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Effect of salinity and some salinity curing compounds on yield and fruit quality of Manfalouty pomegranate cultivar.

Farouk M. A. Mostafa , Kamelia I. A. Amen, and Yaser SH. Aly ,
Dept. Hort., Fac. Agric., Assiut Univ.

Abstract:

This study was carried out during 2003 and 2004 seasons to investigate the effect of salinity, as well as yeast and P-humex application on yield weight (kg)/ tree, commercial fruit percentage / tree ,fruit weight (g), fruit volume (cm^3), and peel weight % / fruit. In addition to that TSS% , TA%, TSS / TA ratio and reducing and total sugars % in fruit juice. Four levels of salinity (zero , 1000 ppm , 2000 ppm , 3000 ppm) applied as a mixture of Nacl and $CaCL_2$ at ratio 1:1 based on the equivalent weight of both (Nacl and $CaCL_2$). The salt mixture was applied before each irrigation with 24 hours the heated tars have been received 120 g / tree for the 1st level , 240 g / tree for the 2nd level and 360 g / tree for the 3rd level at the end of growth neasan. Yeast was applied as anti-salinity at rate of 40 g / tree as soil drench only once application before the 1st irrigation after bud-burst occurring. As well as P-humex was applied at rate of 20 g / tree as once application, 40 g / tree as twice application and 60 g / tree as thrice application. The experiment was designed as factorial experiment setted up in split-split-plot arrangement at complete randomized back de sign with 3 replicates, one tree each. Results showed that salinity reduced both of the total and the commercial yield weight % / tree as well as fruit weight, fruit volume and peel weight %. In addition, to that salinity induced negative effects on TSS%, TSS / TA ratio and reducing – and total sugars %, while it increased the TA% in fruit Juice. All treatments with yeast or P-humex improved the total and commercial yield / tree and minimized the negative effects of salinity on the physical and chemical characteristics of Manfalouty pomegranate fruits. According to this study, it was found that treatment with yeast or P-humex gave the best result to minimize the undesirable effects on yield and fruit characteristics of Manfalouty pomegranate cv.. Therefore, it could be recommended with the aforementioned treatment to improve yield and fruit quality of pomegranate trees grown under the conditions of this study.

Key Words : Salinity , Yeast , P-humex , Yield , Manfalouty.

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Referees:Prof.Dr.Abd EL-Fattah.M.Elsalhy Prof.Dr.Fisal.Fadel.Ahmed

Introduction:

Pomegranate has been cultivated over the whole Mediterranean region as well as in part of California and Arizona for juice production. Pomegranate juice provides about 16% vitamin C, a good source of vitamin B5 (pantothenic acid) , potassium and antioxidant polyphenols as hydrobyzable tannins called punicalogins which have free-radical scavenging properties (Fuhrman and Aviram 2007).

As reported by Hassan *et al*(1999) it was found that soil salinity Above 1200 ppm reduced yield by 3.7% in Fayouim grape cv. such yield reduction was attributed to the reduction in vegetative growth. Yield of Thompson Seedless grape cv. was markedly reduced by irrigation with water containing 2688 ppm salinity (Lurie *et al* , 1989), as well as yield of Colomberd and Ramsey grape cvs. when treated with 2240 ppm salinity (Steven and Harvey, 1990). AbdEl-Ghany *et al.*(2001) reported that "Thompson Seedless" grape cv. (*Vitis vinifera L.*) treated with 2 strains from yeast and diluted with water to reach volume of 200 ml and 600 ppm for soil application. Yeast application increase cluster quality via increasing berry size. Keutgen and Keutgen (2003) reported that response of "Esanta" and "Korona" strawberry cvs. to levels (0, 2340 and 4680 ppm) of NaCl salinity salt stress lowered the concentration of titratable acids in the fruit. In 'Esanta' the content of soluble solids was reduced. Naeini *et al.* (2005) reported that "Alak Torsh", "Malas Torsh" and "Malas Shirin" pomegranate cvs. (*Punica grantum L.*) treaed with different concentrations (0, 2340, 4680 and 7020 ppm) of NaCl solution, soluble sugars decreased as NaCl concentrations in irrigation water increased. Ben- Ashar *et al.* (2006) stated that growth characters of "Thompson Seedless" grapevine were greatly abversed by irrigation with saline water. Mohamed-Ebtesam (2007) mentioned that salinity at 1000 to 4000 ppm effectively inhibited growth characters of "Banaty", "Superior" and "Flame" grapevine cvs. Seedless.

Therefore , the objectives of this research were to examine:

1) the effect of water salinity an yield, commercial yield percentage and fruit characteristics.

2) the response to applying yeast and P-humex as anti-salinity reagents to minimize the negative effects of salinity treatment on yield and fruit characteristics.

