

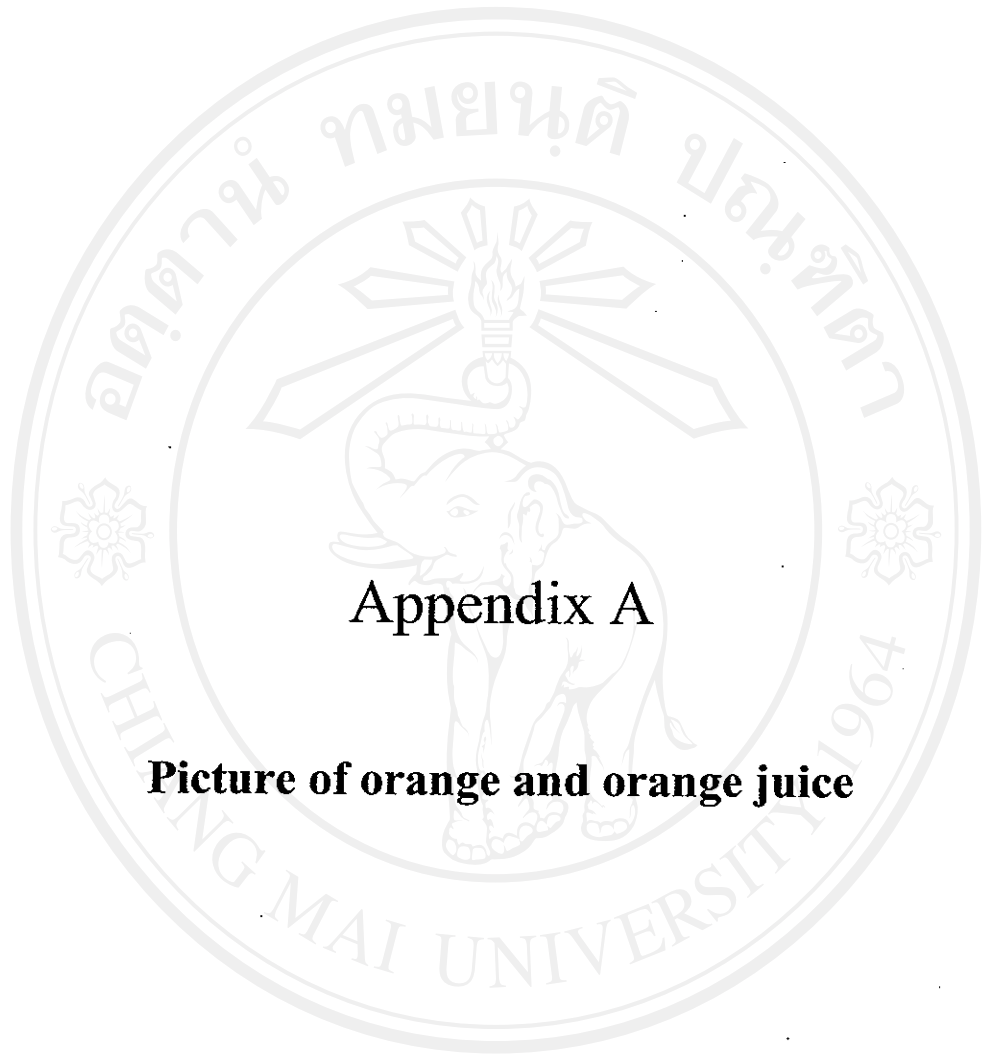


## **Appendices**

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่

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## Appendix A

**Picture of orange and orange juice**

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**Fig. A1** Fruit and juice of Keaw Wan Prae orange

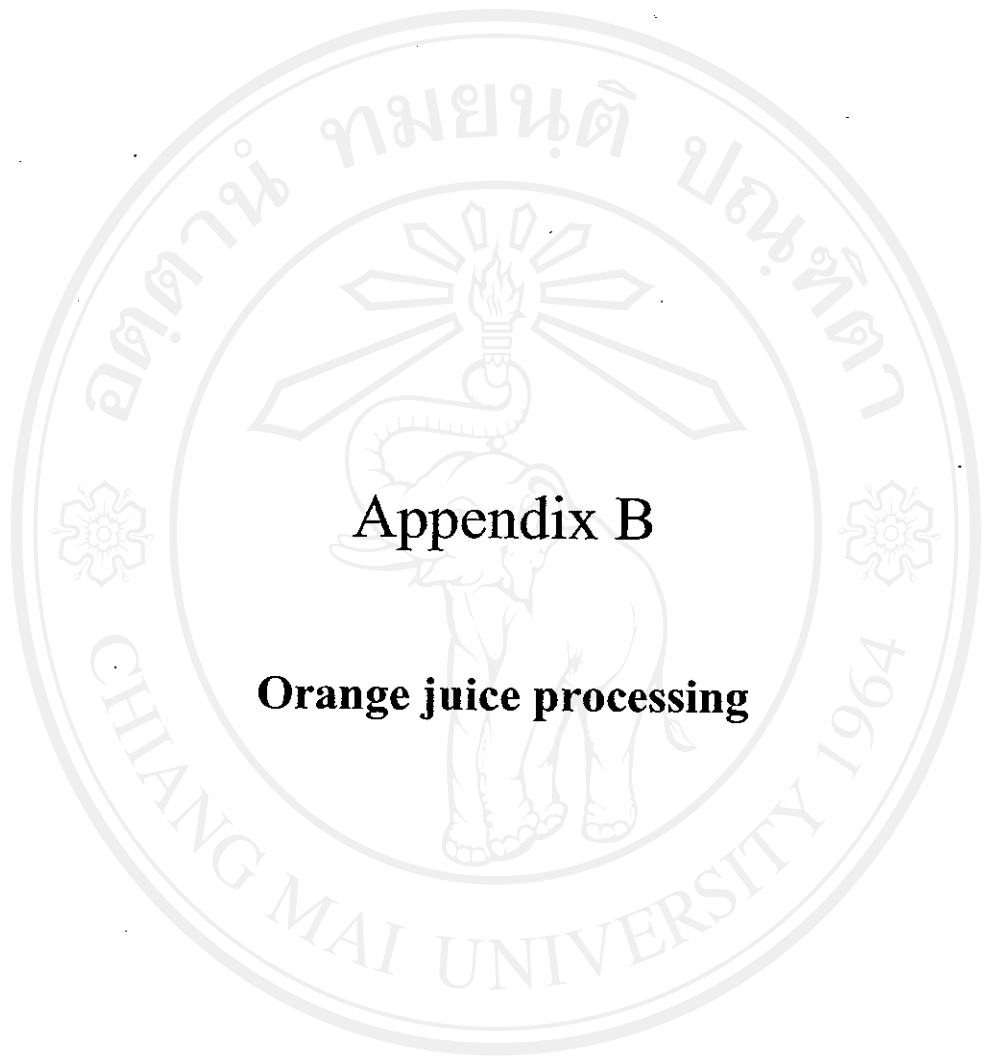


**Fig. A2** Fruit and juice of Sai Namphung orange



**Fig. A3** A color comparison between Keaw Wan Prae orange juice (left) and Sai Namphung orange juice (right)

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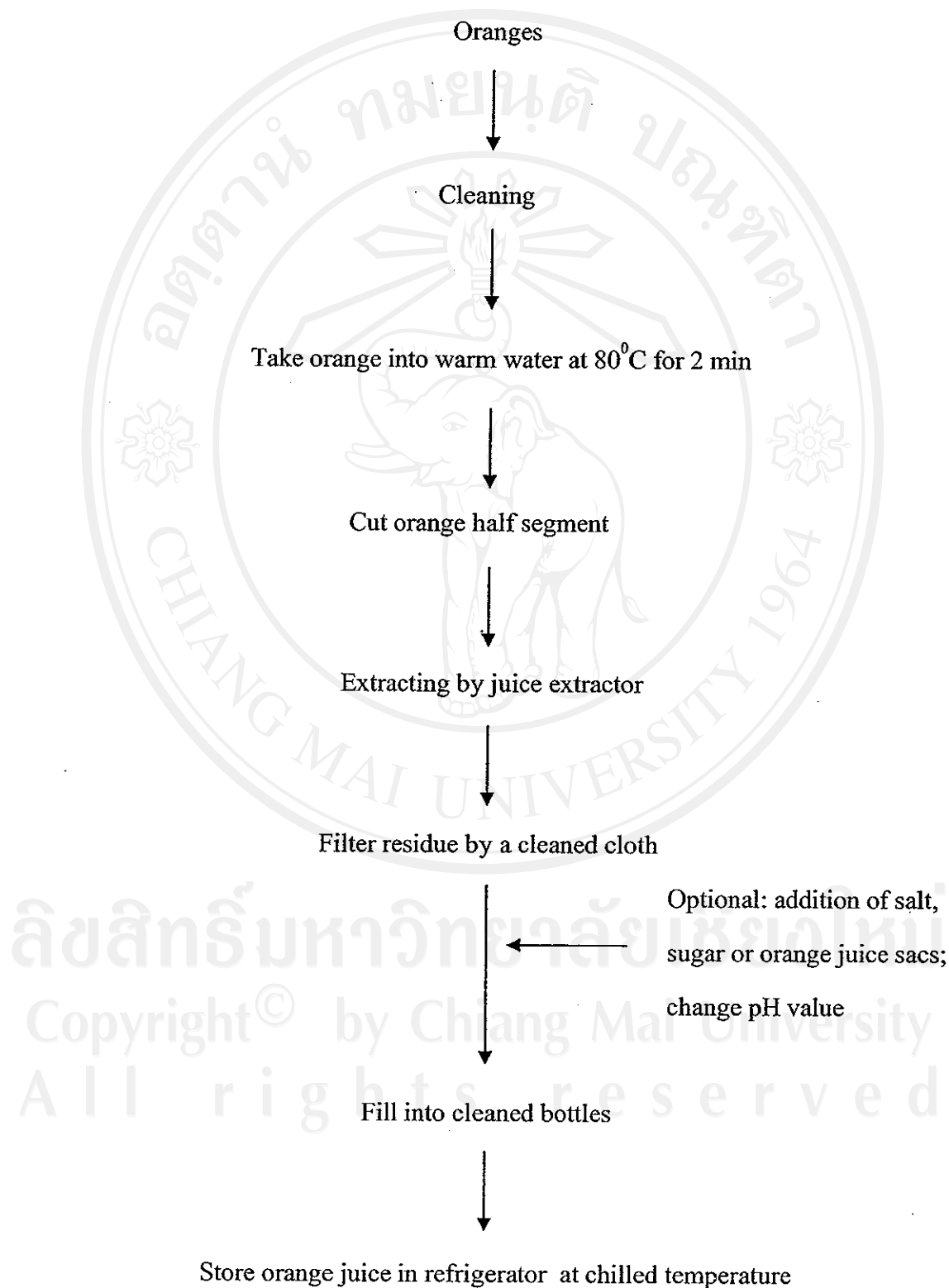
## Appendix B

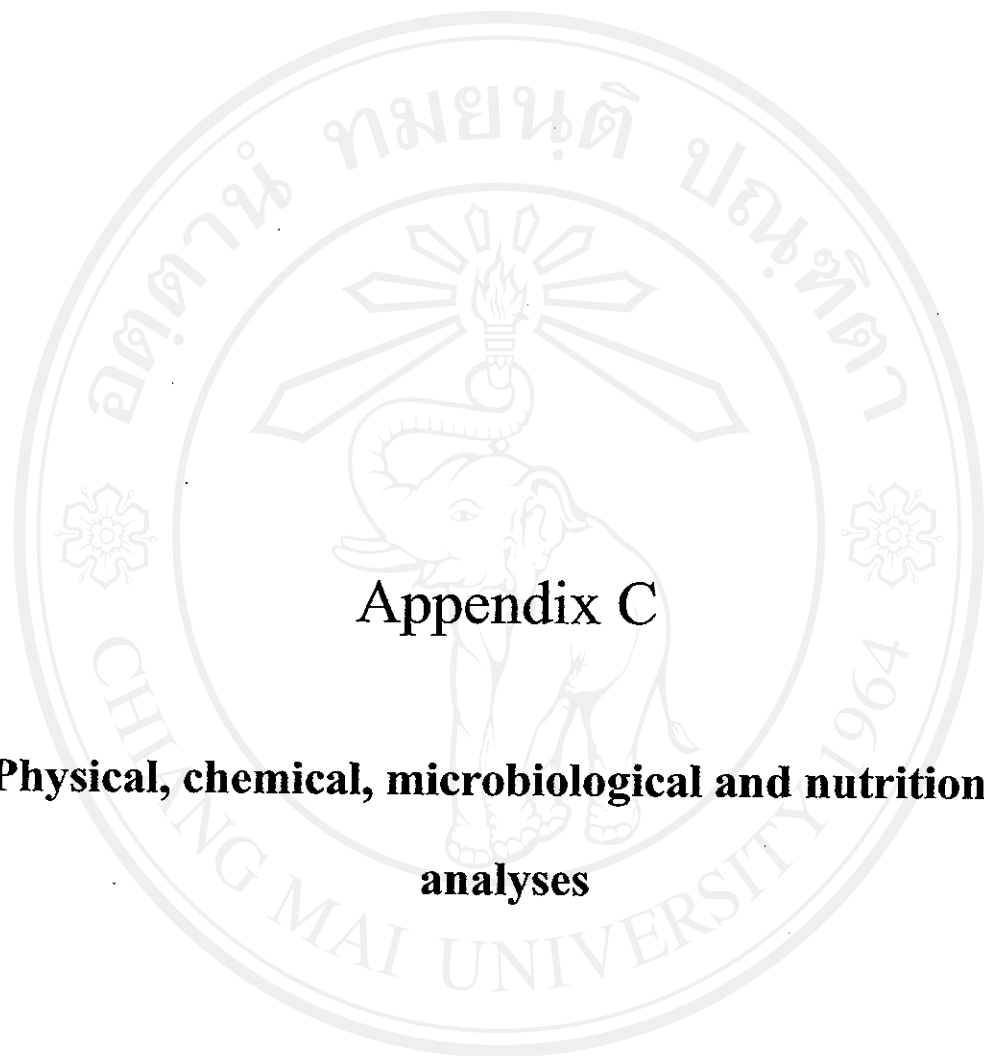
**Orange juice processing**

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**Steps in the orange juice process**



## Appendix C

**Physical, chemical, microbiological and nutritional  
analyses**

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## 1. Physical method

### 1.1 Color analysis

CIE L, a\* and b\* values were measured with a colorimeter (Chrometer, Minolta CR-300, Japan). Samples of juice were prepared by pouring 30 ml of orange juice into a white plastic cup.

L value = a lightness factor with a value range of 0-100 %.

a\* and b\* value = chromaticity coordinates, with a value range from (-) 60 to (+) 60.

