition, Lester *et al.*, (2005) found that supplemental foliar K applications resulted in significantly firmer fruit with higher K, soluble solids, total sugars, ascorbic acid (vitamin C) and beta-carotene concentrations than fruit from control plants.

Calcium ions also are known to play an important role in the intricate network of interactions which controls the growth and development of plants (Leopold *et al.*, 1974 and Hanson, 1983). It was demonstrated that when plants were supplied with additional Ca, in presence of NH4-N, fresh weight of aerial parts was increased by 27.2% in cantaloupe, 25.9% in squash, 250% in tomato, 148% in cabbage, 14.5% in radish, 13.3% in chilli pepper and 21.5% in Swiss chard over those of normal Ca (Taylor *et al.*, 1985).

Potassium or calcium play an important role in quality and storability of fruits (Aydin, 1996) and (Hewedy, 1998) on tomato and (Abdel-Rahman *et al.*, 2001) on eggplant reported that foliar application with potassium enhanced dry matter content, T.S.S and firmness of fruits at harvest. Also, El-Shehk, (1988) and Agwah and Mahmoud, (1994) on tomato and Soliman, (2004) on eggplant, found that foliar spray fertilizer with potassium inhibited weight loss and decay percentage and maintained quality of fruits during storage.

Calcium is known to delay senescence of plant tissue especially fruits, so respiration rate, ripening rate ,ethylene production and softening are reduced in tissues having high calcium concentration (Wills and Tirmazi,1979). Also, adding calcium extend storage life for fruits, maintained firmness and vitamin C content and reduce storage decay and weight loss (Ferguson, 1984, Jeong *et al.*, (1998) and Lester and Grusak, (1999) on muskmelon, Abd El-Hady, (2001) and Rageh, (2003) on cantaloupe

. Concerning the effect of N-sources of fruit storability which was studied by Abbady *et al.*, (2003), El-Bauome, (2005) and Gouda, (2002) they observed that the application of sulphur coated urea as N-source to plants significantly improved fruit quality and decreased weight loss and decay percentage during storage.

Therefore, the purpose of this study was to evaluate the performance of some sources of slow release nitrogen fertilizer and foliar potassium and calcium application at stage of fruit development on plant growth, yield, sugar content, nitrate accumulation and storage ability of melon fruits.

MATERIALS AND METHODS

Seeds of melon (*Cucumis melo* L.) c.v Passport were directly sown in open filed at 28^{th} and 30^{th} March 2006 and 2007 seasons, respectively. The two trials were carried out in the Agricultural Experimental Station Farm of Kaha location, Kulybia Governorate on a clay loam soil in texture with pH value of 8.1 and 1.7 % organic matter. Soil available N, P and K contents were 36.7 ppm, 4.3 ppm, and 205.5 ppm for the first season and 43.3 ppm, 5.9 ppm and 208.3 ppm for the second season, respectively. Soil analysis was done by using standard method described by Jackson (1967).

The present investigation was conducted to study the influence of five slow release urea sources 46%N (bentonite coated urea, bitumen coated urea, wax coated urea, rock phosphate coated urea and calcite coated urea) which were taken from Egyptian Fertilizer Development Center, beside traditional urea as a control, with using recommended nitrogen rate (100 kg N/faddan), as well as potassium and calcium foliar application at concentrations (2.5 gm/liter and 5 gm/liter respectively, three time, seven days intervals) during fruit development on yield, sugar content, nitrate accumulation, NPK and Ca content and storage ability in melon

Seeds were sown in rows, each row was 1.5 m wide and 5m along, plant distance were 50cm apart. At the time of sowing the slow release nitrogen fertilizer was added, while traditional urea was added after three weeks of sowing. The rate of fertilizer was added in side dressed as one dose.

The experiments of this study were executed in a split plots design in randomized complete block design with three replicates. Sources of urea were randomly distributed in the main plots while, the sub – plots were assigned for foliar application with potassium and calcium.

Calcium superphosphate (15.5 % P_2O_5) and potassium sulphate (48.5 % K_2O) were applied at 200 and 100 kg respectively during soil preparation according to local recommendation. The bentonite, rock phosphate and calcite added in treatments were balanced in all urea treatments using same materials. The different agricultural practices were applied whenever it was necessary according to recommendation of agriculture ministry for melon production.

Residual soil nitrogen for bentonite-cu, bitumen-cu, wax-cu, rock phosphate-cu, calcite-cu and traditional urea were 18.6, 30.3, 28.3, 23.7, 16.9, and 14.09 mg kg^{-1} and 34.1, 42.3, 42.0, 37.8, 28.06 and 20.3 mg kg^{-1} for first and second season, respectively. N (NH_4+NO_3) were determined at depth of 0.3 m from the beds after harvesting and measured by the Kjeldahl method described by Bremner and Mulvaney (1982)

Data on growth (plant fresh and dry weight) were recorded ninety days after sowing. Nitrate content was determined according to the method recorded by (Singh, 1988) in fresh fruits. Dry weight percentage of leaves and mineral contents were calculated from determined dry matter of leaves dried at 70°C and weighed. Samples were digested to determine nitrogen, phosphorus, potassium and calcium according to the methods described by Black (1965) for nitrogen, John (1970) for phosphorus, Brown and Lilleland (1946) for potassium and calcium.

Average fruit weight and total yield as well as marketable yield were measured per plot then calculated to ton/fed.

All sound and healthy marketable fruits, from plots of the field experiment were harvested at half-slip stage then transferred to the laboratory at Giza. The fruits were stored, cleaned with dry towels, where sound and healthy fruits were chosen for storage, experiment complete randomized design was adopted having foliar spray fertilizer (3 materials) followed by N-sources (6 sources) and storage period (5 periods) fifteen replication for each treatment three fruits were put in carton box as one replicate were stored at 5°C and 90% RH. From all stored fruits, samples were taken at random from three replications for each treatment and examined every 7 days intervals.

The following data were recorded:

1- Weight loss and decay of fruits (in percent).
2- Flesh firmness was measured by using Magness and Ballav F pressure tester equipped with 3/16 inch 2 plunger adjusted in Newton (as recommended by ASHS post harvested working group (Wills *el al.* 1981).
3- T.S.S %
4- Ascorbic acid was determined according to (A.O.A.C., 1992) as mg/100g fresh weight.

Statistical analysis of data was done according to Snedecor and Cochran (1980).

RESULTS AND DISCUSSION

Part 1: Vegetative growth, yield and mineral content:

Data of plant growth expressed as fresh and dry weight are recorded in Table (1). Results show that application of slow release N-fertilizers resulted in highly significant increase of the plant growth compared with traditional N-fertilizer (urea). Also, it was noticed that fresh weight had significantly increase with spraying of potassium followed by calcium. However, the plants which spraying with distillated water (control) gave the lowest values. Same trend was found with dry mater percentage in both seasons.