Materials and Methods:

This study was carried out during 2003 and 2004 seasons on Manfalouty pomegranate cv. grown in the Experimental fruit Qrchard, Department of Horticulture, Faculty of Agriculture, Assiut University. The trees age was 30 years old at the beginning of the experiment and they were planted at 5*5 in apart, 96 trees unifermly in growth were chosen for this study.

a) using four levels of salinity (zero, 1000, 2000, 3000 ppm) in irrigation water using a mixture of the Nacl and $Cacl_2$ at ratio 1:1 based on the equivament weight

as 58g of NaCl and 55g of $Cacl_2$ whereas a mixtures of salt was used of 0.51g Nacl + 0.49g $Cacl_2$ for the 1000 ppm salinity, 1.02 Nacl + 0.98 $Cacl_2$ for the 2000 ppm salinity, and 1.53 Nacl + 1.47 $Cacl_2$ for the 3000 ppm salinity to prepare a liter. Therefore , salinity treatment per each irrigation as follows:

1-Untreated trees (only water without salt as control).

2-Treated trees with 1000 ppm salinity (10g from the mixture salt / 10 L. water / tree).

3-Treated trees with 2000 ppm salinity (20g from the mixture salt / 10 L. water / tree).

4-Treated trees with 3000 ppm salinity (30g from the mixture salt / 10 L. water / tree).

Thus treated trees with salinity during each growth seasons have been received 120g / tree of the mixture salt for the 1st level of salinity and 240g / tree of the mixture salt for the 2nd salinity level, and 360g / tree of the mixture salt for the 3rd salinity level at the end of growth season. Moreover, the mixture salt was applied before the irrigation with 24 hours.

b) The response to applying P-humex at three times. The 1st time was on March (during a month pre-budburst). The 2nd time after a month of the 1st time (on April). The 3rd time of P-humex application was before fruit harvesting (on September). P-humex was applied at rate of 20 g / tree as once application and 40 g / tree as twice application and 60 g / tree as thrice application. According to that treated trees with P- humex were divided into 4 groups as follows : the 1st group was untreated trees as control trees, the 2nd group was treated trees with 20 g P-humex , the 3rd growp was treated trees with 40 g P-humex and 4th group was treated trees the with 60 g P-humex.

Furthermore , P-humex was applied to trees as soil drench during the three aforemention times.

C) the effect of yeast applications as an antisalinity compound , whereas the yeast was applied at rate of 40 g / tree in once application during the 1st irrigation after budburst occurring of trees.

Statistical Analysis

The experiment of this study was designed as factorial contained 32 treatments , setted up in split – split plot arrangement at complete randomized black design with three replicates , one tree each. Salinity was the factor (A) as whole plot, yeast was the factor (B) as the 1st level of splits and P-humex was the factor (C) as the 2nd level of splits. All obtained data throughout this study were tabulated and statistically analyzed according to the methods described by Snedccor and Cochran (1990) and using New L.S.D test to recognize the significance of the difference among treatments means.

The following measurements were taken during each seasons of this study in response to the effect of salinity , yeast and P-humex applications:

1. Total yield weight (kg)/ tree
2. Commercial fruit weight percentage / tree.
3. Fruit weight (g).
4. Fruit volume (cm^3).
5. Peel weight percentage / fruit.
6. Total soluble solids percentage in fruit juice (TSS%),whereas

percentage of total soluble solids (TSS%) in fruit juice was measured by using a hand refractometer.

7. Titretable acidity percentage in fruit juice (TA%),
   total acidity (titretable acidity) percentage was estimated in fruit juice by 0.1 NaOH titration and was calculated as grams of citric acid / 100g fruit juice, according to A.O.A.C. (1985).
8. The ratio between the total soluble solids and titretable acidity in fruit juice (TSS / TA ratio)
9. Reducing and total sugars percentage in fruit juice . The chemical character of fruit juice were determined as described in A.O.A.C. (1985).

Results and Discussion

1:Effect of salinity levels, yeast and P-humex application on yield, commercial fruit percentage / tree:-

As shown in Tables (1 and2) it could be observed that all treatments with yeast or P-humex and or different levels of salinity induced significant effects on total yield weight (kg/tree) and commercial fruit weight % of Manfalouty pomegranate cv. in 2003 and 2004 seasons.

Regarding to the effect of salinity levels on commercial and fruit weight (kg/tree), it was cleared that more reduction of commercial weight / tree has been attributed with the heights levels of salinity during the two studied seasons. On the other hand , applying both of yeast or P-humex resulted in improving commercial weight (kg/tree) meanwhile , all treatments with yeast or P-humex induced minimizing the negative effects of salinity on this connection throughout the two seasons of this study.

Moreover, not yet, it was observed that both yeast or P-humex application induced an increase in total commercial fruit (kg/tree). In adduction to that , it could be noticed that applying P-humex at the 3rd time to the treated trees with yeast gave the best result during the two studied seasons (Table 1).

Furthermore , according to data recorded in (Table 2) it was cleary that all treatments with salinity levels , yeast application or P-humex application number, resulted in significant effects on total yield and commercial fruit percentage in 2003 and 2004 seasons. However , all treatment carried out during this study gave the same trend on yield parameters , i-g yield weight (kg/tree) , commercial fruit weight (kg/tree) and commercial fruit weight percentage of Manfalouty pomegranate cv. throughout the two studied seasons (Table 2).