Total color difference ( $\Delta E^*$ ) was calculated using a formula of :  $(\Delta L^2 + \Delta a^{*2} + \Delta b^{*2})^{1/2}$  (Lee and Coates, 1999).

Browning index was calculated from  $[(C_{rt} - C_{ro})^2 + [(C_{yt} - C_{yo})^2]^{1/2}$  (Suklampoo, 2003).

$C_{rt}$  = a\* value of samples.

$C_{ro}$  = a\* value of control.

$C_{yt}$  = b\* value of samples.

$C_{yo}$  = b\* value of control.

### 1.2 Cloud loss analysis (Farnworth *et al.*, 2001)

Cloudiness of orange juice samples was determined by measuring % transmittance (%T) in a spectrophotometer at a wavelength of 640 nm.

### 1.3 Viscosity analysis

Viscosity of orange juice was measured using a viscometer. An amount of 8 ml orange juice was poured into a 100 cylinder and placed in the correct position under the viscometer equipment. The orange juice sample was measured using a viscometer speed at 200 rpm. Measurements were conducted at room temperature.



### 1.4 Yield analysis

The yield of orange juice was measured based on a formula:

$$\% \text{ yield} = \frac{\text{weight of orange juice}}{\text{weight of orange fruit}} \times 100$$

## 2. Chemical method

### 2.1 Total Titratable Acidity analysis (AOAC, 2000)

Pipette 10 ml orange juice sample into a flask and dilute the sample with distilled water. Then pipette 10 ml diluted solution sample into another flask. Drop phenolphthalein 2-3 drops and titrate the sample with 0.1 M NaOH until sample reach the end point (sample solution became pink that was persisted for 30 s).

$$\% \text{ Citric acid} = \frac{\text{ml of 0.1 M NaOH} \times 0.1 \times 0.007 \times 100}{\text{weight of sample}}$$

### 2.2 Moisture and Total solid analysis (AOAC, 2000)

Heated an empty moisture dish in a hot air oven about 20-30 min. Cool in a desiccator and weigh the dish. Into the cooled and weighed dish (provided with cover), previously heated to  $100 \pm 3^{\circ}\text{C}$ , accurately weigh 2 g of orange juice sample. Uncover the dish and dry the dish with its cover and contents for 3 h in an oven provided with opening for ventilation and maintained at  $100 \pm 3^{\circ}\text{C}$ . Cover the dish while it is still in the oven, transfer to a desiccator, and weigh the dish soon after it reached a room temperature. Dry the sample again for several times until the sample has a constant weight.

$$\% \text{ moisture content} = \frac{\text{Loss in the sample weight during drying} \times 100}{\text{Initial weight of the sample}}$$

$$\% \text{ total solid} = 100 - \% \text{ moisture content}$$

### 2.3 Sugar analysis (AOAC, 2000)

#### 2.3.1 Reducing sugar

Transfer 15 ml of orange juice sample into a 100 volumetric flask and adjust to 100 ml with deionized water. Add 5 ml of Carrez I and II solutions. Shake and adjust to 200 ml with distilled water. Put aside the mixed solution for precipitation about 20 min and filter the solution with a Whatman filter paper no. 4. Pour the solution filtrate into a 50 ml burette and pipette 5 ml of Fehling solution no. 1 and 2 into a flask. Heat the Fehling solution on a hot plate and add one drop of methylene blue indicator. Titrate the Fehling solution with the filtrate solution in the burette until the Fehling solution has a color of orange-red.

#### 2.3.2 Inversion sugar

Pipette 50 ml of filtrate solution from the previous determination into a volumetric flask. Add 10 ml of 6.34 N hydrochloric acid. Place the volumetric flask in a water bath at 70°C for 10 min and cool immediately. Make the mixture solution neutral with 5 N NaOH and adjust to 100 ml with water. Do titration following the procedure of reducing sugar.

$$\% \text{ sucrose (S)} = \% \text{ different between } D_1 \text{ and } D_2 \times 0.95$$

$$\% \text{ total sugar} = D_1 + S$$

$D_1 = \% \text{ Reducing sugar}$

$D_2 = \% \text{ Inversion sugar}$

#### 2.4 Protein analysis (AOAC, 2000)

Place weighed sample (15 ml) in a digestion flask. Add 8 g catalyst mixture and 20 ml  $\text{H}_2\text{SO}_4$ . Place the flask in an inclined position in a digestion machine and heat the machine gently until frothing ceases. Continue boil briskly until the solution clears (~ 2 h).

Cool, add distilled water to dilute the mixture solution and pour into a distilling flask. Add 400 ml  $\text{H}_2\text{O}$  (ammonia-free water) and a few Zn granules to prevent bumping. Immediately immerse a condenser tip into a receiver that contains 50 ml of 2% boric acid solution in a 500 ml flask and 5-7 drops indicator. Add 75 ml of 50% sodium hydroxide using a funnel into the distilling equipment. Rotate the distilling flask to mix the contents thoroughly; then heat until all  $\text{NH}_3$  has been distilled ( $\geq 150$  ml distillate). Remove the receiver, wash the tip of the condenser and titrate excess standard acid in distillate with 0.05 M  $\text{H}_2\text{SO}_4$ . Do blank determination to correct any nitrogen content in reagents.

$$\%N = \frac{(V_a - V_b) \times N.H_2SO_4 \times 1.4007}{W}$$

W

$V_a = \text{ml of standard acid for sample titration}$

$V_b = \text{ml of standard acid for blank titration}$

$N.H_2SO_4 = \text{normality acid}$

W = weight of sample (g)

$\% \text{ Protein} = \%N \times \text{factor}$  (factor value = 6.25)

### 2.5 Fat analysis (AOAC, 2000)

Weigh sample (0.5-1.0 g) and place into a separated funnel. Add 10 ml water and shake. Add 1.25 ml ammonia solution, 10 ml ethyl alcohol and 25 ml diethyl ether, close with a stopper and shake vigorously for 1 min. Carefully release the pressure of the funnel. Add 25 ml petroleum ether, close the stopper and shake vigorously for 1 min. Carefully release the pressure. Let stand until an upper liquid is practically clear (~ 30 min). Pour the upper clear solution into a previously weighed beaker. Take the beaker to stand in a hood until diethyl ether and petroleum are evaporated and place the beaker in a hot air oven ( $T = 102 \pm 2^{\circ}\text{C}$ ) for 2 h. Cool in a desiccator and weigh the sample.

$$\% \text{Fat content} = \frac{(W_2 - W_3) \times 100}{W_1}$$

$W_1$  = Weight of sample

$W_2$  = Weight of beaker and fat

$W_3$  = Weight of beaker

### 2.6 Ash analysis (AOAC, 2000)

Weigh 3-5 g sample into an ashing dish that has been heated, cooled in a desiccator, and weighed soon after reaching room temperature. Before ashing the sample, heat the sample on a bunched lamp until no more black smoke appeared. Then ash the sample in a muffle furnace at  $550^{\circ}\text{C}$  until light gray ash results or until it reaches a constant weight. Cool in a desiccator and weigh soon after reaching room temperature.

$$\% \text{ Ash} = \frac{\text{Weight of ash} \times 100}{\text{Weight of sample}}$$

### 2.7 Fiber analysis (AOAC, 2000)

Weigh 5 g sample into a 500 ml beaker. Transfer 1.25 M sulfuric acid (200 ml) into the beaker. Boil the sample solution on a hot plate for 30 min. Filter the sample solution using a Whatman paper no. 4 until it dries by applying a vacuum pump and wash the residue with boiling water until the sample does not have acid (do a test using a litmus paper). Place 200 ml of 1.25% NaOH into a beaker and boil the beaker on a hot plate. Wash the residue on the filter paper with distilled water. Boil the sample again on the hot plate for 30 min. Filter the sample using a Whatman paper no. 4 and wash the residue with boiling water. Transfer the filter paper with the sample residue into a crucible and dry at  $102 \pm 2^\circ\text{C}$  for 3 h. Cool in a desiccator and weigh. Then ash the residue for 2 h at  $550 \pm 10^\circ\text{C}$ , cool in the desiccator, and weigh.

$$\% \text{ Crude fiber} = \frac{(W_4 - W_3 + W_2) + (W_5 - W_3)(100 - \%H_2O - \%fat)}{W_1}$$

$W_1$  = Weight of sample

$W_2$  = Weight of filter paper

$W_3$  = Weight of crucible

$W_4$  = Weight of crucible + filter paper + sample after drying

$W_5$  = Weight of crucible + ash

$\%H_2O$  = Moisture content of sample

$\%fat$  = Fat of sample

### 2.8 Carbohydrate content (AOAC, 2000)

Carbohydrate content was determined by measuring the difference of the original sample minus the moisture, protein, crude fat and mineral contents calculated at the same moisture level.

## 2.9 Pectin esterase (PE) activity

Quantitative measurement of PE was based on a method reported by Bull *et al.* (2004). The orange juice sample was mixed properly by inverting the bottle several times and 5 ml of the juice was transferred into 50 ml of a 1% pectin substrate solution in 0.2 M sodium chloride. The sample was titrated to pH 7.5 with 0.2 N NaOH. Then 0.05 N NaOH was titrated into the sample to maintain the sample pH at 7.5 for 30 min. The volume of 0.05 N NaOH consumed during this time was recorded. The PE activity expressed as PE units (PEU) per gram soluble solids was calculated by using the formula:

$$\text{PEU/g.s.s.} = \frac{\text{ml NaOH} \times \text{normality of NaOH}}{\text{Weight of sample} \times 30 \text{ min} \times \text{Brix}/100}$$

## 2.10 Flavor analysis

The flavor components of orange juice samples Gas Chromatography – Mass Spectrophotometer (GC-MS) were identified. For this portion of the work, a GC 6890 Agilent Technologies equipped with a 30 m x 0.25 mm ID column and 0.25 μm film thickness was used. The GC was linked to a Hewlett Packard Model 5973 (EI) mass spectrometry detector. The initial oven temperature was maintained at 50°C for 1 min. It was then raised at 10°C/min to 70°C. After that, it increased to 140°C at a rate of 5°C/min and maintained at 140°C for 11 min. Finally it increased to 220°C at a rate of 10°C/min without a final hold time. The injection port and ionizing source were kept at 230°C, and the transfer line was kept at 230°C. Helium was used as a carrier gas and the flow through the column was maintained at 1.0 ml/min. Identification of the components was done by comparison of mass spectra and retention time data with those of authentic compounds supplement with standard mass spectra.

### 3. Microbiological analysis

**3.1 Total Plate Counts.** The number of total microorganisms were enumerated using a pour plate method on Orange Serum Agar. Incubation was performed at 35°C for 48 h (Jia *et al.*, 1999).

**3.2 Total yeast and moulds** were enumerated on Potato Dextrose Agar acidified to pH 3.5 with 10% tartaric acid by a pour plating technique. The incubation for total yeast and mold counts was done at 22°C for 5 days (Jia *et al.*, 1999).

**3.3 Lactic acid bacteria** were enumerated on de Man Rogosa Sharpe (MRS) agar. The incubation for lactic acid bacteria counts was done anaerobically at 35°C for 3 days (de Man *et al.*, 1960).

### 4. Nutritional analysis

#### 4.1 Vitamin C content (AOAC, 2000)

Pipette 50 ml sample into a 100 ml volumetric flask. Add 25 ml of 0.4% oxalic acid and dilute with distilled water. Then pipette 10 ml of the diluted sample into a 125 ml flask. Titrate this sample with an indophenol standard solution. At the end point, an excess unreduced dye will produce a rose pink color in solution.

A similar procedure as above is done for 0.05 g of vitamin C standard.

1 ml of vitamin C standard 1 ml had a vitamin C content of 0.2 mg

10 ml of vitamin C standard 10 ml had a vitamin C content  $0.2 \times 10 = 2$  mg

If 2 mg of vitamin C used an indophenol standard solution of  $a$  ml, then

the sample that used  $a$   $b$  ml indophenol standard solution would have a vitamin C

content of:  $= \frac{2 \times b}{a}$  mg

Since the initial sample volume was 50 ml then for 100 ml of orange juice sample, the sample would contained vitamin C of:  $\frac{2 \times b \times 100}{a \times 50}$  mg/100 ml

## 4.2 Carotenoid content (AOAC, 2000)

### 4.2.1 Make a standard curve of carotenoid

Place a 0.0005 g of standard beta-carotene ( $\beta$ -carotene) into a beaker. Dilute the standard  $\beta$ -carotene with 2.5 ml chloroform. Pour the  $\beta$ -carotene solution into a 50 ml volumetric flask and adjust the volume with hexane. Pipette 5 ml of the standard solution into a 50 ml volumetric flask and adjust the volume with hexane. Then pipette 1, 2, 3, 4, 5, 6, 7, 8 and 9 ml of the standard solution into 10 ml volumetric flasks and adjust with a 10% acetone in hexane solution. Take the solution that has the highest concentration of  $\beta$ -carotene solution to find the highest absorbance using a wavelength range between 400-500 nm in a spectrophotometer. Use 10% acetone in hexane as a blank. Choose the wavelength that shows the highest absorbance and measure the absorbance of the other solutions (1, 2, 3, 4, 5, 6, 7 and 8 ml). Make a standard curve between the concentrations of the standard  $\beta$ -carotene solution and the absorbance values.

### 4.2.2 Determination of carotenoid in sample

Weigh 5 g sample and place the sample into a flask. Add 100 ml of 10% acetone in hexane, stir for 10 min and filter using a funnel and Whatman paper no. 4. Pour the clear solution into a separate funnel and pour 100 ml distilled water into the separate funnel to separate acetone from the solution. Shake the funnel and pour the acetone in water into a beaker. Filter the carotenoid in hexane solution and place the carotenoid in hexane solution in a hood to evaporate the hexane from carotenoid. Then dilute the dry carotenoid with 10% acetone in hexane solution in a 50 ml volumetric



flask. Measure the absorbance of the sample solution with a spectrophotometer at 450 nm (Use 10% acetone in hexane as a blank). Calculate the carotenoid content in orange juice using the  $\beta$ -carotene standard curve (Fig. C1).

#### From standard curve

$$y = 1.2808x - 0.0072$$

$y$  = absorbance value of carotenoid.

$x$  = carotenoid content (ppm).

Take the  $x$  value from the standard curve equation to find the carotenoid content in the orange juice sample.

#### Calculation to find carotenoid content

1000 ml of a dilute solution has carotenoid =  $x$  mg.

50 ml of a dilute solution has carotenoid =  $(x/1000) \times 50$  mg.

Carotenoid content from 5 g sample

5 g orange juice has carotenoid =  $z$  mg.

1g orange juice has carotenoid =  $z/5$  mg.