With respect to the form of N-application, it was observed that the bitumen coated urea gave the highest values for plant growth in both seasons. This phenomenon could be explain on the basis of dissolution rate, since, bitumen is low dissolution rate followed by wax, rock phosphate, bentonite and calcite, respectively. Low dissolution rate may enhance the N-efficiency through minimizing N-loss (El-Alia and Abou Seeda, 1996b) and Vallejo *et al.*, 1993). On the other hand, the addition of slow release fertilizers with potassium foliar increased all parameters under study as compared with the control treatment.

Data reveal that, coating urea with various coating materials, i.e., bitumen, wax, rock phosphate, bentonite and calcite, significantly increased the fruit weight, total yield and marketable yield in melon compared with the control (urea). Moreover, the greatest increment occurred when urea applied as bitumen coated urea (Table1). Similar results were obtained by Wills, 1979 who reported that the application of slow release fertilizer increased the yield of cucumber by 8-10%. It was also shown by Kulyukin and Litviov (1984), Gezeral and Donmez (1988). Same results were observed by Nasr-Alla *et al.*, (1998) on potato and El-Asdoudi (1993) on cucumber.

Foliar application with potassium and calcium increased significantly fruit weight and yield (total and marketable) of melon in both seasons, potassium gave the best results. These finding was harmony with Lester *et al.*, (2005). Concerning with the interaction on fruit weight and yield, data in Table (1) show that the high fruit weight and high yield were arranged by treatments as follow: bitumen coated urea, wax-cu, rock phosphate-cu, bentonite-cu, calcite-cu and urea with potassium foliar.

Regarding to the effect of nitrogen sources on nitrate contents, data presented in Table (2) show that in the two seasons the highest NO_3 concentration of melon fruits were recorded in case of applying urea as a source of nitrogenous fertilizer. This result are in agreement with that obtained by Ombodi *et al.,* 2000, they indicated that application of slow release nitrogen fertilizers decreased nitrate content were attributed to lower nitrate availability in the soil caused by the controlled-released characteristic of slow release fertilizers. Concerning with foliar application of potassium and calcium, data show that the application of potassium reduce significantly the nitrate content of melon fruits. This results are in harmony with those obtained by El-Asdoudi (1993), Hanafy Ahmed *et al.*, (1997) and Abou El-Nasr (2002), they found that a negative relationship between potassium concentration and nitrate accumulation. On the other hand, the reduction in nitrate concentration by calcium foliar can be attributed to calcium application may increase the anionic concentration in leaves and hence encourage the reductase system of the plant to convert NO_3 to amines in order to establish the ionic balance.

The reduction of NO_3 will further increase the amine groups leading to the formation of amino acids and protein. These results are in harmony with those obtained by Talaat (1995) on lettuce plants.

The interaction between slow release fertilizer and foliar application on nitrate content was recorded in Table (2). Potassium application with bitumen-cu, wax-cu, rock ph.-cu reduce the nitrate content in melon fruits. The fruit quality improvement may be referred to slow release nitrogen fertilizer application, which may secure available regular source for nitrogen supply, Ramadan (2004).

Table (1): Effect of slow release nitrogen fertilizers with foliar potassium and calcium application on fresh weight/plant, dry weight/ plant, fruit weight, total yield and marketable yield/fed in melon during the two season of 2006 and 2007.

Characters	Plant fresh weight/ plant (g)				Dry weight / plant (%)				Fruit fresh weight/ plant (g)				Total yield/fed. (ton)				Marketable yield/fed. (ton)			
	2006				2006				2006				2006				2006			
Foliar spray	K	Ca	Con.	Mean	K	Ca	Con.	Mean	K	Ca	Con.	Mean	K	Ca	Con.	Mean	K	Ca	Con.	Mean
bentonite-cu	572.60	550.20	489.97	537.59	22.86	21.97	19.56	21.46	813.33	791.66	598.33	734.44	13.99	13.75	11.58	13.11	13.58	13.34	11.18	12.71
bitumen-cu	652.26	624.62	525.13	600.67	26.04	24.94.	20.96	23.98	890.00	868.33	793.33	850.55	18.02	14.98	13.58	15.53	17.80	14.76	13.38	15.31
wax-cu	631.15	600.44	558.71	596.77	25.20	23.97	22.31	23.83	853.33	824.16	790.00	822.50	17.25	15.43	13.18	15.29	17.02	15.20	12.95	15.06
rock ph.-cu	616.96	604.06	564.91	595.31	24.63	24.12	22.55	23.77	830.00	826.66	726.66	794.44	15.90	14.37	11.75	14.00	15.64	14.11	11.49	13.75
calcite –cu	541.41	540.24	504.31	528.65	21.61	21.57	20.13	21.11	695.00	673.33	576.66	648.33	12.75	12.51	11.42	12.22	12.26	12.02	10.93	11.74
urea	426.50	412.41	382.47	407.13	20.03	19.46	19.27	20.25	530.00	500.00	473.33	501.11	11.37	11.03	10.73	11.04	10.41	10.08	9.78	10.09
Mean	573.48	555.33	504.25		22.90	22.17	20.13		768.61	747.36	659.72		14.88	13.68	12.04		14.46	13.25	11.62	
	2007				2007				2007				2007				2007			
bentonite-cu	600.46	584.22	506.38	563.68	23.97	23.32	20.22	22.50	820.35	740.37	690.05	750.00	14.06	12.04	11.48	12.53	13.66	11.64	11.08	12.13
bitumen-cu	639.73	625.35	577.00	614.02	25.54	24.97	23.04	24.51	880.17	863.00	805.17	849.33	15.88	14.57	12.63	14.36	15.69	14.38	12.44	14.17
wax-cu	637.75	576.41	550.46	588.20	25.46	23.01	21.98	23.48	870.05	854.34	793.00	839.00	15.24	15.00	12.46	14.23	15.02	14.78	12.24	14.01
rock ph-cu	608.59	593.71	550.33	575.32	24.30	23.70	21.97	23.32	860.41	846.17	779.22	828.33	14.81	13.09	12.15	13.35	14.56	12.84	11.90	13.10
calcite–cu	586.55	558.63	541.64	562.28	23.42	22.30	21.62	22.45	785.14	742.30	703.06	743.33	13.16	12.21	11.68	12.35	12.71	11.76	11.23	11.90
urea	415.83	410.90	391.07	405.93	20.60	19.40	19.01	20.20	698.11	678.21	591.44	655.67	11.78	11.55	10.58	11.30	11.18	10.95	9.98	10.70
Mean	577.04	558.21	519.48		23.22	22.29	20.74		818.83	787.17	726.83		14.15	13.08	11.83		13.80	12.73	11.48	
L.S.D. at 5% 1st season																				
Urea sources (A)				18.38				0.73				47.64				1.12				1.12
Foliar application (B)				13.00				0.51				33.68				0.79				0.79
A x B				31.84				1.27				82.51				1.94				1.94
L.S.D. at 5% 2nd season																				
Urea sources (A)				27.11				0.88				40.92				0.51				0.51
Foliar application (B)				19.17				0.62				28.94				0.36				0.36
A x B				46.95				1.53				70.88				0.89				0.89

Table (2): Effect of slow release nitrogen fertilizers with foliar potassium and calcium application on nitrate content in melon fruits and mineral contents in leaves of melon during the two season of 2006 and 2007.