All the obtained results of this study are in harmony with those

demonstrated by Abo-Taleb (1999) who studied that on "Manfalouty" and "Nab El-Gamal" pomegranate cvs. The effect of yeast soil application rates : 10 g/L (1%), 20 g/L (2%), 40 g/L (4%) per tree on two Once, twice and three times annually per tree were applied. All the treatments in general increased Fruit (weight and volume) and peel (weight). Ahmad-Amin *et al*. (2000) reported that all concentration used of yeast at (3, 6 or 9 g/vine) induced a significant increase in weight of 100 berry of "King Ruby" grapevine cv. . Abd El-Ghany *et al.* (2001) reported that "Thompson Seedless" grapevines cv. (*Vitis vinifera L.*) treated with 2 strains from yeast and diluted with water to reach volume of 200 and 600 ppm for soil application. All yeast application treatments increased number compared with control. Yeast application also increased leaf size and weight of pruning wood compared to control. Gobara *et al.* (2002) stated that berry set, yield and cluster weight of "Red Roomy" grapevines cv. were positively affected by application of yeast at 0.025 to 0.1 %, increased concentration of yeast from 0.025 to 0.1 % was followed by a gradual promotion on yield. Walker *et al.* (2002) stated that yield of "Sultana" grapevines cv. irrigated, with water of three salinity levels (from 256 to 2240 ppm)was studied. Yield was significantly reduced by high salinity 2240 ppm.

2-Effect of salinity levels, yeast and P-humex on physical characters of ripe fruits:-

Data illustrated in Tables (3,4 and 5) showed significant differences in physical characters of fruit, i-g. fruit weight (g), fruit volume (cm^3) and peel weight% per fruit of of Manfalouty pomegranate cv. in 2003 and 2004 seasons.

Concerning, the salinity, the same trend was obtained on both fruit weight (g) and fruit volume whereas, yeast and P-humex application member significantly improved these traits comparing with untreated control trees during the two seasons. (Table 3,4 and 5). There fruiting were agreement with these found by Abd El-Ghany *et al.* (2001) reported that "Thompson Seedless" grapevines cv. (*Vitis vinifera L.*) treated with 2 strains from yeast and diluted with water to reach volume of 200 ml and 600 ml for soil application. All yeast application treatments increased vine growth and increased number ofclustes compared with control . Yeast application also increased leaf size and weight of pruning weight compared to control. Ebrahiem *et al.* (2000) applied yeast at 0.05, 0.1 or 0.2 % to "Balady" mandarin cv.. They found that all treatments with yeast were very effective in increasing number of fruits /tree, fruit weight and dimensions. Al-Sayed (2001) stated that supplying "Flame Seedless" grapevines cv. with yeast at 8.0 g/vine caused a remarkable promotion

on the berry set %. Abada (2002) found that yeast spraying at 0.025 to 1% on "Red Roomy" grapevines cv. was very favourable in enhancing quality of the berries in terms of increasing berry weight and dimensions, total soluble%, total sugars % and the ratio between total soluble solids and total acidity compared to unspraying. Gobara *et al.* (2002) stated that berry set, yield and cluster weight of "Red Roomy" grapevines cv. were positively affected by application of yeast at 0.025 to 0.1 %. Increased concentration of yeast from 0.025 to 0.1 % was followed by a gradual promotion on yield. Omran, *et al*. (2003) stated that yield of "Red Roomy" grapevines cvs. was considerably promoted in response to application of yeast at 0.5 g/vine. Garcia-Sanchez. *et al.* (2004) reported that fruit yield was progressively decreased by salinity in all treatments on "Star Ruby" grapefruit cv. treated with 3 irrigation waters having sodium chloride concentrations of 175, 877 and 1755 ppm. Keutgen and Keutgen (2003) reported that response of "Esanta" and "Korona" strawberry cvs. to levels (0, 40 and 80 ppm) of NaCl salinity salt stress and to describe salt effects on fruit quality.

3-Effect of salinity levels, yeast and P-humex application on some chemical characteristies of fruits:-

3-1.Total soluble solids percentage (TSS%) in fruit juice :-

Concerning , the effect of yeast application on TSS% in fruit juice it could be observed that applying yeast caused an improvement in TSS% in fruit juice during the two seasons. As well as, it was found the same results were obtained from P-humex application number on TSS% in fruit juice of Manfalouty pomegranate during the two seasons (Table 6). These obtained results of this study are in agreement with these results were found by Ahmad *et al*. (1988) found that spraying 0.1% of active dry yeast plus micro or macronutrients at 2nd week of April, June or August to "Red Roomy" grapevines cv. was very effective in stimulating total soluble solids and total sugars while was responsible for reducing the total acidity. Ahmad-Amin *et al*. (2000) reported that all treatment with (3, 6 and 9 g/vine) of yeast significantly increased total soluble solids percentage in "King Ruby" grapevines cv. juice.