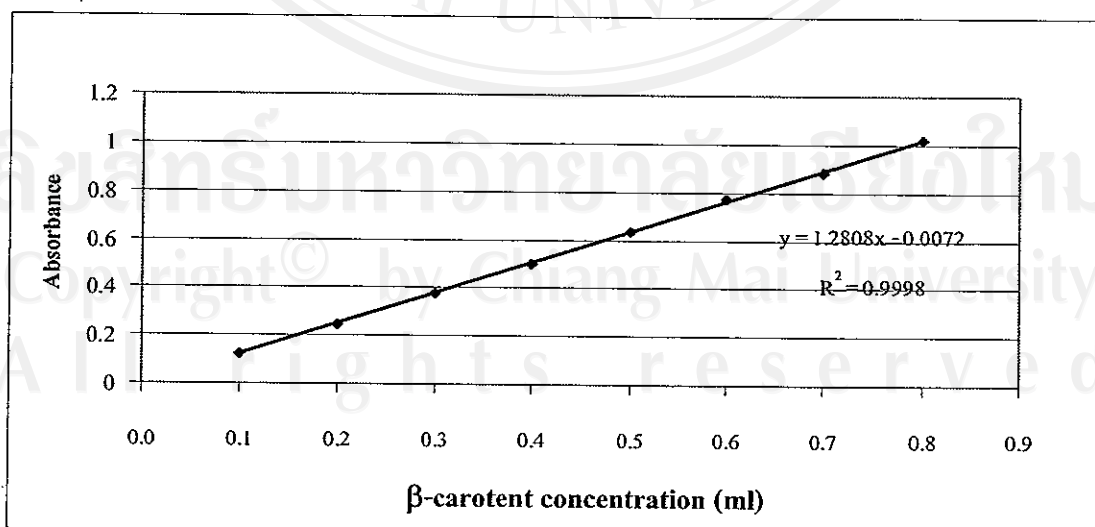
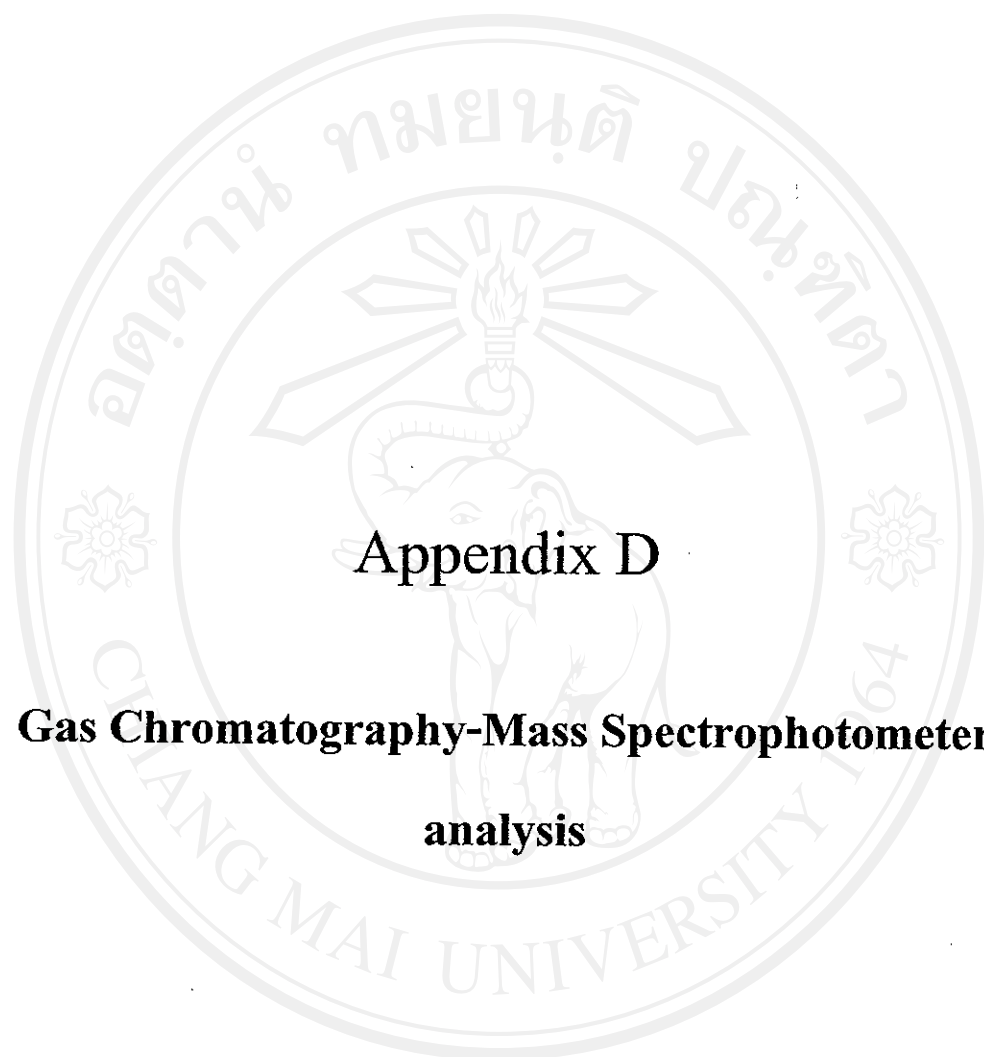


Fig. C1 The standard curve of  $\beta$  - carotene in 10% acetone in hexane solution



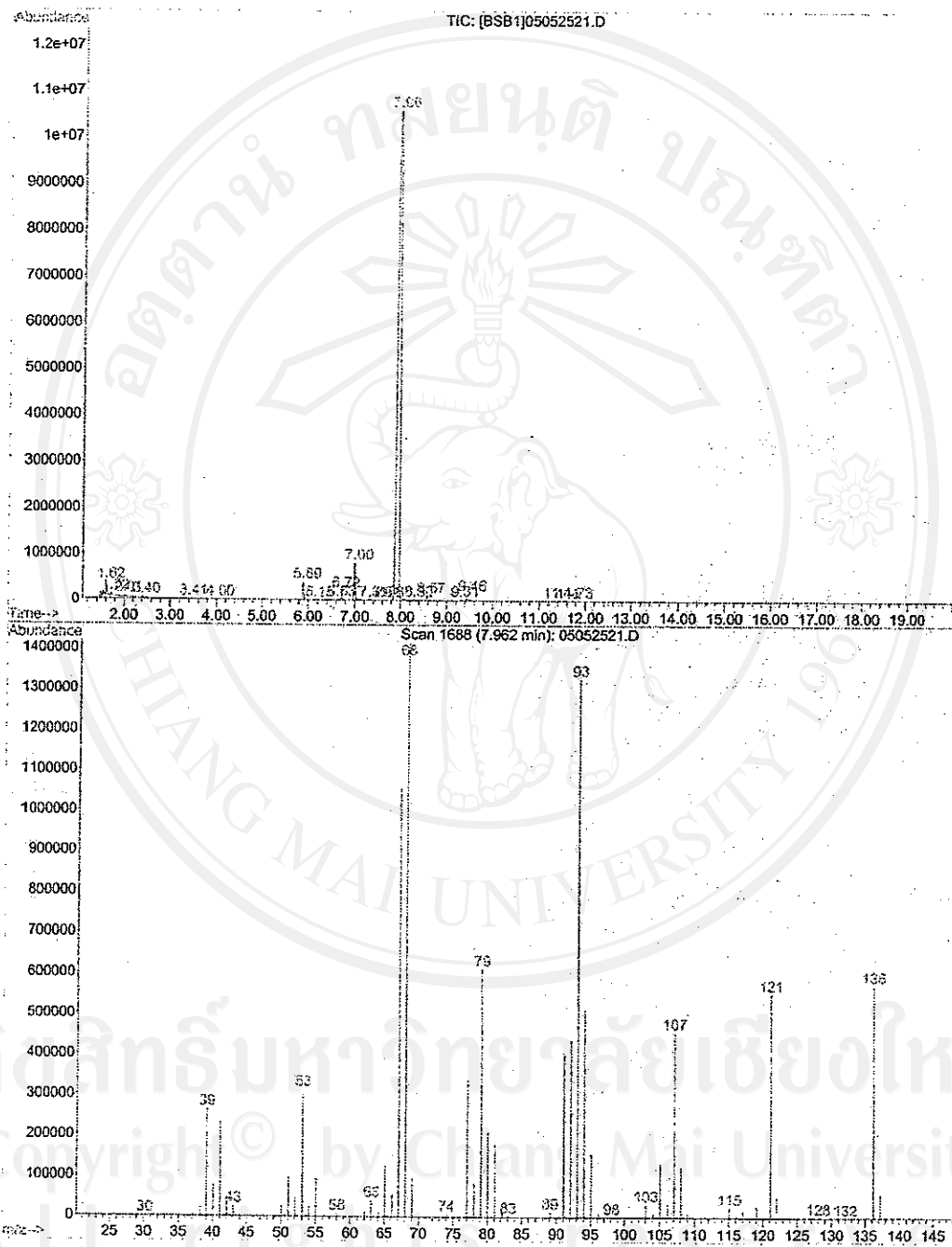
## Appendix D

**Gas Chromatography-Mass Spectrophotometer  
analysis**

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**Fig. D1** The chromatogram of flavour components in Keaw Wan Prae fresh orange juice

**Table D1** The retention time and percentage of peak area of flavour components in Keaw Wan Prae fresh orange juice

peak #	R.T. min	first scan	max scan	last scan	PK TY	peak height	corr. area	corr. % max.	% of total
1	1.615	121	129	151	BV	277330	3593799	0.75%	0.687%
2	1.720	151	155	171	PV 2	49569	502632	0.10%	0.096%
3	2.010	222	226	265	PV	31554	367508	0.08%	0.070%
4	2.396	307	321	366	BV 2	35279	1054750	0.22%	0.202%
5	3.414	540	571	596	BB 4	16429	237729	0.05%	0.045%
6	4.005	677	716	727	BB 2	8477	105807	0.02%	0.020%
7	5.890	1167	1179	1213	BB	399216	6910297	1.44%	1.322%
8	6.155	1233	1244	1259	BB 3	7965	152184	0.03%	0.029%
9	6.627	1350	1360	1370	BV 2	18974	348737	0.07%	0.067%
10	6.725	1370	1384	1411	VB	213607	3966350	0.82%	0.759%
11	6.997	1429	1451	1510	BB	819494	15811572	3.29%	3.024%
12	7.315	1514	1529	1552	BB 2	17316	432512	0.09%	0.083%
13	7.608	1577	1601	1609	BV 5	15212	355802	0.07%	0.068%
14	7.677	1609	1618	1643	VB 2	15373	415154	0.09%	0.079%
15	7.962	1653	1688	1764	BV	10574484	481065447	100.00%	91.997%
16	8.304	1764	1772	1822	VB 3	23142	744378	0.15%	0.142%
17	8.569	1823	1837	1870	BV 2	103014	2099966	0.44%	0.402%
18	9.310	2007	2019	2040	PV 4	31260	669758	0.14%	0.128%
19	9.465	2040	2057	2104	PB 2	152839	3658152	0.76%	0.700%
20	11.436	2532	2541	2556	BB 6	6687	135896	0.03%	0.026%
21	11.725	2596	2612	2636	BB 6	10558	283599	0.06%	0.054%

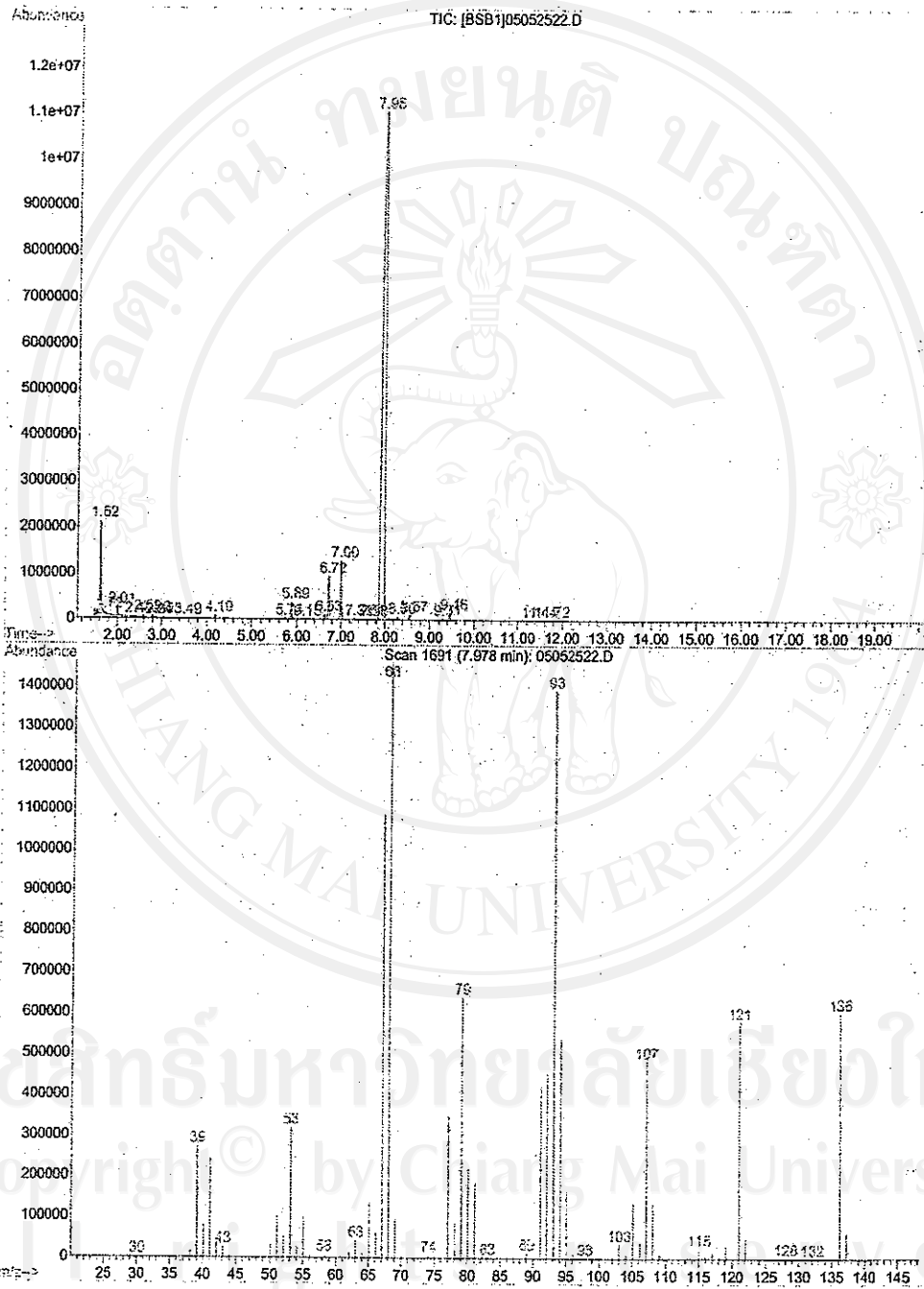


Fig. D2 The chromatogram of flavour components in Sai Namphung fresh orange juice