Characters	Nitrate content (ppm)				Nitrogen %				Phosphor %				Potassium %				Calcium %			
	2006				2006				2006				2006				2006			
Foliar spray	K	Ca	Con.	Mean	K	Ca	Con.	Mean	K	Ca	Con.	Mean	K	Ca	Con.	Mean	K	Ca	Con.	Mean
bentonite-cu	28.57	32.28	40.24	33.70	3.21	3.16	3.12	3.16	0.29	0.28	0.28	0.28	4.67	4.40	3.90	4.32	0.39	0.40	0.38	0.39
bitumen-cu	20.54	21.91	25.41	22.62	3.98	3.81	3.72	3.83	0.36	0.34	0.33	0.34	5.21	5.05	4.86	5.04	0.42	0.42	0.42	0.42
wax-cu	20.73	22.54	29.67	24.31	3.82	3.69	3.44	3.65	0.32	0.31	0.31	0.31	5.11	4.93	4.59	4.87	0.41	0.41	0.39	0.40
rock ph.-cu	21.69	25.42	39.22	28.77	3.38	3.31	3.29	3.32	0.30	0.29	0.29	0.29	4.92	4.83	4.59	4.78	0.40	0.41	0.39	0.40
calcite –cu	29.77	32.97	41.64	34.79	3.16	2.92	2.61	2.89	0.28	0.26	0.23	0.25	4.60	4.28	3.78	4.21	0.35	0.40	0.35	0.37
urea	31.52	33.91	40.49	35.31	3.01	2.95	2.55	2.83	0.27	0.26	0.23	0.25	4.19	3.92	3.74	3.95	0.35	0.40	0.33	0.36
Mean	25.47	28.17	36.11		3.42	3.30	3.12		0.30	0.29	0.27		4.78	4.57	4.24		0.39	0.41	0.38	
	2007				2007				2007				2007				2007			
bentonite-cu	27.76	30.47	38.43	32.22	3.81	3.59	3.18	3.52	0.34	0.32	0.28	0.31	3.94	3.87	3.83	3.88	0.41	0.43	0.40	0.41
bitumen-cu	18.73	20.10	26.60	21.81	4.25	4.12	3.96	4.11	0.38	0.37	0.35	0.36	4.88	4.67	4.56	4.70	0.44	0.50	0.40	0.45
wax-cu	18.92	22.73	27.86	23.17	4.17	4.02	3.74	3.97	0.37	0.36	0.33	0.35	4.44	4.33	4.22	4.32	0.41	0.47	0.41	0.43
rock ph.-cu	19.87	23.60	37.41	26.96	4.01	3.94	3.74	3.89	0.36	0.35	0.33	0.34	4.14	4.07	4.03	4.08	0.42	0.44	0.40	0.42
calcite –cu	28.62	31.16	39.83	33.20	3.75	3.49	3.08	3.44	0.34	0.31	0.27	0.30	3.87	3.58	3.20	3.55	0.40	0.41	0.39	0.40
urea	29.71	32.10	38.67	33.49	3.42	3.20	3.05	3.22	0.31	0.29	0.27	0.28	3.69	3.62	3.13	3.48	0.39	0.40	0.38	0.39
Mean	23.93	26.69	34.80		3.90	3.72	3.45		0.34	0.33	0.30		4.16	4.02	3.82		0.41	0.44	0.40	

L.S.D. at 5% 1st season					
Urea sources (A)	3.16	0.11	0.03	0.42	0.04
Foliar application (B)	2.23	0.08	0.02	0.30	0.02
A x B	5.47	0.19	0.05	0.73	0.06
L.S.D. at 5% 2nd season					
Urea sources (A)	3.15	0.34	0.03	0.14	0.03
Foliar application (B)	2.24	0.24	0.02	0.09	0.02
A x B	5.48	0.59	0.05	0.24	0.05

Also, data in Table (2) reveal that the contents of leaves with nitrogen, phosphor, potassium and calcium were influenced by adopted treatments during the both seasons. The highest values of N, P, K and Ca were recorded with adding slow release fertilizer comparing with urea. Also, the foliar application of potassium and calcium increase significantly the characters mentioned above. Application of bitumen-cu, wax-cu, rock ph-cu, bentonite-cu and calcite–cu markedly increase the N, P, K and Ca comparing with urea treatment in both seasons. These results could be explained by minimizing the mineralization process of nitrogen to the plant growth and reducing partial loss of urea-N through NH_3 volatilization following by urea hydrolysis to $(NH_4)_2CO_2$ (Tomar *at al.*, 1985).

With respect to effect of foliar potassium and calcium application on mineral contents, data in Table (2) show that potassium foliar caused a significant increasing in all mineral content in leaves, whereas, calcium foliar increment generally the mineral content in leaves especially calcium content. Concerning with interaction between nitrogen sources and foliar application on N,P,K and Ca, data in Table (2) reveals that the best values were obtained with slow release fertilizer especially bitumen-cu and potassium application. These results are in harmony with El-Sherbieny *et al.,* (1986). This phenomena is due to the role of potassium in promotes water uptake, regulates nutrients translocation in plant and enhances N uptake and protein synthesis (Mengel, 1997).

Part 2: Postharvest properties:

Weight loss%

Data in Table (3) show that foliar application with potassium and calcium caused significant effect on fruit weight loss percentage. However, spraying cantaloupe plants with these materials inhibited the weight loss% in fruits during storage. Whereas the highest values of weight loss were found in untreated plants. Calcium treatment was the most effective treatment in respect to weight loss. Obtained results are in agreement with those obtained by Lester and Grusak (1999) whose reported that softening was associated with muskmelon fruits weight loss, and Ca maintained fruits more firm during storage and subsequently reduce fruit weight loss.

The favorable effect of calcium treatments in reduction of weight loss of cantaloupe fruits during storage may be due to that calcium stimulated pectin formation in the leaves and in their outward flow and accumulation in fruits. At the sometime calcium reduced the activity of pectolytic enzymes within the fruits (Gawish *et al.,* 1991).