3-2.Titratable acidity percentage (TA%) in fruit juice :-

Data recorded in (Tables 7) showed significant effects on titratable acidity percentage (TA%) as citric acid in fruit juice of Manfalouty pomegranate in fruits during the two studied seasons. As when in (Tables 7), it was found that treatment with salinity levels, yeast and P-humex induced significant effects on TA% in juice of pomegranate fruits during the two studied seasons. These obtained results from this study are in agreement with

these of Abd El-Ghany *et al.* (2001) reported that yeast applied as soil drench or foliar sprays at 1, 2 or 4 kg/feddan on "Thompson Seedless" grape cv. was responsible for advancing quality by increasing total soluble solids and reducing total acidity berry weight and compared to the check treatment. Keutgen and Keutgen (2003) reported that response of "Esanta" and "Korona" strawberry cvs. to levels (0, 2340 and 4680 ppm) of NaCl salinity salt stress lowered the concentration of titratable acids in the fruit. In 'Esanta' the content of soluble solids was reduced.

3-3.TSS/TA ratio in fruit juice :-

Regarding the effects of salinity levels on TSS/TA ratio in fruit juice.

Concerning the recorded data in (Tables 8) it could be deduced that treatments with salinity levels, caused significant decrease in the ratio between TSS% and TA%, whereas yeast and P-humex caused a significantly increased in this trait in juice of fruit of Manfalouty pomegranate cv. in 2003 and 2004 seasons.

So, it could be concluded that application of both yeast and P-humex gave positive effects on salinity application on TSS/TA ratio in juice of fruits of Manfalouty pomegranate cv. comparing with untreated control fruits in 2003 and 2004 seasons.

These obtained results from this study are in agreement with these of Ebrahiem *et al.* (2000) reported that "Balady" mandarin treated with yeast at 0.05, 0.1 or 0.2 % very effective in increasing percentages of juice, total soluble solids / acidity and reducing total acidity in juice. On other hand El-Naby and Soliman (2003) reported that fruit of "Zaghloul" date cv. treated with calcium chloride solution (24000 or 60000 ppm) was more effective in increasing total soluble solids (TSS)/total acidity ratio, total sugar content and reducing sugar content.

3-4.Sugars content%in fruit juice :-

As reported in (Tables 9 and 10) it could be noticed that treatments with salinity levels, yeast and P-humex showed significant effects on the total sugars% and reducing sugars% in ripe fruit juice of Manfalouty pomegranate cv. 2003 and 2004 seasons.

Concerning the effects of salinity levels on total and reducing sugar contents in fruit juice it was found that salinity caused significant decrease in these traits of fruit juice, all data were comparing with untreated control fruits in 2003 and 2004 seasons (Tables 9 and 10).

These effects could be due to the negative effects on the bio synthesis process whereas these process were very sensitive to salinity levels stress factor.

Concerning the effects of yeast or P-humex application on total and reducing sugars content of fruit juice significantly increased them, compared to untreated one. Consequently, minimized the negative effects of salinity on this studied parameters during the two studied seasons.

These obtained results from this study are in agreement with

those reported by DongKum *et al*. (2003) reported that in "Kumssaragiuncheon" melon cv. (*Cucumis melo*) grown on soil with different salinity levels (512, 1408 and 2688 ppm) the sugar contant and external appearance of fruit were similar under the different soil salinity levels. Naeini *et al.* (2005) reported that "Alak Torsh", "Malas Torsh" and "Malas Shirin" pomegranate cvs. (*Punica grantum L*.) treated with different concentrations (0, 2340 4680, and 7020 ppm) of NaCl solution, decreased soluble sugars as NaCl concentrations in irrigation water increased. Contrarly, El-Naby and Soliman (2003) reported that fruit of "Zaghloul" date cv. treated with calcium chloride solution (24000 or 60000 ppm) was more effective in increasing total soluble solids (TSS)/total acidity ratio, total sugar content and reducing sugar content.

Table (1): Effect of salinity levels, yeast and P-humex application number as anti-salinity compounds on total yield weight (kg/tree) of Manfalouty pomegranate cv. in 2003 and 2004 seasons.

Yeast (B)	P-humex (C)	2003					2004				
		Salinity (A)									
		zero ppm	1000 ppm	2000 ppm	3000 ppm	Mean	zero ppm	1000 ppm	2000 ppm	3000 ppm	Mean
Control	zero	74.67	73.67	72.67	72.67	73.42	75.17	74.90	73.70	72.10	73.97
	Once	75.50	74.83	73.33	71.83	73.88	76.00	75.40	74.20	72.60	74.55
	Twice	76.33	76.17	74.67	74.00	75.29	77.67	77.00	75.33	73.90	75.96
	Thrice	78.50	77.50	76.50	74.00	76.63	79.50	78.07	77.50	75.80	77.72
Mean		76.25	75.54	74.29	73.13		77.07	76.34	75.18	73.60	
Yeast	zero	77.50	75.67	74.67	74.83	75.67	78.60	78.00	76.70	75.40	77.17
	Once	78.67	77.67	79.50	74.67	77.63	79.83	78.93	77.30	76.90	78.24
	Twice	80.00	79.00	77.67	76.33	78.25	80.90	80.40	78.90	77.50	79.43
	Thrice	81.83	81.33	79.33	77.83	80.08	83.20	82.60	81.00	79.60	81.60
Mean		79.50	78.42	77.79	75.92		80.63	79.98	78.48	77.35	

New L.S.D 0.05		season 2003	season 2004
Salinity	(A)	7.00	6.53
Yeast	(B)	6.56	5.18
P-humex	(C)	4.26	4.79
Interaction I	(A.B)	N.S	N.S

Interaction II	**(A.C)**	**N.S**	**N.S**
Interaction III	**(B.C)**	**N.S**	**N.S**

Table(2): Effect of salinity levels, yeast and P-humex application number as anti-salinity compounds on percentage of commercial fruit weight/ trees of Manfalouty pomegranate cv. in 2003 and 2004 seasons.