**Table D2** The retention time and percentage of peak area of flavour components in Sai Namphung fresh orange juice

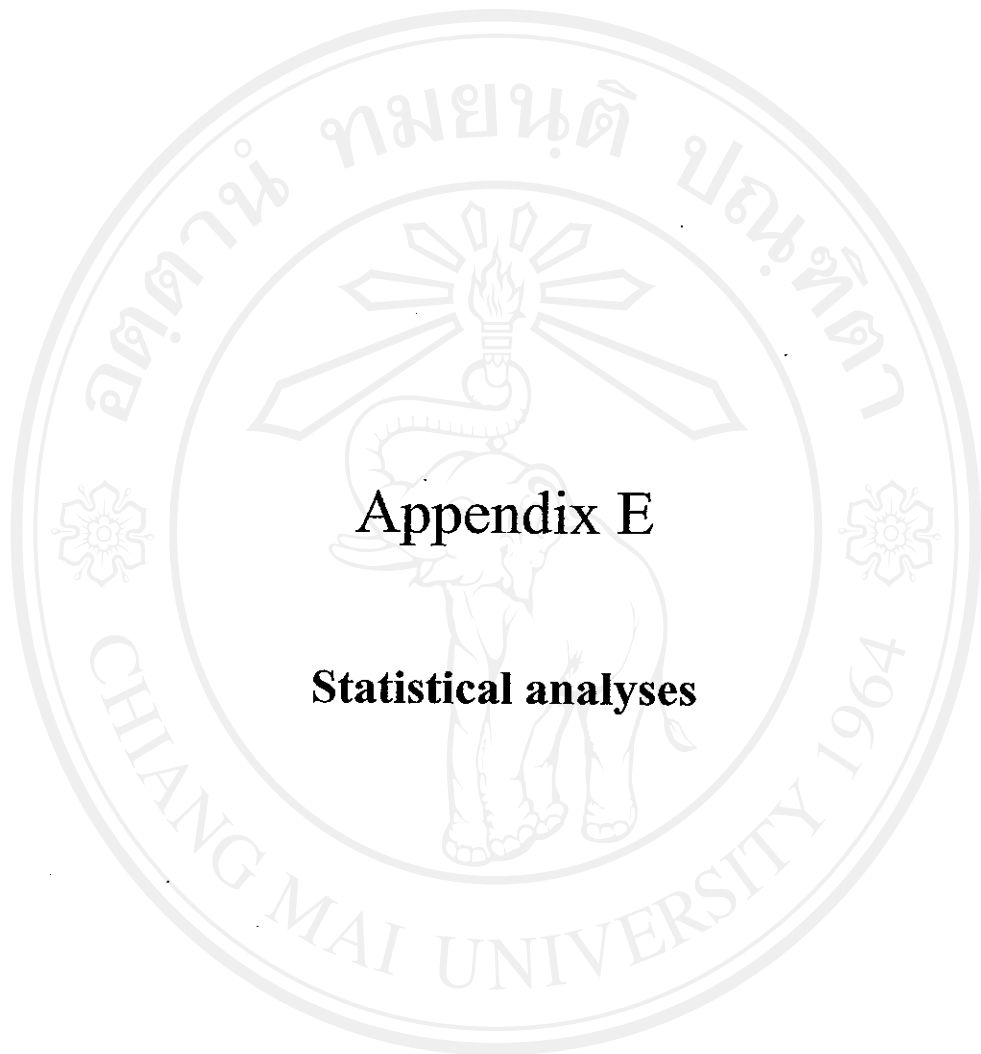
peak #	R.T. min	first scan	max scan	last scan	PK TY	peak height	corr. area	corr. % max.	% of total
1	1.618	120	129	151	BV	1988382	27685704	4.70%	4.024%
2	1.724	151	155	205	VV 6	57267	1271405	0.22%	0.185%
3	2.009	221	225	241	VV	196906	2496886	0.42%	0.363%
4	2.400	316	321	363	VV 3	23215	1022202	0.17%	0.149%
5	2.595	363	369	408	PV	81846	1075436	0.18%	0.156%
6	2.803	408	420	426	PV	58704	748377	0.13%	0.109%
7	2.844	426	430	464	VB	20522	330007	0.06%	0.048%
8	3.047	464	480	496	BV	28614	366586	0.06%	0.053%
9	3.491	582	589	617	PB 3	24593	391274	0.07%	0.057%
10	4.196	737	762	792	BB	79475	1190124	0.20%	0.173%
11	5.743	1134	1142	1155	VB	24774	413404	0.07%	0.060%
12	5.890	1165	1178	1201	BB	385537	6691595	1.14%	0.973%
13	6.154	1233	1243	1256	BB 3	9620	167115	0.03%	0.024%
14	6.631	1347	1360	1371	BV	113549	2043704	0.35%	0.297%
15	6.724	1371	1383	1410	VV	941266	17940009	3.05%	2.608%
16	6.997	1422	1450	1512	PV	1279653	24687068	4.19%	3.589%
17	7.315	1512	1528	1551	VB	22851	544966	0.09%	0.079%
18	7.604	1576	1599	1610	BV 2	27686	645801	0.11%	0.094%
19	7.681	1610	1618	1644	VV 3	10748	312299	0.05%	0.045%
20	7.978	1644	1691	1761	PV	11052103	588734984	100.00%	85.579%
21	8.304	1761	1771	1810	VB 3	67371	1633209	0.28%	0.237%
22	8.573	1815	1837	1858	BV	116268	2309131	0.39%	0.336%
23	9.310	1998	2018	2038	BV 3	35764	738907	0.13%	0.107%
24	9.464	2038	2056	2102	PB 2	165627	3866226	0.66%	0.562%
25	11.435	2528	2540	2565	BB 5	11643	277803	0.05%	0.040%
26	11.724	2595	2611	2637	BB 7	13100	357111	0.06%	0.052%



**Fig. D3.** GC-MS; GC 6890 Agilent Technologies and Hewlett Packard Model 5973 (EI) mass spectrometry .



**Fig. D4.** A segment of GC-MS in which sample is injected.



## Appendix E

**Statistical analyses**

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I. The result of statistical analysis during storage time.

1. The effect of storage time on orange juices added with salt and sugar

Table 1.1 L value

Storage time (day)	% sugar vs %salt									
	0% vs 0%	0% vs 0.05%	0% vs 0.1%	2.5% vs 0%	2.5% vs 0.05%	2.5% vs 0.1%	5% vs 0%	5% vs 0.05%	5% vs 0.1%	
0	44.58 ± 0.20 <sup>a)</sup>	45.86 ± 1.23 <sup>a</sup>	47.40 ± 2.36 <sup>a</sup>	47.04 ± 1.50 <sup>a</sup>	45.85 ± 0.25 <sup>a</sup>	45.08 ± 0.63 <sup>a</sup>	44.42 ± 0.14 <sup>a</sup>	44.99 ± 0.20 <sup>a</sup>	45.43 ± 0.08 <sup>a,b</sup>	
3	44.64 ± 0.55 <sup>a,b</sup>	46.14 ± 1.07 <sup>a,b</sup>	48.24 ± 0.99 <sup>a</sup>	46.60 ± 0.56 <sup>a</sup>	46.30 ± 0.83 <sup>a</sup>	45.47 ± 0.32 <sup>a</sup>	44.76 ± 0.12 <sup>a,b</sup>	46.09 ± 0.14 <sup>b</sup>	45.44 ± 0.14 <sup>a,b</sup>	
6	45.64 ± 0.64 <sup>b,c</sup>	46.68 ± 0.13 <sup>a,b</sup>	48.49 ± 3.21 <sup>a</sup>	47.04 ± 0.52 <sup>a</sup>	45.89 ± 0.10 <sup>a</sup>	45.77 ± 1.04 <sup>a</sup>	45.48 ± 0.44 <sup>b,c</sup>	47.33 ± 0.20 <sup>c</sup>	44.58 ± 0.17 <sup>a</sup>	
9	45.60 ± 0.09 <sup>b,c</sup>	46.64 ± 0.11 <sup>a,b</sup>	48.65 ± 3.00 <sup>a</sup>	46.98 ± 0.37 <sup>a</sup>	45.77 ± 0.14 <sup>a</sup>	45.65 ± 1.03 <sup>a</sup>	45.53 ± 0.30 <sup>c</sup>	47.26 ± 0.07 <sup>c</sup>	44.46 ± 0.45 <sup>a</sup>	
12	46.29 ± 0.47 <sup>c,d</sup>	47.42 ± 0.62 <sup>b</sup>	47.57 ± 2.30 <sup>a</sup>	46.58 ± 0.31 <sup>a</sup>	44.39 ± 0.22 <sup>b</sup>	45.16 ± 0.73 <sup>a</sup>	44.80 ± 0.78 <sup>a,b</sup>	45.42 ± 0.96 <sup>a,b</sup>	46.34 ± 2.04 <sup>b,c</sup>	
15	46.75 ± 0.75 <sup>d</sup>	49.58 ± 1.29 <sup>c</sup>	49.06 ± 1.87 <sup>a</sup>	49.65 ± 0.86 <sup>b</sup>	47.18 ± 0.28 <sup>c</sup>	46.33 ± 1.40 <sup>a</sup>	47.58 ± 0.60 <sup>d</sup>	48.64 ± 0.21 <sup>d</sup>	47.89 ± 0.10 <sup>c</sup>	

\*) Values within a column followed by different letters were significantly different ( $P \leq 0.05$ )

Table 1.2 a\* value

Storage time (day)	% sugar vs %salt									
	0% vs 0%	0% vs 0.05%	0% vs 0.1%	2.5% vs 0%	2.5% vs 0.05%	2.5% vs 0.1%	5% vs 0%	5% vs 0.05%	5% vs 0.1%	5% vs 0.1%
0	-4.92 ± 1.99 <sup>ab*</sup>	-6.06 ± 0.68 <sup>a</sup>	-7.63 ± 1.88 <sup>a</sup>	-7.58 ± 0.88 <sup>a</sup>	-6.83 ± 0.62 <sup>a</sup>	-4.83 ± 1.55 <sup>a</sup>	-5.04 ± 1.42 <sup>a</sup>	-5.16 ± 0.23 <sup>a</sup>	-5.46 ± 1.28 <sup>a</sup>	
3	-4.49 ± 1.00 <sup>ab</sup>	-6.12 ± 0.46 <sup>a</sup>	-7.57 ± 1.55 <sup>a</sup>	-7.93 ± 0.14 <sup>a</sup>	-7.11 ± 0.83 <sup>ab</sup>	-5.33 ± 1.71 <sup>a</sup>	-5.40 ± 0.88 <sup>ab</sup>	-6.03 ± 1.19 <sup>ab</sup>	-5.42 ± 0.44 <sup>a</sup>	
6	-3.76 ± 0.51 <sup>a</sup>	-6.64 ± 0.83 <sup>a</sup>	-7.63 ± 1.59 <sup>a</sup>	-7.63 ± 0.78 <sup>a</sup>	-7.96 ± 0.79 <sup>b</sup>	-5.72 ± 2.27 <sup>a</sup>	-6.55 ± 0.24 <sup>c</sup>	-7.10 ± 0.36 <sup>b</sup>	-4.77 ± 0.87 <sup>a</sup>	
9	-3.45 ± 0.38 <sup>a</sup>	-6.14 ± 0.99 <sup>a</sup>	-7.40 ± 1.36 <sup>a</sup>	-7.45 ± 0.42 <sup>a</sup>	-7.40 ± 0.76 <sup>ab</sup>	-5.51 ± 1.78 <sup>a</sup>	-5.74 ± 0.42 <sup>abc</sup>	-6.81 ± 0.56 <sup>b</sup>	-4.68 ± 0.88 <sup>a</sup>	
12	-6.73 ± 2.51 <sup>b</sup>	-8.14 ± 1.32 <sup>b</sup>	-8.54 ± 1.44 <sup>a</sup>	-9.07 ± 0.65 <sup>b</sup>	-9.44 ± 1.05 <sup>c</sup>	-8.06 ± 0.42 <sup>b</sup>	-6.42 ± 1.16 <sup>bc</sup>	-8.21 ± 0.39 <sup>c</sup>	-8.28 ± 0.08 <sup>b</sup>	
15	-6.78 ± 2.70 <sup>b</sup>	-8.42 ± 0.99 <sup>b</sup>	-8.58 ± 1.52 <sup>a</sup>	-9.15 ± 0.75 <sup>b</sup>	-9.27 ± 1.00 <sup>c</sup>	-8.17 ± 0.34 <sup>b</sup>	-6.52 ± 1.19 <sup>c</sup>	-8.29 ± 0.35 <sup>c</sup>	-8.30 ± 0.07 <sup>b</sup>	

\*) Values within a column followed by different letters were significantly different ( $P \leq 0.05$ )

Table 1.3 b\* value

Storage time (day)	% sugar vs %salt									
	0% vs 0%	0% vs 0.05%	0% vs 0.1%	2.5% vs 0%	2.5% vs 0.05%	2.5% vs 0.1%	5% vs 0%	5% vs 0.05%	5% vs 0.1%	5% vs 0.1%
0	25.00 ± 2.12 <sup>a</sup>	22.44 ± 1.52 <sup>a</sup>	24.00 ± 1.01 <sup>a</sup>	25.58 ± 1.27 <sup>a</sup>	32.29 ± 0.48 <sup>a</sup>	28.04 ± 1.40 <sup>a</sup>	27.08 ± 0.80 <sup>a</sup>	32.10 ± 0.56 <sup>a</sup>	27.80 ± 0.52 <sup>a</sup>	
3	25.24 ± 1.82 <sup>a</sup>	25.09 ± 2.50 <sup>b</sup>	25.19 ± 2.26 <sup>a</sup>	26.84 ± 1.50 <sup>b</sup>	33.32 ± 0.48 <sup>b</sup>	27.58 ± 1.07 <sup>a</sup>	28.36 ± 0.95 <sup>a</sup>	33.76 ± 1.06 <sup>b</sup>	28.78 ± 0.76 <sup>a</sup>	
6	26.75 ± 2.60 <sup>b</sup>	28.08 ± 2.96 <sup>c</sup>	27.52 ± 3.06 <sup>b</sup>	29.88 ± 3.24 <sup>b</sup>	35.53 ± 0.25 <sup>c</sup>	28.14 ± 1.02 <sup>a</sup>	29.14 ± 1.55 <sup>a</sup>	35.06 ± 0.20 <sup>c</sup>	27.77 ± 0.52 <sup>a</sup>	
9	26.56 ± 2.76 <sup>b</sup>	27.26 ± 3.9 <sup>c</sup>	27.25 ± 3.09 <sup>b</sup>	29.66 ± 3.46 <sup>b</sup>	35.46 ± 0.30 <sup>c</sup>	28.11 ± 0.87 <sup>a</sup>	28.51 ± 2.42 <sup>a</sup>	34.70 ± 0.15 <sup>bc</sup>	27.99 ± 0.24 <sup>a</sup>	
12	27.08 ± 3.05 <sup>b</sup>	27.85 ± 3.90 <sup>c</sup>	27.83 ± 3.40 <sup>b</sup>	30.89 ± 4.12 <sup>b</sup>	35.44 ± 0.40 <sup>c</sup>	29.23 ± 2.07 <sup>b</sup>	29.11 ± 2.84 <sup>a</sup>	35.13 ± 0.18 <sup>c</sup>	31.01 ± 0.48 <sup>b</sup>	
15	27.08 ± 2.96 <sup>b</sup>	27.96 ± 3.98 <sup>c</sup>	27.95 ± 3.36 <sup>b</sup>	30.87 ± 4.05 <sup>b</sup>	35.37 ± 0.22 <sup>c</sup>	29.37 ± 2.05 <sup>b</sup>	29.13 ± 2.59 <sup>a</sup>	35.27 ± 0.23 <sup>c</sup>	30.96 ± 0.37 <sup>b</sup>	