Minimizing weight loss of cantaloupe fruits during storage with potassium treatment might be explained on the bases of the physiological role of K in increasing the osmotic potential in the cell of fruits (Gardener *et al.,* 1985) which diminished the weight loss in fruits during storage.

Regarding to the effect of nitrogen sources on weight loss, data presented in Table (3) show that the highest value of weight loss were recorded by applying urea as a source of nitrogen. However, the lowest value was obtained by treated with bitumen-cu, wax-cu and bentonite–cu. These results may be explained by using slow release nitrogen fertilizer reduced respiration rate and physiological changes of fruits during storage (Abbady *et al.*, 2003 and EL-Bauome, 2005).

Table (3): Effect of slow release nitrogen fertilizers with foliar potassium, calcium application and storage period on weight loss (%) of cantaloupe fruits during the two seasons of 2006 and 2007.

Foliar spray	N-sources treatments	2006 Storage period					2007 Storage period				
		7 days	14 days	21 days	28 days	Mean	7 days	14 days	21 days	28 days	Mean
K	bentonite-cu	1.58	2.29	3.89	5.49	3.31	1.60	2.11	4.44	5.80	3.49
	bitumen-cu	1.46	2.00	3.40	4.50	2.84	1.49	2.21	3.67	5.20	3.14
	wax-cu	1.46	2.20	3.81	5.41	3.22	1.48	2.23	3.85	5.44	3.25
	rock ph.-cu	1.55	2.27	3.97	5.57	3.34	1.58	2.30	3.99	5.60	3.37
	calcite –cu	1.59	2.29	3.89	5.49	3.32	1.63	2.30	3.94	5.48	3.34
	Urea	1.63	2.60	3.90	5.80	3.48	1.66	2.37	4.01	5.59	3.41
	Mean	1.55	2.28	3.81	5.38	3.25	1.57	2.25	3.98	5.52	3.33
Ca	bentonite-cu	1.54	2.14	2.94	4.34	2.74	1.59	2.19	3.52	4.79	3.02
	bitumen-cu	1.30	1.91	3.30	4.71	2.81	1.35	1.99	3.01	4.71	2.77
	wax-cu	1.40	2.00	3.43	4.82	2.91	1.42	2.21	3.47	4.85	2.99
	rock ph.-cu	1.41	2.03	3.45	4.86	2.94	1.43	2.06	3.47	4.88	2.96
	Calcite–cu	1.53	2.18	3.59	4.99	3.07	1.55	2.20	3.61	5.01	3.09
	Urea	1.61	2.31	3.72	5.14	3.20	1.63	2.33	3.76	5.18	3.23
	Mean	1.47	2.10	3.41	4.81	2.94	1.50	2.16	3.47	4.90	3.01
Without	bentonite-cu	1.67	2.42	4.07	5.73	3.47	1.71	2.47	4.12	5.77	3.52
	bitumen-cu	1.51	2.25	3.91	5.55	3.31	1.54	2.28	3.95	5.59	3.34
	wax-cu	1.53	2.35	3.97	5.62	3.37	1.57	2.38	4.01	5.66	3.41
	rock ph.-cu	1.59	2.43	4.03	5.68	3.43	1.63	2.48	4.08	5.72	3.48
	Calcite–cu	1.62	2.33	3.93	5.58	3.37	1.66	2.36	3.98	5.63	3.41
	Urea	1.78	2.63	4.24	5.89	3.64	1.79	2.66	4.28	5.93	3.67
	Mean	1.62	2.40	4.03	5.68	3.43	1.65	2.44	4.07	5.72	3.47
Mean of N-sources	bentonite-cu	1.60	2.28	3.63	5.19	3.18	1.63	2.26	4.03	5.45	3.34
	bitumen-cu	1.42	2.05	3.54	4.92	2.98	1.46	2.16	3.54	5.17	3.08
	wax-cu	1.46	2.18	3.74	5.28	3.17	1.49	2.27	3.78	5.32	3.21
	rock ph.-cu	1.52	2.24	3.82	5.37	3.24	1.55	2.28	3.85	5.40	3.27
	Calcite–cu	1.58	2.27	3.80	5.35	3.25	1.61	2.29	3.84	5.37	3.28
	Urea	1.67	2.51	3.95	5.61	3.44	1.69	2.45	4.02	5.57	3.43
	Mean	1.54	2.26	3.75	5.29		1.57	2.29	3.84	5.38	
L.S.D. at 0.05%											
Urea sources(U.S)						0.04					0.55
Foliar spray (F.T)						0.11					0.09
Storage period(S.P)						0.34					0.31
(U.S) X (F.T)						0.08					0.07
(U.S) X (S.P)						1.90					1.07
(F.T) X (S.P)						1.30					1.50
(U.S) X (F.T) X (S.P)						2.02					3.01

The results in the same table indicate a progressive increase in the percentage of loss in cantaloupe fruit weight during storage. These may be due to the loss in moisture through transpiration and loss in the dry matter content through respiration process (Rageh, 2003).

Interaction effect between foliar spray with K ad Ca and slow release nitrogen given in Table (3) recorded that calcium application with bentonite-cu and bitumen-cu or potassium fertilizer with bitumen-cu reduced the weight loss percentage in cantaloupe fruits during storage.

Regarding interaction between foliar spray, N-sources and storage period, as shown in Table (3) show that, calcium foliar application significantly reduced weight loss of fruits under all nitrogen sources during all storage periods.

Decay%

Data in Table (4) indicate clearly that foliar application of potassium and calcium had significant differences in decay percentage of cantaloupe fruit during storage. In this respect, all treatments were much better in reducing decay percentage, whereas untreated cantaloupe fruits had the highest decay percentage, from the obtained data it was reasonable to say that, fruits obtained from plants fertilizer with foliar calcium surpassed those fruits obtained from plant treated with potassium in minimizing fruit decay during storage. These results were true in the two seasons. These findings are supported by the work of Abd-El-Hady, (2001) and Rageh, (2003) on cantaloupe.

Calcium application can significantly reduce postharvest decay by strengthening the cell wall matrix and presumable enhancing resistance to attack by fungi and bacteria (Poovaiah, 1986). The proportion of Ca pectate in cell well is also importance for the susceptibility or reacceptance of the tissue to fungal and bacterial infections (Poovaiah, 1988).

This favorable effect of potassium treatment may be attributed to the inhibitory effect of potassium on the development of certain type of microorganisms during storage of cantaloupe fruits. Abd El-Rahman and Hosny (2001) on eggplant attributed similar results to that K encouraged the formation of rapid cell wall and enhanced the thickness of cuticle or epidermis cells.

With respect to N-source, data in Table (4) show that application of slow release nitrogen fertilizers decreased decay percentage during storage whereas, the highest decay were recorded in case of applying urea as source of nitrogen. On the other hand, the lowest decay percentage was recorded by treatment with bitumen–cu and wax-cu. These results are in agreement with that obtained by El-Bauome (2005).