Yeast (B)	P-humex (C)	2003					2004				
		Salinity (A)									
		zero ppm	1000 ppm	2000 ppm	3000 ppm	Mean	zero ppm	1000 ppm	2000 ppm	3000 ppm	Mean
Control	zero	82.83	82.61	82.28	82.02	82.44	83.34	83.21	83.13	82.95	83.16
	Once	82.87	82.73	82.47	82.19	82.57	83.43	83.29	83.48	82.92	83.28
	Twice	83.01	82.90	82.65	82.40	82.74	83.64	83.51	83.29	83.09	83.38
	Thrice	83.19	83.11	82.93	82.70	82.98	83.74	83.63	83.49	83.38	83.56
Mean		82.98	82.84	82.58	82.33		83.54	83.41	83.35	83.09	
Yeast	zero	83.06	82.85	82.58	82.27	82.69	83.36	83.47	83.29	83.14	83.31
	Once	83.21	83.31	82.79	82.60	82.98	84.13	84.00	83.83	83.62	83.90
	Twice	83.01	82.90	82.65	83.40	82.99	84.02	83.83	83.56	83.49	83.72
	Thrice	83.19	83.38	82.92	82.70	83.01	84.30	84.20	83.95	83.80	84.06
Mean		83.30	83.11	83.72	82.66		83.95	83.87	83.66	83.51	

New L.S.D 0.05		season 2003	season 2004
Salinity	(A)	0.76	N.S
Yeast	(B)	0.52	0.18
P-humex	(C)	0.78	N.S
Interaction I	(A.B)	N.S	N.S
Interaction II	(A.C)	N.S	N.S
Interaction III	(B.C)	N.S	N.S

Table(3): Effect of salinity levels, yeast and P-humex application number as anti-salinity compounds on fruit weight (g) of Manfalouty pomegranate cv. in 2003 and 2004 seasons.

Yeast (B)	P-humex (C)	2003					2004				
		Salinity (A)									
		zero ppm	1000 ppm	2000 ppm	3000 ppm	Mean	zero ppm	1000 ppm	2000 ppm	3000 ppm	Mean
Control	zero	411.7	410.0	394.7	386.7	400.8	443.0	442.0	438.0	435.0	439.5
	Once	413.3	411.3	398.0	390.0	403.2	445.0	443.0	440.0	438.0	441.5
	Twice	415.0	413.0	400.0	396.0	406.0	446.2	444.0	443.1	442.4	443.9
	Thrice	420.0	413.3	405.0	400.7	409.8	447.0	445.0	443.2	441.0	444.1
Mean		415.0	411.9	399.4	393.3		445.3	444.5	441.1	439.1	
Yeast	zero	430.0	421.3	417.0	410.0	419.6	448.0	445.0	442.2	441.5	444.2
	Once	438.3	428.7	423.0	413.0	425.8	451.0	446.0	444.0	443.0	446.0
	Twice	443.0	435.0	425.3	418.3	430.4	454.0	447.0	445.2	444.5	447.7
	Thrice	446.0	439.7	408.0	420.0	428.4	457.3	447.0	446.2	445.1	448.9
Mean		439.3	431.2	418.3	415.3		452.6	446.3	444.4	443.5	

New L.S.D 0.05		season 2003	season 2004
Salinity	(A)	N.S	17.78
Yeast	(B)	N.S	14.40
P-humex	(C)	N.S	21.50
Interaction I	(A.B)	N.S	N.S
Interaction II	(A.C)	N.S	N.S
Interaction III	(B.C)	N.S	N.S

Table(4): Effect of salinity levels, yeast and P-humex application as number anti-salinity compounds on fruit volume (cm3) of Manfalouty pomegranate cv. In 2003 and 2004 seasons.