\*) Values within a column followed by different letters were significantly different ( $P \leq 0.05$ )

Table 1.4 Browning value

Storage time (day)	% sugar vs %salt									
	0% vs 0%	0% vs 0.05%	0% vs 0.1%	2.5% vs 0%	2.5% vs 0.05%	2.5% vs 0.1%	5% vs 0%	5% vs 0.05%	5% vs 0.1%	5% vs 0.1%
0	0.00 ± 0.00 <sup>a</sup>	3.52 ± 0.27 <sup>a</sup>	3.11 ± 0.75 <sup>a</sup>	2.75 ± 2.11 <sup>a</sup>	7.60 ± 1.83 <sup>a</sup>	3.63 ± 0.48 <sup>a</sup>	2.71 ± 0.77 <sup>a</sup>	7.32 ± 2.43 <sup>a</sup>	3.51 ± 1.52 <sup>a</sup>	
3	0.81 ± 0.72 <sup>a</sup>	2.31 ± 0.70 <sup>a</sup>	2.68 ± 1.49 <sup>a</sup>	3.74 ± 1.55 <sup>ab</sup>	8.64 ± 1.91 <sup>b</sup>	3.15 ± 0.93 <sup>a</sup>	3.80 ± 0.86 <sup>a</sup>	9.20 ± 1.70 <sup>b</sup>	4.24 ± 1.32 <sup>a</sup>	
6	2.77 ± 0.87 <sup>b</sup>	3.84 ± 1.65 <sup>a</sup>	3.90 ± 0.56 <sup>ab</sup>	5.71 ± 0.81 <sup>bc</sup>	11.00 ± 2.20 <sup>cd</sup>	3.87 ± 0.99 <sup>a</sup>	4.72 ± 0.69 <sup>a</sup>	10.45 ± 2.02 <sup>c</sup>	3.27 ± 2.34 <sup>a</sup>	
9	2.83 ± 1.17 <sup>b</sup>	2.97 ± 1.98 <sup>a</sup>	3.54 ± 0.56 <sup>ab</sup>	5.50 ± 1.08 <sup>bc</sup>	10.79 ± 1.92 <sup>c</sup>	3.74 ± 1.13 <sup>a</sup>	4.02 ± 0.70 <sup>a</sup>	10.08 ± 2.07 <sup>bc</sup>	3.48 ± 2.16 <sup>a</sup>	
12	2.90 ± 0.91 <sup>b</sup>	4.54 ± 2.54 <sup>a</sup>	4.68 ± 0.98 <sup>b</sup>	7.46 ± 0.90 <sup>c</sup>	11.43 ± 2.26 <sup>d</sup>	5.50 ± 1.46 <sup>b</sup>	4.84 ± 0.93 <sup>a</sup>	10.72 ± 2.00 <sup>c</sup>	7.01 ± 1.98 <sup>b</sup>	
15	2.95 ± 0.90 <sup>b</sup>	4.82 ± 2.52 <sup>a</sup>	4.79 ± 0.96 <sup>b</sup>	7.49 ± 0.74 <sup>c</sup>	11.30 ± 2.40 <sup>bd</sup>	5.65 ± 1.41 <sup>b</sup>	4.87 ± 0.73 <sup>a</sup>	10.88 ± 2.10 <sup>c</sup>	7.00 ± 2.06 <sup>b</sup>	

\*) Values within a column followed by different letters were significantly different ( $P \leq 0.05$ )

Table 1.5 Total color difference ( $\Delta E^*$ )

Storage time (day)	% sugar vs %salt									
	0% vs 0%	0% vs 0.05%	0% vs 0.1%	2.5% vs 0%	2.5% vs 0.05%	2.5% vs 0.1%	5% vs 0%	5% vs 0.05%	5% vs 0.1%	5% vs 0.1%
0	0.00 ± 0.00 <sup>a</sup>	3.87 ± 0.80 <sup>ab</sup>	4.44 ± 1.72 <sup>a</sup>	3.83 ± 2.37 <sup>a</sup>	7.71 ± 1.82 <sup>a</sup>	3.69 ± 0.42 <sup>a</sup>	2.72 ± 0.76 <sup>a</sup>	7.34 ± 2.42 <sup>a</sup>	3.62 ± 1.52 <sup>a</sup>	
3	0.94 ± 0.62 <sup>a</sup>	2.84 ± 1.28 <sup>a</sup>	4.58 ± 1.62 <sup>a</sup>	4.35 ± 1.16 <sup>ab</sup>	8.83 ± 1.88 <sup>b</sup>	3.28 ± 0.92 <sup>a</sup>	3.81 ± 0.87 <sup>ab</sup>	9.33 ± 1.65 <sup>b</sup>	4.32 ± 1.33 <sup>a</sup>	
6	3.00 ± 0.72 <sup>b</sup>	4.41 ± 1.51 <sup>ab</sup>	5.90 ± 1.89 <sup>a</sup>	6.25 ± 0.58 <sup>bc</sup>	11.08 ± 2.18 <sup>cd</sup>	4.11 ± 1.09 <sup>a</sup>	4.82 ± 0.78 <sup>bc</sup>	10.81 ± 1.96 <sup>cd</sup>	3.28 ± 2.34 <sup>a</sup>	
9	3.04 ± 1.05 <sup>b</sup>	3.74 ± 1.62 <sup>ab</sup>	5.72 ± 1.79 <sup>a</sup>	6.03 ± 0.88 <sup>bc</sup>	10.85 ± 1.91 <sup>c</sup>	3.97 ± 1.13 <sup>a</sup>	4.15 ± 0.66 <sup>b</sup>	10.43 ± 2.03 <sup>c</sup>	3.49 ± 2.16 <sup>a</sup>	
12	3.45 ± 0.64 <sup>b</sup>	5.43 ± 2.35 <sup>bc</sup>	5.86 ± 0.65 <sup>a</sup>	7.74 ± 0.80 <sup>cd</sup>	11.43 ± 2.26 <sup>de</sup>	5.57 ± 1.51 <sup>b</sup>	4.92 ± 0.81 <sup>bc</sup>	10.78 ± 2.05 <sup>cd</sup>	7.44 ± 1.65 <sup>b</sup>	
15	3.71 ± 1.06 <sup>b</sup>	7.13 ± 2.19 <sup>c</sup>	6.75 ± 0.81 <sup>a</sup>	9.10 ± 0.10 <sup>d</sup>	11.60 ± 2.32 <sup>e</sup>	6.02 ± 1.34 <sup>b</sup>	5.77 ± 0.20 <sup>c</sup>	11.62 ± 2.10 <sup>d</sup>	7.76 ± 1.96 <sup>b</sup>	

\*) Values within a column followed by different letters were significantly different ( $P \leq 0.05$ )

Table 1.6 Cloudiness (%T)

Storage time (day)	% sugar vs %salt									
	0% vs 0%	0% vs 0.05%	0% vs 0.1%	2.5% vs 0%	2.5% vs 0.05%	2.5% vs 0.1%	5% vs 0%	5% vs 0.05%	5% vs 0.1%	
0	11.05 ± 1.53 <sup>a</sup>	11.27 ± 0.93 <sup>a</sup>	11.71 ± 1.36 <sup>a</sup>	12.10 ± 1.35 <sup>a</sup>	10.01 ± 1.44 <sup>a</sup>	10.29 ± 0.35 <sup>a</sup>	7.59 ± 0.54 <sup>a</sup>	9.74 ± 1.50 <sup>a</sup>	8.60 ± 1.33 <sup>a</sup>	
3	11.19 ± 1.66 <sup>a</sup>	11.68 ± 1.55 <sup>a</sup>	11.43 ± 0.81 <sup>a</sup>	12.08 ± 1.41 <sup>a</sup>	10.38 ± 1.35 <sup>a</sup>	10.45 ± 0.49 <sup>a</sup>	8.58 ± 1.51 <sup>ab</sup>	9.92 ± 1.50 <sup>a</sup>	9.44 ± 0.85 <sup>ab</sup>	
6	11.16 ± 0.94 <sup>a</sup>	12.46 ± 1.44 <sup>a</sup>	11.85 ± 0.65 <sup>a</sup>	12.07 ± 1.59 <sup>a</sup>	10.64 ± 1.31 <sup>a</sup>	10.61 ± 0.76 <sup>a</sup>	10.16 ± 0.34 <sup>b</sup>	11.07 ± 1.01 <sup>ab</sup>	10.07 ± 0.20 <sup>ab</sup>	
9	12.04 ± 0.70 <sup>a</sup>	12.13 ± 1.59 <sup>a</sup>	12.86 ± 0.50 <sup>a</sup>	12.31 ± 1.20 <sup>a</sup>	11.15 ± 1.01 <sup>ab</sup>	11.35 ± 0.32 <sup>ab</sup>	10.14 ± 0.09 <sup>b</sup>	11.58 ± 1.22 <sup>ab</sup>	10.79 ± 0.06 <sup>bc</sup>	
12	12.53 ± 0.78 <sup>a</sup>	12.47 ± 0.84 <sup>a</sup>	13.36 ± 1.31 <sup>ab</sup>	12.71 ± 1.12 <sup>a</sup>	12.19 ± 1.10 <sup>bc</sup>	12.24 ± 0.16 <sup>bc</sup>	12.16 ± 1.17 <sup>c</sup>	12.89 ± 0.82 <sup>bc</sup>	11.77 ± 0.46 <sup>cd</sup>	
15	13.59 ± 1.58 <sup>a</sup>	12.99 ± 0.64 <sup>a</sup>	15.06 ± 0.83 <sup>b</sup>	13.44 ± 0.62 <sup>b</sup>	12.74 ± 0.31 <sup>c</sup>	13.19 ± 1.66 <sup>c</sup>	12.89 ± 0.65 <sup>c</sup>	13.85 ± 1.65 <sup>c</sup>	13.01 ± 1.51 <sup>d</sup>	

\*) Values within a column followed by different letters were significantly different ( $P \leq 0.05$ )

Table 1.7 Viscosity (cps)

Storage time (day)	% sugar vs %salt					
	0% vs 0%	0% vs 0.05%	0% vs 0.1%	2.5% vs 0%	2.5% vs 0.05%	2.5% vs 0.1%
0	2.27 ± 0.09 <sup>a</sup>	2.57 ± 0.24 <sup>a</sup>	2.95 ± 0.28 <sup>a</sup>	3.34 ± 0.26 <sup>a</sup>	2.63 ± 0.21 <sup>a</sup>	2.97 ± 0.33 <sup>a</sup>
7	2.11 ± 0.19 <sup>a</sup>	2.40 ± 0.29 <sup>ab</sup>	2.52 ± 0.10 <sup>a</sup>	2.95 ± 0.25 <sup>ab</sup>	2.35 ± 0.18 <sup>a</sup>	2.63 ± 0.08 <sup>a</sup>
15	1.95 ± 0.24 <sup>a</sup>	2.14 ± 0.35 <sup>b</sup>	2.22 ± 0.24 <sup>a</sup>	2.48 ± 0.19 <sup>b</sup>	1.84 ± 0.27 <sup>b</sup>	2.37 ± 0.24 <sup>a</sup>

\*) Values within a column followed by different letters were significantly different ( $P \leq 0.05$ )

Table 1.8 pH value

Storage time (day)	% sugar vs %salt									
	0% vs 0%	0% vs 0.05%	0% vs 0.1%	2.5% vs 0%	2.5% vs 0.05%	2.5% vs 0.1%	5% vs 0%	5% vs 0.05%	5% vs 0.1%	5% vs 0.1%
0	3.29 ± 0.10 <sup>a</sup>	3.33 ± 0.11 <sup>a</sup>	3.30 ± 0.14 <sup>a</sup>	3.44 ± 0.02 <sup>a</sup>	3.30 ± 0.06 <sup>a</sup>	3.28 ± 0.10 <sup>a</sup>	3.34 ± 0.04 <sup>a</sup>	3.39 ± 0.06 <sup>a</sup>	3.40 ± 0.08 <sup>a</sup>	3.40 ± 0.08 <sup>a</sup>
3	3.19 ± 0.04 <sup>b</sup>	3.22 ± 0.06 <sup>b</sup>	3.22 ± 0.13 <sup>ab</sup>	3.30 ± 0.01 <sup>b</sup>	3.21 ± 0.05 <sup>ab</sup>	3.18 ± 0.10 <sup>ab</sup>	3.21 ± 0.03 <sup>b</sup>	3.27 ± 0.06 <sup>b</sup>	3.31 ± 0.08 <sup>b</sup>	3.31 ± 0.08 <sup>b</sup>
6	3.09 ± 0.06 <sup>c</sup>	3.12 ± 0.09 <sup>b</sup>	3.10 ± 0.12 <sup>b</sup>	3.19 ± 0.08 <sup>c</sup>	3.09 ± 0.03 <sup>c</sup>	3.07 ± 0.05 <sup>bc</sup>	3.07 ± 0.04 <sup>c</sup>	3.20 ± 0.02 <sup>bc</sup>	3.19 ± 0.04 <sup>c</sup>	3.19 ± 0.04 <sup>c</sup>
9	2.95 ± 0.08 <sup>d</sup>	3.12 ± 0.16 <sup>b</sup>	3.10 ± 0.17 <sup>b</sup>	3.15 ± 0.03 <sup>c</sup>	3.10 ± 0.08 <sup>bc</sup>	3.05 ± 0.13 <sup>c</sup>	3.00 ± 0.05 <sup>d</sup>	3.14 ± 0.04 <sup>cd</sup>	3.13 ± 0.08 <sup>cd</sup>	3.13 ± 0.08 <sup>cd</sup>
12	2.99 ± 0.10 <sup>d</sup>	3.13 ± 0.11 <sup>b</sup>	3.08 ± 0.17 <sup>b</sup>	3.20 ± 0.05 <sup>c</sup>	3.08 ± 0.07 <sup>c</sup>	3.07 ± 0.07 <sup>bc</sup>	3.01 ± 0.07 <sup>d</sup>	3.12 ± 0.04 <sup>d</sup>	3.09 ± 0.07 <sup>d</sup>	3.09 ± 0.07 <sup>d</sup>
15	3.10 ± 0.07 <sup>c</sup>	3.12 ± 0.09 <sup>b</sup>	3.08 ± 0.13 <sup>b</sup>	3.19 ± 0.07 <sup>c</sup>	3.08 ± 0.02 <sup>c</sup>	3.08 ± 0.03 <sup>bc</sup>	3.11 ± 0.01 <sup>c</sup>	3.16 ± 0.05 <sup>cd</sup>	3.16 ± 0.06 <sup>cd</sup>	3.16 ± 0.06 <sup>cd</sup>