With regard to decay during storage data in Table (4) indicate that a progressive and continuous increase in percentage of decay was noticed till the end of storage period in both seasons. This finding may be due to the continuous chemical and biochemical changes happened in the fruits such as moisture concentration and transformation of complex compounds to simple forms of more liability to fungal infection such as solid protopectin to the soluble pectin form.

The interaction between foliar fertilizer and N-sources on decay percentage during storage data in Table (4) show that calcium treatment with bitumen-cu reduced the decay percentage of cantaloupe fruits during storage.

Interaction between foliar fertilizer , N-sources and storage period data in Table (4) revealed that the lowest decay percentage after 28 days of storage was observed in calcium foliar application in presence of bitumen-cu and wax-cu or potassium treatment with bitumen-cu.

Table (4): Effect of slow release nitrogen fertilizers with foliar potassium, calcium application and storage period on decay (%)of cantaloupe fruits during the two seasons of 2006 and 2007.

Foliar spray	N-sources treatments	2006					2007				
		Storage period				Mean	Storage period				Mean
		7 days	14 days	21 days	28 days		7 days	14 days	21 days	28 days	
K	bentonite-cu	0.0	0.6	1.7	5.2	1.9	0.0	1.7	5.2	5.2	3.0
	bitumen-cu	0.0	0.0	0.0	0.6	0.2	0.0	0.0	1.1	1.7	0.7
	wax-cu	0.0	0.0	0.6	1.7	0.6	0.0	0.0	1.7	5.2	1.7
	rock ph.-cu	0.0	0.0	1.7	1.7	0.9	0.0	0.6	5.2	6.6	1.5
	calcite –cu	0.0	0.6	5.2	5.2	2.8	0.0	1.1	5.2	6.6	3.2
	urea	0.0	1.1	5.2	7.5	3.5	0.0	1.7	6.6	6.9	3.8
	Mean	0.0	0.4	2.4	3.7	1.6	0.0	0.9	4.2	5.1	2.3
Ca	bentonite-cu	0.0	0.0	0.6	1.7	0.6	0.0	0.0	1.7	5.2	1.7
	bitumen-cu	0.0	0.0	0.0	0.6	0.2	0.0	0.0	0.6	1.1	0.4
	wax-cu	0.0	0.0	0.0	0.6	0.2	0.0	0.0	1.7	5.2	1.7
	rock ph.-cu	0.0	0.0	0.0	1.7	0.4	0.0	0.0	1.7	5.2	1.7
	calcite –cu	0.0	0.0	0.6	5.2	1.5	0.0	0.0	1.7	6.6	2.1
	urea	0.0	1.1	1,7	6.6	1.9	0.0	1.7	6.6	6.9	3.8
	Mean	0.0	0.2	0.2	2.7	0.8	0.0	0.3	2.3	5.0	1.9
Without	bentonite-cu	0.0	1.7	5.2	6.6	3.4	0.0	1.7	5.2	6.6	3.4
	bitumen-cu	0.0	0.6	1.1	5.2	1.7	0.0	0.6	1.7	5.2	1.9
	wax-cu	0.0	0.6	1.7	6.6	2.2	0.0	1.1	5.2	6.6	3.2
	rock ph.-cu	0.0	1.7	5.2	6.7	3.4	0.0	1.1	5.2	6.9	3.3
	calcite –cu	0.0	5.2	5.2	6.9	4.3	0.0	1.7	5.2	6.9	3.5
	urea	0.0	5.2	7.5	7.5	5.1	0.0	5.2	6.9	7.5	4.9
	Mean	0.0	2.5	4.3	6.6	3.4	0.0	1.9	4.9	6.6	3.4
Mean of N-sources	bentonite-cu	0.0	0.8	2.5	4.5	1.9	0.0	1.1	4.0	5.7	2.7
	bitumen-cu	0.0	0.2	0.4	2.1	0.7	0.0	0.2	1.1	2.7	1.0
	wax-cu	0.0	0.2	0.8	2.9	0.9	0.0	0.4	2.9	5.7	2.2
	rock ph.-cu	0.0	0.6	2.3	3.4	1.6	0.0	0.6	4.0	6.1	2.2
	calcite –cu	0.0	1.9	3.7	5.8	2.8	0.0	0.9	4.0	6.7	2.9
	urea	0.0	2.5	6.4	7.2	3.5	0.0	2.9	6.7	7.1	4.2
	Mean	0.0	1.0	2.3	4.3		0.0	1.0	3.8	5.6	

***Not statistically analyzed**

Firmness

Data in table (5) indicate that foliar application with potassium or calcium enhanced the firmness of cantaloupe fruits, whereas the highest firmness of fruits was obtained from plants treated with calcium or potassium in both seasons. Thus spraying plants with calcium being the most effective treatment.The lowest firmness was noticed for fruits obtained from un treated plants.

These results may be due to calcium ions are bound to the pectins present in the cell wall (Demary *et al.,* 1984). Pectins are composed of polygalacturonic acid residues in a chain with rhamnose insertions in this chain (Preston, 1979). The rhamnose insertion puts a marked link in this chain, leaving spaces for the insertion of a series of cations (Grant *et al.,* 1973). The formation of cation cross-bridges between pectic acids or between pectic acids and other polysaccharides with acid groups may make the cell wall less accessible to enzymes occurring in the fruit (which cause softening) or to enzymes produced by fungal pathogens (which cause decay) (Tepfer and Taylor, 1981).

Maintain fruit firmness during storage with potassium treatment may be due to that K increased the osmotic potential and water uptake (Epstein, 1972) and allows less water loss (Humble and Hsiao, 1969) and this in turn increased the fruits firmness. Concerning the form of N-application it was noticed that coating urea with various coating materials, i.e. bitumen, wax, rock phosphate and calcite, significantly increase the frits firmness compared with the control (urea) during storage. Moreover, the greatest increment occurred when nitrogen applied as bitumen coated urea.

With respect to storage period, it appears from data presented in Table (5) that cantaloupe fruits before storage were firmness then at the end of storage periods. Fruits firmness significantly affected by the storage periods. Thus, there was a significant reduction in fruits firmness by the prolongation of storage periods in both seasons. These results are in agreement with Rageh, 2003 on cantaloupe.

The decrease in fruit firmness may be due to the gradual breakdown of protopectin to lower molecular weight fractions which are more soluble in water and this was directly correlated with the rate of softening of the fruits (Wills *et al.*, 1981).

The interaction between slow release nitrogen fertilizer and foliar application with K and Ca was observed in Table (5) calcium or potassium application with bitumen-cu maintained firmness during storage. These results were true in two seasons.