Yeast (B)	P-humex (C)	2003					2004				
		Salinity (A)									
		zero ppm	1000 ppm	2000 ppm	3000 ppm	Mean	zero ppm	1000 ppm	2000 ppm	3000 ppm	Mean
Control	zero	442.0	432.7	425.3	412.7	428.2	465.0	460.7	454.2	449.2	457.3
	Once	439.0	436.7	416.7	406.7	422.6	467.2	459.0	454.5	451.1	4.57.94
	Twice	436.7	439.3	418.3	419.3	428.4	469.0	466.0	459.1	455.1	462.3
	Thrice	446.3	433.3	428.3	421.7	432.4	475.3	470.0	464.2	453.8	465.9
Mean		438.8	435.5	422.2	415.1		469.1	463.9	458.0	452.3	
Yeast	zero	467.0	458.3	443.3	431.7	450.1	468.9	464.0	462.6	456.5	463.0
	Once	462.3	452.7	443.3	434.0	448.1	473.0	468.0	465.3	460.7	466.8
	Twice	462.7	457.7	448.3	444.0	453.2	475.3	470.3	466.4	461.3	468.4
	Thrice	476.7	465.0	431.7	445.3	454.7	477.3	470.3	467.5	463.7	469.7
Mean		467.2	458.4	441.7	438.8		473.6	468.2	465.5	460.6	

New L.S.D 0.05		season 2003	season 2004
Salinity	(A)	N.S	19.94
Yeast	(B)	N.S	17.55
P-humex	(C)	N.S	18.04
Interaction I	(A.B)	N.S	N.S
Interaction II	(A.C)	N.S	N.S
Interaction III	(B.C)	N.S	N.S

Table(5): Effect of salinity levels, yeast and P-humex application number as anti-salinity compounds on fruit peel weight % of Manfalouty pomegranate cv. in 2003 and 2004 seasons.

Yeast (B)	P-humex (C)	2003					2004				
		Salinity (A)									
		zero ppm	1000 ppm	2000 ppm	3000 ppm	Mean	zero ppm	1000 ppm	2000 ppm	3000 ppm	Mean
Control	zero	40.30	41.27	41.63	41.67	41.22	41.03	43.60	43.60	44.90	43.02
	Once	40.23	40.30	40.87	40.13	40.63	40.67	43.47	43.47	44.30	42.59
	Twice	40.33	40.50	39.93	41.10	40.47	40.17	42.60	42.60	43.37	41.95
	Thrice	36.93	40.00	40.37	40.03	39.33	39.50	41.93	41.93	42.50	41.28
Mean		39.79	40.52	40.70	40.98		40.34	42.90	42.90	43.77	
Yeast	zero	38.30	39.00	40.67	40.07	39.89	40.30	42.47	42.47	43.77	41.93
	Once	38.17	39.07	40.20	40.30	39.68	39.47	42.60	42.60	42.83	41.43
	Twice	38.00	38.83	38.90	39.40	38.78	39.00	40.40	40.40	42.10	40.44
	Thrice	37.53	36.87	37.53	38.97	37.73	38.30	40.40	40.40	41.60	40.06
Mean		38.13	38.44	39.32	40.18		39.27	41.47	41.47	42.57	

New L.S.D 0.05		season 2003	season 2004
Salinity	(A)	N.S	1.71
Yeast	(B)	2.05	1.43
P-humex	(C)	N.S	2.41
Interaction I	(A.B)	N.S	N.S
Interaction II	(A.C)	N.S	N.S
Interaction III	(B.C)	N.S	N.S

Table (6): Effect of salinity levels, yeast and P-humex application as anti-salinity compounds on total soluble solids (TSS) % in fruit juice of Manfalouty pomegranate cv. in 2003 and 2004 seasons.

Yeast (B)	P-Humex (C)	2003					2004				
		Salinity (A)									
		zero ppm	1000 ppm	2000 ppm	3000 ppm	Mean	zero ppm	1000 ppm	2000 ppm	3000 ppm	Mean
Control	zero	14.07	13.67	13.27	13.17	13.54	15.83	15.13	14.60	14.07	14.91
	Once	14.73	14.10	13.73	13.37	13.98	15.93	15.35	14.73	14.47	15.12
	Twice	14.90	14.13	13.73	13.13	13.98	15.93	15.20	14.90	14.87	15.23
	Thrice	14.83	14.07	13.60	13.33	13.89	16.07	15.50	15.10	14.67	15.33
Mean		14.63	13.99	13.58	13.25		15.94	15.30	14.83	14.52	
Yeast	zero	15.27	14.27	13.73	13.50	14.19	15.90	15.73	14.80	14.27	15.18
	Once	15.20	14.23	13.83	13.77	14.26	16.10	15.83	14.87	14.70	15.38
	Twice	14.57	14.07	13.90	13.53	14.02	16.57	16.00	15.13	15.20	15.72
	Thrice	15.70	14.37	13.50	13.67	14.18	15.60	16.13	15.73	15.73	16.05
Mean		15.05	14.23	13.74	13.67		16.29	15.93	15.13	14.98	

New L.S.D 0.05		season 2003	season 2004
Salinity	(A)	0.28	0.32
Yeast	(B)	0.21	0.15
P-humex	(C)	N.S	0.23
Interaction I	(A.B)	N.S	N.S
Interaction II	(A.C)	N.S	N.S
Interaction III	**(B.C)**	**N.S**	**N.S**

Table (7): Effect of salinity levels, yeast and P-humex application as anti-salinity compounds on titratable acidity (TA)% in fruit juice of Manfalouty pomegranate cv. in 2003 and 2004 seasons.