\*) Values within a column followed by different letters were significantly different ( $P \leq 0.05$ )

Table 1.9 Total Soluble Solid (TSS) (°Brix)

Storage time (day)	% sugar vs %salt									
	0% vs 0%	0% vs 0.05%	0% vs 0.1%	2.5% vs 0%	2.5% vs 0.05%	2.5% vs 0.1%	5% vs 0%	5% vs 0.05%	5% vs 0.1%	5% vs 0.1%
0	12.13 ± 0.23 <sup>a</sup>	11.47 ± 0.50 <sup>a</sup>	11.67 ± 0.76 <sup>a</sup>	14.00 ± 0.00 <sup>a</sup>	13.87 ± 0.23 <sup>a</sup>	13.93 ± 1.01 <sup>a</sup>	15.80 ± 1.00 <sup>a</sup>	16.33 ± 0.70 <sup>a</sup>	16.53 ± 0.50 <sup>a</sup>	16.53 ± 0.50 <sup>a</sup>
3	11.67 ± 0.58 <sup>ab</sup>	11.67 ± 0.61 <sup>a</sup>	11.87 ± 0.81 <sup>a</sup>	13.93 ± 0.12 <sup>a</sup>	14.47 ± 0.50 <sup>a</sup>	14.00 ± 0.92 <sup>a</sup>	15.33 ± 1.15 <sup>a</sup>	15.47 ± 2.00 <sup>a</sup>	16.47 ± 0.61 <sup>a</sup>	16.47 ± 0.61 <sup>a</sup>
6	10.87 ± 0.90 <sup>b</sup>	11.27 ± 0.50 <sup>a</sup>	11.87 ± 0.31 <sup>a</sup>	14.07 ± 0.31 <sup>a</sup>	14.40 ± 0.40 <sup>a</sup>	14.33 ± 0.64 <sup>a</sup>	15.33 ± 1.15 <sup>a</sup>	15.40 ± 1.97 <sup>a</sup>	16.60 ± 0.69 <sup>a</sup>	16.60 ± 0.69 <sup>a</sup>
9	10.93 ± 0.81 <sup>b</sup>	11.33 ± 0.42 <sup>a</sup>	11.67 ± 0.50 <sup>a</sup>	14.00 ± 0.20 <sup>a</sup>	14.47 ± 0.46 <sup>a</sup>	14.07 ± 0.58 <sup>a</sup>	15.33 ± 0.99 <sup>a</sup>	15.47 ± 2.00 <sup>a</sup>	16.60 ± 0.72 <sup>a</sup>	16.60 ± 0.72 <sup>a</sup>
12	10.87 ± 0.90 <sup>b</sup>	11.27 ± 0.23 <sup>a</sup>	11.27 ± 1.42 <sup>a</sup>	13.93 ± 0.50 <sup>a</sup>	14.67 ± 0.42 <sup>a</sup>	13.80 ± 0.53 <sup>a</sup>	15.33 ± 1.15 <sup>a</sup>	15.60 ± 1.97 <sup>a</sup>	16.93 ± 0.90 <sup>a</sup>	16.93 ± 0.90 <sup>a</sup>
15	11.20 ± 0.92 <sup>b</sup>	11.40 ± 0.53 <sup>a</sup>	11.13 ± 0.76 <sup>a</sup>	13.93 ± 0.61 <sup>a</sup>	14.33 ± 0.31 <sup>a</sup>	13.40 ± 0.53 <sup>a</sup>	14.67 ± 0.92 <sup>b</sup>	16.33 ± 2.04 <sup>a</sup>	17.53 ± 0.81 <sup>b</sup>	17.53 ± 0.81 <sup>b</sup>

\*) Values within a column followed by different letters were significantly different ( $P \leq 0.05$ )

Table 1.10 Total titrable acidity (% citric acid)

Storage time (day)	% sugar vs %salt									
	0% vs 0%	0% vs 0.05%	0% vs 0.1%	2.5% vs 0%	2.5% vs 0.05%	2.5% vs 0.1%	5% vs 0%	5% vs 0.05%	5% vs 0.1%	
0	0.29 ± 0.04 <sup>a</sup>	0.28 ± 0.05 <sup>a</sup>	0.30 ± 0.05 <sup>a</sup>	0.25 ± 0.03 <sup>a</sup>	0.31 ± 0.05 <sup>a</sup>	0.31 ± 0.07 <sup>a</sup>	0.29 ± 0.02 <sup>a</sup>	0.24 ± 0.02 <sup>a</sup>	0.23 ± 0.03 <sup>a</sup>	
3	0.29 ± 0.03 <sup>a</sup>	0.27 ± 0.06 <sup>a</sup>	0.27 ± 0.02 <sup>a</sup>	0.24 ± 0.02 <sup>a</sup>	0.31 ± 0.04 <sup>a</sup>	0.29 ± 0.06 <sup>a</sup>	0.28 ± 0.02 <sup>a</sup>	0.26 ± 0.02 <sup>a</sup>	0.25 ± 0.02 <sup>a</sup>	
6	0.29 ± 0.03 <sup>a</sup>	0.27 ± 0.05 <sup>a</sup>	0.29 ± 0.05 <sup>a</sup>	0.25 ± 0.03 <sup>a</sup>	0.29 ± 0.01 <sup>a</sup>	0.30 ± 0.04 <sup>a</sup>	0.30 ± 0.03 <sup>a</sup>	0.25 ± 0.01 <sup>a</sup>	0.25 ± 0.02 <sup>a</sup>	
9	0.27 ± 0.03 <sup>a</sup>	0.30 ± 0.02 <sup>a</sup>	0.32 ± 0.02 <sup>a</sup>	0.28 ± 0.02 <sup>a</sup>	0.28 ± 0.01 <sup>a</sup>	0.32 ± 0.01 <sup>a</sup>	0.31 ± 0.01 <sup>a</sup>	0.25 ± 0.01 <sup>a</sup>	0.25 ± 0.01 <sup>a</sup>	
12	0.30 ± 0.05 <sup>a</sup>	0.27 ± 0.03 <sup>a</sup>	0.30 ± 0.05 <sup>a</sup>	0.25 ± 0.03 <sup>a</sup>	0.33 ± 0.09 <sup>a</sup>	0.30 ± 0.04 <sup>a</sup>	0.30 ± 0.03 <sup>a</sup>	0.25 ± 0.02 <sup>a</sup>	0.26 ± 0.01 <sup>a</sup>	
15	0.31 ± 0.06 <sup>a</sup>	0.27 ± 0.04 <sup>a</sup>	0.30 ± 0.04 <sup>a</sup>	0.26 ± 0.03 <sup>a</sup>	0.29 ± 0.02 <sup>a</sup>	0.31 ± 0.04 <sup>a</sup>	0.31 ± 0.03 <sup>a</sup>	0.25 ± 0.01 <sup>a</sup>	0.26 ± 0.01 <sup>a</sup>	

\*) Values within a column followed by different letters were significantly different ( $P \leq 0.05$ )

Table 1.11 Moisture content (%)

Storage time (day)	% sugar vs %salt									
	0% vs 0%	0% vs 0.05%	0% vs 0.1%	2.5% vs 0%	2.5% vs 0.05%	2.5% vs 0.1%	5% vs 0%	5% vs 0.05%	5% vs 0.1%	
0	90.15 ± 0.08 <sup>a</sup>	90.05 ± 0.14 <sup>a</sup>	89.76 ± 0.32 <sup>ab</sup>	87.89 ± 0.15 <sup>a</sup>	88.04 ± 0.19 <sup>ab</sup>	87.44 ± 0.15 <sup>a</sup>	86.11 ± 0.13 <sup>a</sup>	85.63 ± 0.14 <sup>a</sup>	85.41 ± 0.10 <sup>a</sup>	
3	90.18 ± 0.06 <sup>a</sup>	90.12 ± 0.10 <sup>a</sup>	89.66 ± 0.41 <sup>a</sup>	88.04 ± 0.11 <sup>a</sup>	87.90 ± 0.17 <sup>ac</sup>	87.34 ± 0.10 <sup>a</sup>	86.36 ± 0.34 <sup>b</sup>	85.37 ± 0.27 <sup>a</sup>	85.46 ± 0.11 <sup>a</sup>	
6	90.74 ± 0.13 <sup>b</sup>	90.75 ± 0.20 <sup>b</sup>	90.05 ± 0.35 <sup>bc</sup>	88.35 ± 0.06 <sup>b</sup>	88.18 ± 0.07 <sup>b</sup>	87.88 ± 0.09 <sup>b</sup>	86.70 ± 0.19 <sup>c</sup>	85.70 ± 0.28 <sup>a</sup>	85.43 ± 0.18 <sup>a</sup>	
9	91.23 ± 0.15 <sup>c</sup>	91.07 ± 0.19 <sup>c</sup>	90.26 ± 0.23 <sup>c</sup>	88.73 ± 0.14 <sup>cd</sup>	88.42 ± 0.16 <sup>d</sup>	88.27 ± 0.14 <sup>c</sup>	87.07 ± 0.31 <sup>d</sup>	85.62 ± 0.29 <sup>a</sup>	85.68 ± 0.23 <sup>a</sup>	
12	90.70 ± 0.24 <sup>b</sup>	90.67 ± 0.37 <sup>b</sup>	89.97 ± 0.34 <sup>bc</sup>	88.99 ± 0.25 <sup>d</sup>	88.12 ± 0.20 <sup>b</sup>	88.73 ± 0.15 <sup>d</sup>	86.79 ± 0.14 <sup>c</sup>	85.35 ± 0.50 <sup>a</sup>	85.35 ± 0.39 <sup>a</sup>	
15	90.20 ± 0.37 <sup>a</sup>	90.28 ± 0.20 <sup>a</sup>	90.57 ± 0.02 <sup>d</sup>	88.50 ± 0.23 <sup>bc</sup>	87.76 ± 0.16 <sup>c</sup>	89.20 ± 0.28 <sup>c</sup>	87.12 ± 0.24 <sup>d</sup>	85.10 ± 0.50 <sup>b</sup>	85.38 ± 0.30 <sup>a</sup>	

\*) Values within a column followed by different letters were significantly different ( $P \leq 0.05$ )

Table 1.12 Total solid (%)

Storage time (day)	% sugar vs %salt									
	0% vs 0%	0% vs 0.05%	0% vs 0.1%	2.5% vs 0%	2.5% vs 0.05%	2.5% vs 0.1%	5% vs 0%	5% vs 0.05%	5% vs 0.1%	5% vs 0.1%
0	9.85 ± 0.08 <sup>a</sup>	9.95 ± 0.14 <sup>a</sup>	10.24 ± 0.32 <sup>ab</sup>	12.11 ± 0.15 <sup>a</sup>	11.96 ± 0.19 <sup>ab</sup>	12.56 ± 0.15 <sup>a</sup>	13.89 ± 0.13 <sup>a</sup>	14.37 ± 0.14 <sup>a</sup>	14.59 ± 0.10 <sup>a</sup>	14.59 ± 0.10 <sup>a</sup>
3	9.82 ± 0.06 <sup>a</sup>	9.88 ± 0.10 <sup>a</sup>	10.34 ± 0.41 <sup>a</sup>	11.96 ± 0.11 <sup>a</sup>	12.10 ± 0.17 <sup>bc</sup>	12.66 ± 0.10 <sup>a</sup>	13.64 ± 0.34 <sup>b</sup>	14.63 ± 0.27 <sup>a</sup>	14.54 ± 0.11 <sup>a</sup>	14.54 ± 0.11 <sup>a</sup>
6	9.26 ± 0.14 <sup>b</sup>	9.25 ± 0.20 <sup>b</sup>	9.95 ± 0.35 <sup>bc</sup>	11.65 ± 0.06 <sup>b</sup>	11.82 ± 0.07 <sup>a</sup>	12.12 ± 0.09 <sup>b</sup>	13.30 ± 0.19 <sup>c</sup>	14.30 ± 0.28 <sup>a</sup>	14.57 ± 0.18 <sup>a</sup>	14.57 ± 0.18 <sup>a</sup>
9	8.77 ± 0.15 <sup>c</sup>	8.93 ± 0.19 <sup>c</sup>	9.74 ± 0.23 <sup>c</sup>	11.27 ± 0.14 <sup>cd</sup>	11.58 ± 0.16 <sup>d</sup>	11.73 ± 0.14 <sup>c</sup>	12.93 ± 0.31 <sup>d</sup>	14.38 ± 0.29 <sup>a</sup>	14.32 ± 0.23 <sup>a</sup>	14.32 ± 0.23 <sup>a</sup>
12	9.30 ± 0.24 <sup>b</sup>	9.33 ± 0.37 <sup>b</sup>	10.03 ± 0.34 <sup>bc</sup>	11.01 ± 0.25 <sup>d</sup>	11.88 ± 0.20 <sup>a</sup>	11.27 ± 0.15 <sup>d</sup>	13.21 ± 0.14 <sup>c</sup>	14.65 ± 0.49 <sup>a</sup>	14.64 ± 0.39 <sup>a</sup>	14.64 ± 0.39 <sup>a</sup>
15	9.80 ± 0.37 <sup>a</sup>	9.72 ± 0.20 <sup>a</sup>	9.43 ± 0.02 <sup>d</sup>	11.50 ± 0.23 <sup>bc</sup>	12.24 ± 0.16 <sup>c</sup>	10.80 ± 0.28 <sup>e</sup>	12.87 ± 0.24 <sup>d</sup>	15.27 ± 0.46 <sup>b</sup>	14.62 ± 0.30 <sup>a</sup>	14.62 ± 0.30 <sup>a</sup>