The interaction between foliar application, slow release nitrogen fertilizers and storage periods, data indicated that calcium foliar application with Bitumen–cu as nitrogen sources, exhibited significantly higher firmness compared with those of other treatment or control during all storage periods.

These results were true in the tow seasons and might be attributed that these foliar spray with fertilizers increased available calcium and potassium in the plants (Linardkis and Tsikalas, 1988) and in turn they increased firmness of the fruits (Ogbadu and Easmon, 1989).

Table (5): Effect of slow release nitrogen fertilizers with foliar potassium, calcium application and storage period on flesh firmness (pound/inch°) of cantaloupe fruits during the two seasons of 2006 and 2007.

Foliar spray	N-sources treatments	2006						2007					
		Storage period (day)						Storage period (day)					
		zero day	7 days	14 days	21 days	28 days	Mean	zero day	7 days	14 days	21 days	28 days	Mean
K	bentonite-cu	23.3	20.7	16.9	13.7	10.8	17.1	22.0	19.8	15.8	12.9	10.5	16.2
	Bitumen-cu	26.5	23.6	19.4	15.7	12.4	19.5	25.3	22.8	18.3	15.0	12.2	18.7
	wax-cu	22.7	20.2	16.6	13.5	10.7	16.7	24.3	21.9	17.5	14.4	11.7	18.0
	rock ph.-cu	23.7	21.1	17.3	14.0	11.1	17.4	21.5	19.6	15.7	12.8	10.4	16.0
	calcite –cu	22.3	19.8	16.2	13.1	10.3	16.3	22.3	20.1	16.1	13.2	10.7	16.5
	Urea	20.1	17.9	14.7	11.9	9.4	14.8	21.5	19.6	15.6	12.8	10.4	16.0
	Mean	23.1	20.6	16.9	13.7	10.8	17.0	22.8	20.6	16.5	13.5	11.0	16.9
Ca	bentonite-cu	24.2	22.0	17.8	14.8	12.1	18.2	24.1	21.9	17.7	14.8	12.2	18.1
	Bitumen-cu	28.3	25.7	20.8	17.3	14.2	21.3	27.2	24.7	20.0	16.6	13.6	20.4
	wax-cu	24.5	22.3	18.1	15.0	12.3	18.4	27.0	24.6	19.9	16.8	13.8	20.4
	rock ph.-cu	24.1	21.9	17.7	14.7	12.1	18.1	25.2	22.9	18.5	15.4	12.6	18.9
	calcite –cu	23.2	21.1	17.1	14.2	11.2	17.4	24.1	21.9	17.9	14.9	12.2	18.2
	Urea	21.7	19.7	15.9	13.2	10.8	16.3	21.7	19.7	15.9	13.3	11.9	16.5
	Mean	24.3	22.1	17.9	14.9	12.1	18.3	24.9	22.6	18.3	15.3	12.7	18.8
Without	bentonite-cu	22.1	19.8	15.6	12.7	10.5	16.1	22.3	19.8	15.7	12.7	10.1	16.1
	Bitumen-cu	22.6	20.3	16.0	13.1	10.6	16.5	24.8	22.1	17.4	14.2	11.2	17.9
	wax-cu	22.5	20.3	16.0	12.7	10.1	16.3	23.7	21.1	16.7	13.5	10.7	17.1
	rock ph.-cu	22.8	20.5	16.2	13.2	10.5	16.6	23.7	20.0	15.6	13.8	10.3	16.7
	calcite –cu	22.2	19.5	15.4	12.6	10.1	16.0	23.1	20.6	16.2	13.2	10.4	16.7
	Urea	19.7	17.6	14.1	11.5	9.2	14.4	20.2	17.9	14.2	11.6	9.1	14.6
	Mean	22.0	19.7	15.6	12.6	10.2	16.0	23.0	20.3	17.0	13.2	10.3	16.5
Mean of N-sources	bentonite-cu	23.2	20.8	16.8	13.7	11.1	17.1	22.8	20.5	16.4	13.5	10.9	16.8
	Bitumen-cu	25.8	23.2	18.7	15.4	12.4	19.1	25.8	23.2	18.6	15.3	12.3	19.0
	wax-cu	23.2	20.9	16.9	12.9	11.0	17.0	25.0	22.5	18.0	14.9	12.1	18.5
	rock ph.-cu	23.5	21.2	17.1	14.0	13.3	17.8	22.2	20.8	16.6	14.0	11.[illegible]	17.0
	calcite –cu	22.6	20.1	16.2	13.3	10.5	16.6	23.2	20.9	16.7	13.8	11.1	17.1
	Urea	22.6	18.4	14.9	12.2	9.8	15.6	21.1	19.1	15.2	12.6	10.5	15.7
	Mean	23.5	20.8	16.8	13.6	11.4		23.4	21.2	16.9	14.00	11.3	

L.S.D. at 0.05%	2006	2007
Urea sources(U.S)	1.1	0.2
Foliar treatments (F.T)	0.9	0.6
Storage periods(S.P)	0.5	0.3
(U.S) X (F.T)	0.3	0.5
(U.S) X (S.P)	1.4	1.7
(F.T) X (S.P)	1.1	2.1
(U.S) X (F.T) X (S.P)	2.3	3.7

T.S.S and ascorbic acid contents

Data in Table (6)and (7) indicated that foliar application with potassium and calcium enhanced T.S.S and ascorbic acid content in fruits during storage, whereas the highest values of T.S.S and ascorbic acid were obtained from plants sprayed with potassium followed by calcium.

The lowest ones obtained from untreated plants. Similar results were obtained by Gawish *et al.*, (1991) on cucumber. Rageh (2003) on cantaloupe and Abd El- Rahman *et al.*, (2001) on eggplant, they showed that potassium or calcium fertilizer increase T.S.S and ascorbic acid content in the fruits and these treatments play an important role in storability of fruits during storage.

The noticed superiority of Ca foliar spraying in increasing T.S.S and ascorbic acid contents, which involve soluble sugar and other soluble organic compound, may return to their enhancing effect on photosynthesis process and photosynthesites accumulation in fruit.

Regarding to the effect of nitrogen sources on T.S.S and ascorbic acid contents, data in Table (6 and 7) show that coating urea with various coating materials significantly increase the mentioned contents compared with the control (urea) during storage. Moreover, the greatest increment occurred when applied that T.S.S and ascorbic acid contents of fruits were significant reduction in mentioned contents by the prolongation of storage period in both seasons.

Table (6): Effect of slow release nitrogen fertilizers with foliar potassium, calcium application and storage period on total soluble solids (%) of cantaloupe fruits during the two seasons of 2006 and 2007.