Yeast (B)	P-Hume (C) x	2003					2004				
		Salinity (A)									
		zero ppm	1000 ppm	2000 ppm	3000 ppm	Mean	zero ppm	1000 ppm	2000 ppm	3000 ppm	Mean
Control	zero	1.35	1.41	1.44	1.53	1.43	1.32	1.36	1.37	1.41	1.37
	Once	1.38	1.43	1.40	1.42	1.41	1.29	1.33	1.36	1.35	1.33
	Twice	1.29	1.35	1.40	1.46	1.37	1.19	1.25	1.30	1.31	1.27
	Thrice	1.20	1.18	1.22	1.21	1.20	1.08	1.11	1.14	1.15	1.12
Mean		1.31	1.34	1.37	1.41		1.22	1.26	1.29	1.32	
Yeast	zero	1.31	1.34	1.35	1.48	1.37	1.24	1.26	1.28	1.30	1.27
	Once	1.20	1.32	1.38	1.39	1.36	1.23	1.26	1.27	1.31	1.27
	Twice	1.20	1.25	1.34	1.34	1.28	1.11	1.15	1.24	1.25	1.09
	Thrice	1.13	1.16	1.20	1.25	1.18	1.04	1.07	1.11	1.14	1.20
Mean		1.24	1.27	1.32	1.37		1.15	1.18	1.22	1.25	

New L.S.D 0.05		season 2003	season 2004
Salinity	(A)	0.05	0.02
Yeast	(B)	0.26	0.02
P-humex	(C)	0.04	0.02
Interaction I	(A.B)	N.S	N.S
Interaction II	(A.C)	N.S	0.05
Interaction III	(B.C)	N.S	0.24

Table (8): Effect of salinity levels, yeast and P-humex application as anti-salinity compounds on TSS /TA ratio in fruit juice of fruits of Manfalouty pomegranate cv. in 2003 and 2004 seasons.

Yeast (B)	P-Humex (C)	2003					2004				
		Salinity (A)									
		zero ppm	1000 ppm	2000 ppm	3000 ppm	Mean	zero ppm	1000 ppm	2000 ppm	3000 ppm	Mean
Control	zero	10.41	10.06	9.01	8.77	9.56	11.98	11.17	10.93	9.99	10.94
	Once	10.67	9.91	9.79	9.41	9.94	12.33	11.60	10.83	10.77	11.38
	Twice	11.93	10.51	9.63	9.02	10.27	13.37	12.20	11.53	11.00	12.03
	Thrice	12.73	11.87	11.17	10.78	11.64	14.90	14.03	13.20	12.72	13.72
Mean		11.44	10.59	9.91	9.49		13.15	12.25	11.55	11.12	
Yeast	zero	11.67	10.67	10.19	9.12	10.41	12.78	12.50	11.53	11.00	11.95

	Once	11.40	10.51	10.02	9.92	10.48	13.13	12.63	11.70	11.27	12.18
	Twice	11.90	11.53	10.37	10.11	10.98	14.97	13.93	12.23	12.13	13.32
	Thrice	13.53	12.47	11.13	11.30	12.11	15.97	15.00	14.23	13.77	14.74
Mean		12.13	11.31	10.43	10.11		14.21	13.52	12.43	12.04	

New L.S.D 0.05		season 2003	season 2004
Salinity	(A)	0.48	0.32
Yeast	(B)	0.23	0.18
P-humex	(C)	0.22	0.21
Interaction I	(A.B)	N.S	N.S
Interaction II	(A.C)	N.S	N.S
Interaction III	(B.C)	N.S	N.S

Table(9): Effect of salinity levels, yeast and P-humex application number as anti-salinity compounds on total sugars % in fruit juice of Manfalouty pomegranate cv. 2003 and 2004 seasons.

Yeast (B)	P-Hume (C) x	2003					2004				
		Salinity (A)									
		zero ppm	1000 ppm	2000 ppm	3000 ppm	Mean	zero ppm	1000 ppm	2000 ppm	3000 ppm	Mean
Con-trol	zero	13.50	13.40	13.35	13.25	13.38	13.70	13.65	13.50	13.50	13.59
	Once	13.50	13.43	13.30	13.30	13.38	13.75	13.70	13.60	13.60	13.66
	Twice	13.60	13.50	13.40	13.40	13.48	13.83	13.80	13.70	13.60	13.73
	Thrice	13.75	13.70	13.60	13.50	13.64	14.00	13.92	13.90	13.80	13.90
Mean		13.59	13.50	13.41	13.36		13.82	13.77	13.68	13.63	
Yeast	zero	13.70	13.65	13.60	13.45	13.60	13.90	13.80	13.77	13.70	13.79
	Once	13.72	13.70	13.62	13.55	13.65	13.95	13.90	13.88	13.80	13.88
	Twice	13.80	13.75	13.70	13.60	13.71	14.03	14.00	13.93	13.90	13.97
	Thrice	13.95	13.90	13.80	13.75	13.85	14.20	14.13	14.10	13.97	14.10
Mean		13.79	13.75	13.68	13.59		14.02	13.96	13.92	13.84	

New L.S.D 0.05		season 2003	season 2004
Salinity	(A)	0.08	0.06
Yeast	(B)	0.03	6.80
P-humex	(C)	0.09	0.05
Interaction I	(A.B)	N.S	N.S
Interaction II	(A.C)	N.S	N.S
Interaction III	(B.C)	N.S	N.S

Table(10): Effect of salinity levels anti-salinity yeast and P-humex application number as , compounds on reducing sugar % in fruit juice of Manfalouty pomegranate cv. in 2003 and 2004 seasons.