\*) Values within a column followed by different letters were significantly different ( $P \leq 0.05$ )

Table 1.13 Reducing sugar (%)

Storage time (day)	% sugar vs %salt									
	0% vs 0%	0% vs 0.05%	0% vs 0.1%	2.5% vs 0%	2.5% vs 0.05%	2.5% vs 0.1%	5% vs 0%	5% vs 0.05%	5% vs 0.1%	5% vs 0.1%
0	5.51 ± 0.11 <sup>a</sup>	5.48 ± 0.32 <sup>a</sup>	5.14 ± 0.56 <sup>a</sup>	4.76 ± 0.70 <sup>a</sup>	5.08 ± 0.71 <sup>a</sup>	5.41 ± 0.61 <sup>a</sup>	5.04 ± 0.91 <sup>ab</sup>	5.25 ± 0.33 <sup>a</sup>	5.35 ± 0.24 <sup>ab</sup>	5.35 ± 0.24 <sup>ab</sup>
3	5.29 ± 0.10 <sup>b</sup>	5.53 ± 0.43 <sup>a</sup>	5.11 ± 0.39 <sup>a</sup>	5.23 ± 0.34 <sup>a</sup>	5.03 ± 0.82 <sup>a</sup>	5.35 ± 0.64 <sup>a</sup>	5.39 ± 0.42 <sup>a</sup>	5.17 ± 0.25 <sup>a</sup>	5.41 ± 0.48 <sup>a</sup>	5.41 ± 0.48 <sup>a</sup>
6	4.93 ± 0.13 <sup>c</sup>	5.24 ± 0.11 <sup>a</sup>	5.07 ± 0.16 <sup>a</sup>	5.10 ± 0.18 <sup>a</sup>	5.14 ± 0.42 <sup>a</sup>	5.21 ± 0.31 <sup>a</sup>	4.97 ± 0.15 <sup>ab</sup>	5.09 ± 0.33 <sup>a</sup>	5.06 ± 0.36 <sup>b</sup>	5.06 ± 0.36 <sup>b</sup>
9	4.97 ± 0.14 <sup>c</sup>	5.05 ± 0.41 <sup>a</sup>	5.06 ± 0.26 <sup>a</sup>	4.95 ± 0.29 <sup>a</sup>	5.09 ± 0.46 <sup>a</sup>	5.05 ± 0.47 <sup>ab</sup>	5.11 ± 0.19 <sup>ab</sup>	5.11 ± 0.46 <sup>a</sup>	5.11 ± 0.40 <sup>ab</sup>	5.11 ± 0.40 <sup>ab</sup>
12	4.51 ± 0.17 <sup>d</sup>	4.72 ± 0.49 <sup>a</sup>	4.74 ± 0.51 <sup>a</sup>	4.85 ± 0.10 <sup>a</sup>	4.60 ± 0.69 <sup>b</sup>	4.80 ± 0.44 <sup>b</sup>	4.50 ± 0.63 <sup>ab</sup>	4.77 ± 0.30 <sup>a</sup>	4.69 ± 0.66 <sup>c</sup>	4.69 ± 0.66 <sup>c</sup>
15	4.41 ± 0.20 <sup>d</sup>	4.62 ± 0.42 <sup>a</sup>	4.66 ± 0.53 <sup>a</sup>	4.72 ± 0.16 <sup>a</sup>	4.57 ± 0.66 <sup>b</sup>	4.79 ± 0.45 <sup>b</sup>	4.32 ± 0.58 <sup>b</sup>	4.73 ± 0.16 <sup>a</sup>	4.28 ± 0.34 <sup>d</sup>	4.28 ± 0.34 <sup>d</sup>

\*) Values within a column followed by different letters were significantly different ( $P \leq 0.05$ )

**Table 1.14 PE enzyme (PMEu/g.s.s x 10<sup>-4</sup>)**

Storage time (day)	% sugar vs %salt									
	0% vs 0%	0% vs 0.05%	0% vs 0.1%	2.5% vs 0%	2.5% vs 0.05%	2.5% vs 0.1%	5% vs 0%	5% vs 0.05%	5% vs 0.1%	5% vs 0.1%
0	5.57 ± 1.39 <sup>a</sup>	6.07 ± 0.56 <sup>a</sup>	5.49 ± 1.15 <sup>a</sup>	5.37 ± 0.66 <sup>a</sup>	5.43 ± 1.44 <sup>a</sup>	5.05 ± 1.01 <sup>a</sup>	6.83 ± 0.97 <sup>a</sup>	3.96 ± 1.05 <sup>a</sup>	4.56 ± 0.67 <sup>a</sup>	
3	5.94 ± 1.89 <sup>a</sup>	6.02 ± 1.13 <sup>a</sup>	6.32 ± 0.43 <sup>ab</sup>	6.54 ± 1.31 <sup>a</sup>	5.19 ± 0.52 <sup>a</sup>	4.97 ± 0.36 <sup>a</sup>	6.37 ± 1.54 <sup>a</sup>	4.53 ± 0.48 <sup>ab</sup>	4.91 ± 1.13 <sup>a</sup>	
6	6.41 ± 0.43 <sup>a</sup>	8.10 ± 2.10 <sup>a</sup>	4.97 ± 0.70 <sup>a</sup>	4.96 ± 0.69 <sup>a</sup>	5.99 ± 1.85 <sup>a</sup>	7.15 ± 1.51 <sup>a</sup>	4.55 ± 0.50 <sup>a</sup>	6.03 ± 1.29 <sup>bc</sup>	4.20 ± 0.49 <sup>a</sup>	
9	5.98 ± 1.90 <sup>a</sup>	6.66 ± 1.84 <sup>a</sup>	7.35 ± 0.51 <sup>ab</sup>	6.13 ± 0.58 <sup>a</sup>	7.42 ± 0.58 <sup>a</sup>	6.08 ± 1.10 <sup>a</sup>	5.26 ± 1.04 <sup>a</sup>	6.64 ± 0.68 <sup>c</sup>	5.51 ± 0.67 <sup>a</sup>	
12	9.97 ± 3.31 <sup>b</sup>	7.60 ± 2.07 <sup>a</sup>	8.61 ± 1.44 <sup>bc</sup>	5.83 ± 2.24 <sup>a</sup>	5.85 ± 0.52 <sup>a</sup>	6.62 ± 1.78 <sup>a</sup>	5.56 ± 1.30 <sup>a</sup>	5.95 ± 1.27 <sup>bc</sup>	5.12 ± 1.71 <sup>a</sup>	
15	8.27 ± 3.28 <sup>ab</sup>	8.05 ± 1.92 <sup>a</sup>	10.26 ± 5.07 <sup>c</sup>	6.57 ± 0.93 <sup>a</sup>	7.09 ± 2.24 <sup>a</sup>	6.43 ± 0.89 <sup>a</sup>	7.00 ± 1.11 <sup>a</sup>	6.06 ± 0.81 <sup>bc</sup>	5.49 ± 1.98 <sup>a</sup>	

\*) Values within a column followed by different letters were significantly different ( $P \leq 0.05$ )

**Table 1.15 Total Plate count (log CFU/ml)**

Storage time (day)	% sugar vs %salt									
	0% vs 0%	0% vs 0.05%	0% vs 0.1%	2.5% vs 0%	2.5% vs 0.05%	2.5% vs 0.1%	5% vs 0%	5% vs 0.05%	5% vs 0.1%	5% vs 0.1%
0	2.50 ± 0.14 <sup>a</sup>	2.55 ± 0.06 <sup>a</sup>	2.14 ± 0.02 <sup>a</sup>	2.52 ± 0.08 <sup>a</sup>	2.27 ± 0.10 <sup>a</sup>	2.38 ± 0.10 <sup>a</sup>	2.60 ± 0.05 <sup>a</sup>	2.06 ± 0.11 <sup>a</sup>	2.37 ± 0.03 <sup>a</sup>	
3	2.67 ± 0.07 <sup>a</sup>	2.52 ± 0.15 <sup>a</sup>	2.28 ± 0.19 <sup>a</sup>	2.37 ± 0.01 <sup>a</sup>	2.73 ± 0.05 <sup>b</sup>	2.94 ± 0.02 <sup>b</sup>	2.69 ± 0.08 <sup>ab</sup>	2.71 ± 0.06 <sup>b</sup>	2.25 ± 0.13 <sup>a</sup>	
6	2.91 ± 0.03 <sup>b</sup>	2.93 ± 0.03 <sup>b</sup>	2.84 ± 0.09 <sup>b</sup>	2.49 ± 0.08 <sup>a</sup>	3.17 ± 0.15 <sup>c</sup>	2.33 ± 0.10 <sup>a</sup>	2.79 ± 0.12 <sup>b</sup>	2.41 ± 0.20 <sup>b</sup>	2.81 ± 0.08 <sup>b</sup>	
9	3.16 ± 0.07 <sup>c</sup>	3.29 ± 0.10 <sup>c</sup>	2.85 ± 0.13 <sup>b</sup>	2.54 ± 0.05 <sup>a</sup>	3.55 ± 0.09 <sup>d</sup>	3.15 ± 0.10 <sup>c</sup>	2.79 ± 0.14 <sup>b</sup>	2.56 ± 0.22 <sup>b</sup>	3.12 ± 0.06 <sup>c</sup>	
12	3.46 ± 0.11 <sup>d</sup>	3.80 ± 0.09 <sup>d</sup>	3.32 ± 0.07 <sup>c</sup>	3.02 ± 0.12 <sup>b</sup>	3.83 ± 0.09 <sup>e</sup>	4.11 ± 0.13 <sup>d</sup>	3.06 ± 0.16 <sup>c</sup>	3.32 ± 0.28 <sup>c</sup>	3.98 ± 0.11 <sup>d</sup>	
15	4.23 ± 0.18 <sup>e</sup>	4.20 ± 0.16 <sup>c</sup>	4.42 ± 0.55 <sup>d</sup>	4.36 ± 0.18 <sup>c</sup>	5.05 ± 0.06 <sup>f</sup>	5.02 ± 0.09 <sup>e</sup>	3.99 ± 0.05 <sup>d</sup>	4.58 ± 0.13 <sup>d</sup>	4.58 ± 0.40 <sup>e</sup>	

\*) Values within a column followed by different letters were significantly different ( $P \leq 0.05$ )



Table 1.16 Lactic acid bacteria (log CFU/ml)

Storage time (day)	% sugar vs %salt									
	0% vs 0%	0% vs 0.05%	0% vs 0.1%	2.5% vs 0%	2.5% vs 0.05%	2.5% vs 0.1%	5% vs 0%	5% vs 0.05%	5% vs 0.1%	5% vs 0.1%
0	2.16 ± 0.10 <sup>ab</sup>	2.17 ± 0.25 <sup>a</sup>	1.96 ± 0.11 <sup>a</sup>	2.14 ± 0.17 <sup>a</sup>	2.24 ± 0.17 <sup>a</sup>	2.05 ± 0.29 <sup>a</sup>	2.37 ± 0.25 <sup>a</sup>	1.68 ± 0.13 <sup>ab</sup>	2.25 ± 0.11 <sup>ab</sup>	
3	1.82 ± 0.35 <sup>a</sup>	1.33 ± 0.14 <sup>b</sup>	0.85 ± 0.79 <sup>b</sup>	0.78 ± 0.68 <sup>b</sup>	1.47 ± 0.43 <sup>b</sup>	2.52 ± 0.16 <sup>b</sup>	2.44 ± 0.17 <sup>a</sup>	2.62 ± 0.10 <sup>c</sup>	1.93 ± 0.39 <sup>a</sup>	
6	1.93 ± 0.34 <sup>a</sup>	2.39 ± 0.31 <sup>ac</sup>	1.71 ± 0.22 <sup>a</sup>	2.02 ± 0.10 <sup>a</sup>	2.74 ± 0.13 <sup>a</sup>	2.60 ± 0.10 <sup>b</sup>	2.60 ± 0.25 <sup>a</sup>	1.11 ± 0.25 <sup>ad</sup>	2.55 ± 0.13 <sup>b</sup>	
9	2.42 ± 0.17 <sup>b</sup>	2.58 ± 0.12 <sup>c</sup>	2.15 ± 0.22 <sup>a</sup>	2.64 ± 0.22 <sup>ac</sup>	2.74 ± 0.16 <sup>a</sup>	2.38 ± 0.27 <sup>ab</sup>	2.41 ± 0.15 <sup>a</sup>	0.77 ± 0.68 <sup>d</sup>	3.01 ± 0.08 <sup>c</sup>	
12	3.30 ± 0.09 <sup>c</sup>	3.13 ± 0.05 <sup>d</sup>	2.95 ± 0.19 <sup>c</sup>	2.65 ± 0.27 <sup>ac</sup>	2.70 ± 0.15 <sup>a</sup>	2.67 ± 0.08 <sup>b</sup>	2.39 ± 0.13 <sup>a</sup>	1.65 ± 0.20 <sup>ab</sup>	3.52 ± 0.16 <sup>d</sup>	
15	3.58 ± 0.16 <sup>d</sup>	3.45 ± 0.01 <sup>e</sup>	3.46 ± 0.14 <sup>c</sup>	2.98 ± 0.09 <sup>c</sup>	3.83 ± 0.26 <sup>c</sup>	3.21 ± 0.17 <sup>c</sup>	2.36 ± 0.22 <sup>a</sup>	2.04 ± 0.09 <sup>bc</sup>	4.09 ± 0.17 <sup>e</sup>	

\*) Values within a column followed by different letters were significantly different ( $P \leq 0.05$ )

Table 1.17 Yeast and mold (log CFU/ml)

Storage time (day)	% sugar vs %salt									
	0% vs 0%	0% vs 0.05%	0% vs 0.1%	2.5% vs 0%	2.5% vs 0.05%	2.5% vs 0.1%	5% vs 0%	5% vs 0.05%	5% vs 0.1%	5% vs 0.1%
0	2.45 ± 0.18 <sup>a</sup>	2.56 ± 0.08 <sup>a</sup>	2.11 ± 0.23 <sup>a</sup>	2.39 ± 0.15 <sup>a</sup>	2.47 ± 0.11 <sup>a</sup>	2.33 ± 0.02 <sup>a</sup>	2.16 ± 0.01 <sup>a</sup>	1.99 ± 0.09 <sup>a</sup>	2.13 ± 0.22 <sup>a</sup>	
15	5.36 ± 0.31 <sup>b</sup>	5.25 ± 0.19 <sup>b</sup>	4.17 ± 0.05 <sup>b</sup>	3.21 ± 0.19 <sup>b</sup>	5.41 ± 0.14 <sup>b</sup>	4.56 ± 0.28 <sup>b</sup>	4.28 ± 0.12 <sup>b</sup>	3.69 ± 0.29 <sup>b</sup>	4.66 ± 0.21 <sup>b</sup>	