Foliar spray	N-sources treatments	2006 Storage period (day)						2007 Storage period (day)					
		zero day	7 days	14 days	21 days	28 days	Mean	zero day	7 days	14 days	21 days	28 days	Mean
K	entonite-cu	10.8	10.6	10.3	9.5	9.3	10.1	12.5	12.3	12.1	11.2	11.2	11.9
	itumen-cu	13.7	13.5	13.2	12.4	12.1	13.0	14.7	14.6	14.4	13.7	13.3	14.1
	vax-cu	12.5	12.3	12.0	11.2	10.7	11.7	13.8	13.6	13.4	12.5	12.1	13.1
	ock ph.-cu	11.2	10.9	10.7	9.9	9.4	10.4	13.1	12.5	12.8	11.7	11.1	12.2
	alcite –cu	10.6	10.3	10.0	9.2	9.0	9.8	11.1	10.9	10.7	9.8	9.3	10.4
	rea	9.3	9.1	8.8	8.2	7.8	8.6	7.7	7.6	7.4	6.6	6.2	7.1
	Mean	11.4	11.1	10.8	10.1	9.7	10.6	12.2	11.9	11.8	10.9	10.5	11.5
Ca	entonite-cu	10.2	10.0	9.8	9.1	8.8	9.6	10.3	10.1	9.8	8.9	8.3	9.5
	itumen-cu	12.4	12.2	11.9	11.1	10.7	11.7	12.1	11.9	11.7	10.6	10.2	11.3
	vax-cu	11.4	11.2	10.9	10.1	9.8	10.7	13.3	13.1	12.9	11.7	11.2	12.4
	ock ph.-cu	10.8	10.6	10.3	9.5	9.1	10.1	11.8	11.6	11.4	10.5	10.0	11.1
	alcite –cu	10.2	9.9	9.5	8.7	8.2	9.3	10.2	10.0	9.8	8.3	8.0	9.3
	rea	8.6	8.3	8.0	7.2	6.8	7.8	7.3	7.1	6.9	6.3	6.0	6.7
	Mean	10.6	10.4	10.1	9.3	8.9	9.8	10.8	10.6	10.4	9.4	9.0	10.0
Without	entonite-cu	9.6	9.4	9.2	8.7	8.2	9.0	8.3	8.1	7.8	6.9	6.4	7.5
	itumen-cu	12.2	11.8	11.4	10.8	10.4	11.3	12.0	11.8	11.5	10.3	10.0	11.1
	vax-cu	11.2	10.9	10.7	10.0	9.8	10.5	11.5	11.3	11.1	10.2	9.8	10.8
	ock ph.-cu	10.5	10.3	10.0	9.7	9.3	10.0	11.0	10.7	10.4	9.6	9.2	10.2
	alcite –cu	10.0	9.7	9.5	9.1	8.8	9.4	9.7	9.5	9.3	8.5	8.1	9.0
	rea	8.3	8.1	7.8	7.2	6.9	7.7	7.2	7.0	6.8	5.9	5.4	6.5
	Mean	10.3	10.0	9.8	9.3	8.9	9.7	10.0	9.7	9.5	8.6	8.2	9.2
Mean of N-sources	entonite-cu	10.2	10.0	9.8	9.1	8.8	9.6	10.4	10.2	9.9	9.0	8.6	9.6
	itumen-cu	12.8	12.5	12.2	11.4	11.1	12.0	12.9	12.8	12.5	11.5	11.2	12.2
	vax-cu	11.7	11.5	11.2	10.4	10.1	11.0	12.9	12.7	12.5	11.5	11.0	12.1
	ock ph.-cu	10.8	10.6	10.3	9.7	9.3	10.1	12.0	11.6	11.5	10.6	10.1	11.2
	alcite –cu	10.3	10.0	9.7	9.0	8.7	9.5	10.3	10.1	9.9	8.9	8.5	9.5
	rea	8.7	8.5	8.2	7.5	7.2	8.0	7.4	7.2	7.0	6.3	5.9	6.8
	Meai	10.8	10.5	10.2	9.5	9.2	10.0	11.0	10.8	10.6	9.6	9.2	10.2

	2006	2007
.S.D. at 0.05%		
Jrea sources(U.S)	0.03	0.15
Foliar treatments (F.T)	0.50	0.11
Storage periods(S.P)	0.10	0.18
U.S) X (F.T)	0.05	0.20
U.S) X (S.P)	0.33	0.41
F.T) X (S.P)	0.15	0.07
U.S) X (F.T) X (S.P)	1.88	2.14

Table (7): Effect of slow release nitrogen fertilizers with foliar potassium, calcium application and storage period on ascorbic acid (mg/100g fresh weight) of cantaloupe during the two seasons of 2006 and 2007.

Foliar spray	N-sources treatments	2006 Storage period (day)						2007 Storage period (day)					
		zero day	7 days	14 days	21 days	28 days	Mean	zero day	7 days	14 days	21 days	28 days	Mean
K	bentonite-cu	28.7	26.7	25.4	22.8	19.4	24.6	28.4	26.7	24.6	21.4	18.4	23.9
	bitumen-cu	29.4	27.3	25.9	23.4	19.9	25.2	29.0	27.3	25.1	21.8	18.8	24.4
	wax-cu	27.9	25.9	24.6	22.2	18.9	23.9	28.6	26.9	24.7	21.5	18.5	24.0
	rock ph.-cu	28.5	26.5	25.2	22.7	19.3	24.4	28.5	26.8	24.6	21.4	18.4	23.9
	calcite –cu	27.9	25.9	24.6	22.2	18.9	23.9	27.5	25.9	23.8	20.7	17.8	23.1
	urea	27.5	25.6	24.3	21.9	18.6	23.6	26.3	24.7	22.7	19.8	17.0	22.1
	Mean	28.3	26.3	25.0	22.5	19.1	24.3	28.1	26.4	24.3	21.1	18.1	23.6
Ca	bentonite-cu	29.7	27.6	26.2	23.6	20.1	25.5	29.7	27.9	25.7	22.3	19.2	24.9
	bitumen-cu	29.6	27.5	26.2	23.5	20.0	25.4	29.6	27.8	25.6	22.3	19.2	24.9
	wax-cu	28.5	26.5	25.2	22.7	19.3	24.4	28.5	26.8	24.6	21.4	18.4	23.9
	rock ph.-cu	28.4	26.4	25.1	22.6	19.2	24.3	28.4	26.7	24.6	21.4	18.4	23.9
	calcite –cu	28.6	26.5	25.3	22.7	19.3	24.5	28.6	26.9	24.7	21.5	18.5	24.0
	urea	27.9	25.9	24.6	22.2	18.9	23.9	28.3	26.6	24.5	21.3	18.3	23.8
	Mean	28.8	26.8	25.4	22.9	19.5	24.7	28.9	27.1	24.9	21.7	18.7	24.3
Without	bentonite-cu	27.2	25.3	24.0	21.6	18.4	23.3	27.2	25.6	23.5	20.5	17.6	22.9
	bitumen-cu	28	26.1	24.7	22.3	18.9	23.9	28.0	26.3	24.2	21.1	18.1	23.5
	wax-cu	27.6	25.7	24.4	21.9	18.7	23.7	27.6	25.9	23.9	20.8	17.9	23.2
	rock ph.-cu	27.1	25.2	23.9	21.5	18.3	23.2	27.1	25.5	23.4	20.4	17.5	22.8
	calcite –cu	27.3	25.4	24.1	21.7	18.5	23.4	27.3	25.7	23.6	20.5	17.7	22.9
	urea	27	25.1	23.9	21.5	18.2	23.1	27.4	25.8	23.7	20.6	17.7	23.0
	Mean	27.4	25.5	24.2	21.8	18.5	23.5	27.4	25.8	23.7	20.6	17.8	23.1
Mean of N-sources	bentonite-cu	28.5	26.5	25.2	22.7	19.3	24.5	28.4	26.7	24.6	21.4	18.4	23.9
	bitumen-cu	29.0	26.9	25.6	23.1	19.6	24.9	28.9	27.1	24.9	21.7	18.7	24.3
	wax-cu	28.0	26.0	24.7	22.3	18.9	23.9	28.2	26.5	24.4	21.2	18.3	23.7
	rock ph.-cu	27.8	25.9	24.6	22.1	18.8	23.8	28.0	26.3	24.2	21.1	18.1	23.5
	calcite –cu	27.9	25.9	24.7	22.2	18.9	23.9	27.8	26.1	24.0	20.9	17.9	23.4
	urea	27.5	25.5	24.3	21.8	18.6	23.5	27.3	25.7	23.6	20.6	17.7	22.9
	Mean	28.1	26.2	24.8	22.4	19.0		28.1	26.4	24.3	21.2	18.2	