Yeast (B)	P-Humex (C)	2003					2004				
		Salinity (A)									
		zero ppm	1000 ppm	2000 ppm	3000 ppm	Mean	zero ppm	1000 ppm	2000 ppm	3000 ppm	Mean
Control	zero	12.45	12.40	12.35	12.30	12.37	12.60	12.55	12.50	12.45	12.53
	Once	12.50	12.45	12.40	12.35	12.43	12.65	12.60	12.55	12.50	12.58
	Twice	12.60	12.55	12.50	12.45	12.53	12.80	12.80	12.70	12.65	12.74
	Thrice	12.70	12.65	12.60	12.55	12.63	12.90	12.85	12.75	12.70	12.80
Mean		12.56	12.51	12.46	12.41		12.74	12.70	12.63	12.58	
Yeast	zero	12.50	12.45	12.40	12.35	12.42	12.75	12.75	12.65	12.60	12.69
	Once	12.70	12.60	12.55	12.50	12.59	12.85	12.80	12.70	12.75	12.78
	Twice	12.80	12.75	12.70	12.65	12.73	12.90	12.85	12.75	12.75	12.81
	Thrice	12.90	12.85	12.80	12.75	12.83	13.00	12.95	12.90	12.85	12.92
Mean		12.73	12.66	12.61	12.56		12.87	12.84	12.75	12.74	

New L.S.D 0.05		season 2003	season 2004
Salinity	(A)	0.03	0.04
Yeast	(B)	0.04	0.02
P-humex	(C)	0.03	0.05
Interaction I	(A.B)	N.S	N.S
Interaction II	(A.C)	N.S	N.S
Interaction III	(B.C)	N.S	N.S

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تأثير الملوحة وبعض المركبات المعالجة لها على المحصول وجودة ثمار الرمان المنفلوطى

فاروق محمد أحمد مصطفى ،كاملیا إبراهيم أحمد أمين ، ياسر شحاته على
قسم البساتين (فاكهه) – كلية الزراعة – جامعة أسيوط - مصر

أجريت هذه التجربة خلال موسمى 2003، 2004 بمزرعة الفاكهة بكلية الزراعة – جامعة أسيوط على الرمان المنفلوطى باختيار 96 شجرة رمان مثمرة.
بهدف دراسة تأثير أربع مستويات من الملوحة مع مياه الرى (صفر ،1000، 2000 ،3000 جزء فى المليون) وكذلك مدى الإستجابة للمعاملة بالخميرة (بمعدل ،40 جم / شجرة تم إضافتها مرة واحدة مثل الرية الاولى بين تفتح البراعم) وكذلك مركب ال البى – هيوميكس P-humex (بمعدل،20،40،60 جم/ لكل شجرة تم إضافته ثلاث مرات خلال الموسم) فى تقليل التأثير الضار لملوحة مياه الرى على المحصول وبعض الخصائص الطبيعية و الكيميائية لثمار الرمان المنفلوطى.

وقد تم دراسة تأثير هذه المعاملات على الصفات التالية خلال موسمى الدراسة :-

1- وزن المحصول / الشجرة.
2- النسبة المئوية لوزن الثمار التجارية / الشجرة .
3- حجم ووزن الثمرة
4- النسبة المئوية لوزن القشرة.
5 - النسبة المئوية للمواد الصلبة الذائبة.
6- النسبة المئوية للحموضة الكلية.
7- نسبة المواد الصلبة الذائبة /الحموضة.
8- النسبة المئوية للسكريات الكلية والمختزلة.

وقد أوضحت النتائج الأتى:-

1- أدى الرى بالتركيزات المختلفة من ملوحة مياه الرى إلى تأثير سلبى على المحصول وبعض الخصائص الطبيعية والكيميائية لثمار الرمان المنفلوطى.
2- قللت المعاملة بالخميرة والبي-هيومكس التأثير السلبى للملوحة على المحصول وبعض الخصائص

الطبيعية والكيميائية لثمار الرمان المنفلوطى وقد وجدت تحت ظروف هذه الدراسة أن المعاملة بالخميرة بمعدل (40جم/شجرة تضاف مرة واحدة قبل الرية الاولى بعد تفتح البراعم مع إضافة البي– هيومكس P-humex ثلاثة مرات بمعدل 60 جم/شجره) أعطت أفضل النتائج من حيث تحسين المحصول التجارى وجودة صفات الرمان وعليه فإنه ينصح بإجراء هذه المعاملة للتغلب على التأثيرات السلبية لملوحة ماء الرى على المحصول وجودة ثمار الرمان المنفلوطى المنزرع تحت ظروف التجربة .

* هذا البحث مستخلص من رسالة الدكتوراه