L.S.D. at 0.05%	2006	2007
Urea sources(U.S)	0.07	0.02
Foliar treatments (F.T)	0.10	0.70
Storage periods(S.P)	1.70	2.40
(U.S) X (F.T)	0.05	0.34
(U.S) X (S.P)	0.80	1.04
(F.T) X (S.P)	0.23	0.76
U.S) X (F.T) X (S.P)	2.30	3.06

The reduction in T.S.S and ascorbic acid contents during storage may be due to the higher rate of sugar and ascorbic acid loss through respiration than the water loss through transpiration (Wills *et al.*, 1981).

The interaction between foliar application and slow release nitrogen fertilizers was observed in Table (6 and 7) potassium or calcium application with bitumen-cu as nitrogen source, exhibited significantly higher T.T.S and ascorbic acid contents compared with those of other treatment or control during storage.

Interaction between foliar application, slow release nitrogen fertilizers and storage period, data in Table (6 and 7)show that potassium or calcium application significantly maintained T.T.S and ascorbic acid contents of fruits under nitrogen sources during all storage periods.

It can be concluded that it is advisable to use slow release fertilizer with potassium to obtain the higher fruit marketable yield with highest percentage of total soluble sold as well as less nitrate content in cantaloupe fruit. Using calcium or potassium as a foliar application with bitumen-cu or wax–cu as nitrogen sources improve fruits storability by decreasing weight loss and decay percentage and maintained fruit quality (firmness, T.S.S, ascorbic acid content) for 28 days during storage at 5°C. This improving was much pronounced at the application of calcium fertilizer with bitumen–cu or wax–cu.

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تأثير الأسمدة النيتروجينية بطيئة التحلل مع الإضافة الورقية للبوتاسيوم والكالسيوم في مرحلة تكون الثمار على النمو والمحصول ومحتوى السكر وتراكم النترات والقدرة التخزينية في الكنتالوب.

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أجري هذا البحث خلال عامي ٢٠٠٦ ، ٢٠٠٧ في مزرعة بحوث الخضر بقها – محافظة القليوبية ومعمل قسم بحوث تداول الخضر التابع لمعهد بحوث البساتين– مركز البحوث الزراعية بغرض دراسة تأثير إضافة الأسمدة بطيئة الذوبان ٤٦% نيتروجين (يوريا مغلفة بالبنتونيت، يوريا مغلفة بالتومين، يوريا مغلفة بالشمع، يوريا مغلفة بصخر الفوسفات ، يوريا مغلفة بالكالسيت) بالمقارنة بالأسمدة العادية (اليوريا) مع الرش بعناصر البوتاسيوم والكالسيوم في مرحلة تكوين الثمار على النمو والمحصول ومحتوى الأوراق من العناصر المعدنية ومحتوى الثمار من النترات وكذلك القدرة التخزينية للثمار صنف باسبورت.

وقد سجلت النتائج زيادة معنوية في قياسات النمو الخضري سواء بالنسبة للوزن الطازج والجاف للنبات مع استخدام الأسمدة بطيئة الذوبان لاسيما اليوريا المغلفة بالبتومين وكذلك المغلفة بالشمع. كما ارتفع المحصول الكلي والصالح للتسويق مع تلك الأسمدة أيضاً مقارنة باليوريا العادية. كما أوضحت النتائج أن محتوى الأوراق من عناصر النيتروجين والفوسفور والبوتاسيوم والكالسيوم كان مرتفعاً عند استخدام الأسمدة بطيئة الذوبان مع الرش بعنصري البوتاسيوم والكالسيوم بالمقارنة بالأسمدة العادية مع الرش بنفس العناصر.

الرش بالكالسيوم أو بالبوتاسيوم مع التسميد باليوريا المغلفة بالبتومين وكذلك المغلفة بالشمع حافظ على جودة الثمار أثناء التخزين حيث قلل الفقد في الوزن ونسبة التالف وحافظ على صلابة الثمار ونسبة المواد الصلبة الذائبة وفيتامين ج أثناء تخزين الثمار على درجة حرارة خمسة مئوية ورطوبة نسبية ٩٥% .

كذلك كان للرش بعنصر البوتاسيوم مع استخدام الأسمدة بطيئة الذوبان تأثير معنوي على المحصول والتقليل من تراكم النترات داخل الثمار.

ويتضح من هذا البحث أنه يمكن استخدام اليوريا بطيئة الذوبان لاسيما المغلفة بالبتومين والمغلفة بالشمع مع الرش بعنصر البوتاسيوم أثناء مرحلة تكوين الثمار للحصول على محصول مرتفع قابل للتسويق ذات محتوى مرتفع من الجوامد الصلبة الكلية مع أقل محتوى للثمار من النترات ، وأيضاً تحسين القدرة التخزينية لثمار الكنتالوب من خلال تقليل نسبة الفقد والتحلل أثناء التخزين على درجة حرارة ٥ م°.