\*) Values within a column followed by different letters were significantly different ( $P \leq 0.05$ )

Table 1.18 Vitamin C content (mg/100ml)

Storage time (day)	% sugar vs %salt									
	0% vs 0%	0% vs 0.05%	0% vs 0.1%	2.5% vs 0%	2.5% vs 0.05%	2.5% vs 0.1%	5% vs 0%	5% vs 0.05%	5% vs 0.1%	5% vs 0.1%
0	28.48 ± 0.29 <sup>a</sup>	31.03 ± 0.29 <sup>a</sup>	25.93 ± 0.25 <sup>a</sup>	33.41 ± 0.14 <sup>a</sup>	26.50 ± 0.14 <sup>a</sup>	22.22 ± 0.25 <sup>a</sup>	30.53 ± 0.28 <sup>a</sup>	28.81 ± 0.29 <sup>b</sup>	24.20 ± 0.25 <sup>a</sup>	24.20 ± 0.25 <sup>a</sup>
3	30.45 ± 0.38 <sup>b</sup>	31.52 ± 0.28 <sup>a</sup>	25.51 ± 0.14 <sup>ab</sup>	34.40 ± 0.38 <sup>b</sup>	27.32 ± 0.38 <sup>b</sup>	22.64 ± 0.14 <sup>b</sup>	29.79 ± 0.28 <sup>b</sup>	29.39 ± 0.43 <sup>b</sup>	24.36 ± 0.29 <sup>a</sup>	24.36 ± 0.29 <sup>a</sup>
6	27.82 ± 0.29 <sup>c</sup>	30.04 ± 0.38 <sup>b</sup>	25.02 ± 0.29 <sup>b</sup>	34.49 ± 0.14 <sup>b</sup>	26.91 ± 0.00 <sup>ab</sup>	22.97 ± 0.43 <sup>c</sup>	28.64 ± 0.25 <sup>c</sup>	29.88 ± 0.43 <sup>b</sup>	25.43 ± 1.50 <sup>a</sup>	25.43 ± 1.50 <sup>a</sup>
9	24.28 ± 0.38 <sup>d</sup>	27.08 ± 0.29 <sup>c</sup>	24.20 ± 0.43 <sup>c</sup>	33.91 ± 0.14 <sup>c</sup>	27.08 ± 0.38 <sup>b</sup>	23.46 ± 0.25 <sup>d</sup>	27.32 ± 0.28 <sup>d</sup>	28.72 ± 0.14 <sup>a</sup>	20.58 ± 1.43 <sup>b</sup>	20.58 ± 1.43 <sup>b</sup>
12	21.23 ± 0.25 <sup>e</sup>	24.20 ± 0.25 <sup>d</sup>	23.37 ± 0.14 <sup>d</sup>	32.27 ± 0.14 <sup>d</sup>	24.86 ± 0.29 <sup>c</sup>	22.80 ± 0.14 <sup>bc</sup>	27.00 ± 0.38 <sup>d</sup>	28.40 ± 0.25 <sup>a</sup>	18.60 ± 0.38 <sup>c</sup>	18.60 ± 0.38 <sup>c</sup>
15	22.06 ± 0.29 <sup>f</sup>	24.03 ± 0.14 <sup>d</sup>	20.91 ± 0.14 <sup>c</sup>	28.97 ± 0.14 <sup>c</sup>	22.31 ± 0.28 <sup>d</sup>	19.92 ± 0.14 <sup>c</sup>	24.53 ± 0.28 <sup>e</sup>	25.35 ± 0.14 <sup>c</sup>	18.35 ± 0.14 <sup>c</sup>	18.35 ± 0.14 <sup>c</sup>

\*) Values within a column followed by different letters were significantly different ( $P \leq 0.05$ )

Table 1.19 Carotenoid content ( $\mu\text{g/ml}$ )

Storage time (day)	% sugar vs %salt									
	0% vs 0%	0% vs 0.05%	0% vs 0.1%	2.5% vs 0%	2.5% vs 0.05%	2.5% vs 0.1%	5% vs 0%	5% vs 0.05%	5% vs 0.1%	5% vs 0.1%
0	4.54 ± 0.46 <sup>a</sup>	4.63 ± 0.51 <sup>a</sup>	4.49 ± 0.58 <sup>a</sup>	5.46 ± 0.96 <sup>a</sup>	5.26 ± 0.63 <sup>a</sup>	5.03 ± 0.88 <sup>a</sup>	5.83 ± 0.21 <sup>a</sup>	6.00 ± 0.51 <sup>a</sup>	5.85 ± 0.15 <sup>a</sup>	5.85 ± 0.15 <sup>a</sup>
7	6.05 ± 0.57 <sup>a</sup>	5.91 ± 0.64 <sup>a</sup>	5.92 ± 0.70 <sup>a</sup>	5.82 ± 0.33 <sup>a</sup>	5.66 ± 0.67 <sup>a</sup>	5.59 ± 0.86 <sup>a</sup>	5.69 ± 0.31 <sup>a</sup>	5.56 ± 0.50 <sup>a</sup>	5.47 ± 0.66 <sup>a</sup>	5.47 ± 0.66 <sup>a</sup>
15	6.34 ± 1.26 <sup>a</sup>	6.21 ± 0.98 <sup>a</sup>	6.12 ± 1.28 <sup>a</sup>	5.80 ± 0.36 <sup>a</sup>	5.92 ± 0.29 <sup>a</sup>	5.79 ± 0.34 <sup>a</sup>	5.90 ± 0.65 <sup>a</sup>	5.87 ± 0.75 <sup>a</sup>	5.96 ± 0.65 <sup>a</sup>	5.96 ± 0.65 <sup>a</sup>

\*) Values within a column followed by different letters were significantly different ( $P \leq 0.05$ )

## 2. The effect of storage time on orange juices added with orange juice sacs and had different pH values

Table 2.1 Viscosity (cps)

Storage time (day)	% orange juice sacs vs pH variation					
	0% vs pH3	0% vs pH3.5	0% vs pH4	3% vs pH3	3% vs pH 3.5	3% vs pH4
0	6.32 ± 0.26 <sup>a</sup>	6.18 ± 0.72 <sup>a</sup>	5.54 ± 0.91 <sup>a</sup>	6.79 ± 0.36 <sup>a</sup>	5.54 ± 0.59 <sup>a</sup>	5.94 ± 0.75 <sup>a</sup>
7	6.83 ± 0.84 <sup>a</sup>	6.29 ± 0.44 <sup>a</sup>	7.08 ± 1.06 <sup>b</sup>	6.82 ± 1.08 <sup>a</sup>	6.52 ± 0.89 <sup>a</sup>	5.95 ± 0.75 <sup>a</sup>
15	5.57 ± 0.95 <sup>a</sup>	5.95 ± 0.50 <sup>a</sup>	5.30 ± 0.28 <sup>a</sup>	6.52 ± 0.95 <sup>a</sup>	4.73 ± 0.39 <sup>a</sup>	4.47 ± 0.20 <sup>a</sup>

\*) Values within a column followed by different letters were significantly different ( $P \leq 0.05$ )

Table 2.2 L\* value

Storage time (day)	% orange juice sacs vs pH variation					
	0% vs pH3	0% vs pH3.5	0% vs pH4	3% vs pH3	3% vs pH 3.5	3% vs pH4
0	55.81 ± 5.77 <sup>a</sup>	52.50 ± 0.44 <sup>a</sup>	51.32 ± 1.60 <sup>a</sup>	51.51 ± 0.31 <sup>a</sup>	52.01 ± 0.58 <sup>a</sup>	51.67 ± 2.00 <sup>a</sup>
3	53.31 ± 1.73 <sup>a</sup>	54.11 ± 0.63 <sup>a</sup>	53.31 ± 0.33 <sup>ab</sup>	52.82 ± 0.23 <sup>a</sup>	53.76 ± 0.40 <sup>a</sup>	52.41 ± 2.12 <sup>a</sup>
6	53.01 ± 1.76 <sup>a</sup>	53.25 ± 1.16 <sup>ab</sup>	53.15 ± 0.81 <sup>ab</sup>	51.99 ± 1.17 <sup>a</sup>	51.84 ± 2.65 <sup>a</sup>	52.72 ± 1.21 <sup>a</sup>
9	53.06 ± 1.84 <sup>a</sup>	54.28 ± 0.22 <sup>b</sup>	54.68 ± 0.56 <sup>b</sup>	53.13 ± 0.61 <sup>a</sup>	53.25 ± 1.54 <sup>a</sup>	53.09 ± 0.76 <sup>a</sup>
12	53.25 ± 1.64 <sup>a</sup>	53.79 ± 0.69 <sup>b</sup>	54.62 ± 1.22 <sup>b</sup>	52.91 ± 0.53 <sup>a</sup>	54.33 ± 1.23 <sup>a</sup>	53.92 ± 2.51 <sup>a</sup>
15	53.08 ± 1.75 <sup>a</sup>	54.48 ± 0.85 <sup>b</sup>	53.44 ± 1.33 <sup>b</sup>	52.23 ± 0.85 <sup>a</sup>	53.36 ± 0.88 <sup>a</sup>	52.73 ± 0.84 <sup>a</sup>

\*) Values within a column followed by different letters were significantly different ( $P \leq 0.05$ )

Table 2.3 a\* value

Storage time (day)	% orange juice sacs vs pH variation					
	0% vs pH3	0% vs pH3.5	0% vs pH4	3% vs pH3	3% vs pH 3.5	3% vs pH4
0	-1.24 ± 1.25 <sup>a</sup>	-0.91 ± 1.18 <sup>a</sup>	-0.50 ± 0.78 <sup>a</sup>	0.16 ± 1.19 <sup>a</sup>	0.14 ± 1.25 <sup>a</sup>	0.00 ± 0.24 <sup>a</sup>
3	0.04 ± 0.74 <sup>bc</sup>	0.06 ± 0.92 <sup>a</sup>	0.03 ± 0.89 <sup>a</sup>	0.72 ± 1.02 <sup>a</sup>	0.65 ± 0.95 <sup>a</sup>	0.41 ± 1.01 <sup>a</sup>
6	-0.49 ± 0.46 <sup>bc</sup>	-0.10 ± 0.90 <sup>a</sup>	-0.06 ± 0.17 <sup>a</sup>	0.12 ± 0.82 <sup>a</sup>	0.17 ± 1.51 <sup>a</sup>	-0.02 ± 0.56 <sup>a</sup>
9	0.20 ± 0.83 <sup>c</sup>	0.10 ± 1.42 <sup>a</sup>	0.02 ± 0.61 <sup>a</sup>	0.72 ± 0.91 <sup>a</sup>	0.53 ± 1.36 <sup>a</sup>	0.61 ± 0.57 <sup>a</sup>
12	-0.35 ± 0.99 <sup>bc</sup>	-0.12 ± 1.10 <sup>a</sup>	0.14 ± 0.70 <sup>a</sup>	0.81 ± 0.45 <sup>a</sup>	0.40 ± 1.58 <sup>a</sup>	0.60 ± 0.71 <sup>a</sup>
15	-0.61 ± 0.71 <sup>ab</sup>	-0.22 ± 1.09 <sup>a</sup>	-0.17 ± 0.29 <sup>a</sup>	0.23 ± 0.50 <sup>a</sup>	0.07 ± 1.08 <sup>a</sup>	-0.26 ± 0.19 <sup>a</sup>

\*) Values within a column followed by different letters were significantly different ( $P \leq 0.05$ )

Table 2.4 b\* value

Storage time (day)	% orange juice sacs vs pH variation					
	0% vs pH3	0% vs pH3.5	0% vs pH4	3% vs pH3	3% vs pH 3.5	3% vs pH4
0	24.30 ± 4.00 <sup>a</sup>	31.25 ± 3.03 <sup>a</sup>	31.54 ± 2.53 <sup>a</sup>	32.61 ± 2.50 <sup>a</sup>	33.18 ± 0.36 <sup>a</sup>	33.51 ± 0.32 <sup>a</sup>
3	31.07 ± 2.95 <sup>a</sup>	29.80 ± 2.43 <sup>a</sup>	30.09 ± 3.95 <sup>a</sup>	28.84 ± 2.92 <sup>bc</sup>	29.19 ± 1.82 <sup>b</sup>	29.46 ± 3.82 <sup>b</sup>
6	30.52 ± 1.66 <sup>a</sup>	29.83 ± 2.79 <sup>a</sup>	29.60 ± 1.04 <sup>a</sup>	30.06 ± 1.27 <sup>b</sup>	30.00 ± 2.03 <sup>b</sup>	30.50 ± 0.67 <sup>ab</sup>
9	29.52 ± 2.51 <sup>a</sup>	28.25 ± 2.79 <sup>a</sup>	28.23 ± 1.50 <sup>a</sup>	27.5 ± 2.69 <sup>c</sup>	27.89 ± 2.20 <sup>b</sup>	27.98 ± 1.46 <sup>b</sup>
12	30.32 ± 3.14 <sup>a</sup>	28.04 ± 2.08 <sup>a</sup>	29.44 ± 1.24 <sup>a</sup>	27.38 ± 1.98 <sup>c</sup>	28.79 ± 2.24 <sup>b</sup>	27.41 ± 2.93 <sup>b</sup>
15	30.27 ± 2.56 <sup>a</sup>	28.75 ± 0.90 <sup>a</sup>	29.63 ± 1.36 <sup>a</sup>	28.42 ± 0.29 <sup>bc</sup>	29.39 ± 2.33 <sup>b</sup>	29.56 ± 0.70 <sup>b</sup>

\*) Values within a column followed by different letters were significantly different ( $P \leq 0.05$ )

Table 2.5 Browning value

Storage time (day)	% orange juice sacs vs pH variation					
	0% vs pH3	0% vs pH3.5	0% vs pH4	3% vs pH3	3% vs pH 3.5	3% vs pH4
0	0.00 ± 0.00 <sup>a</sup>	4.19 ± 3.83 <sup>a</sup>	3.89 ± 4.06 <sup>a</sup>	3.43 ± 4.64 <sup>a</sup>	5.00 ± 2.82 <sup>a</sup>	4.73 ± 3.59 <sup>a</sup>
3	4.73 ± 3.98 <sup>b</sup>	4.92 ± 2.43 <sup>a</sup>	5.90 ± 3.13 <sup>a</sup>	4.34 ± 1.19 <sup>a</sup>	4.95 ± 2.25 <sup>a</sup>	6.29 ± 3.57 <sup>a</sup>
6	4.11 ± 3.47 <sup>b</sup>	4.47 ± 3.79 <sup>a</sup>	3.94 ± 3.21 <sup>a</sup>	3.52 ± 2.47 <sup>a</sup>	4.84 ± 2.41 <sup>a</sup>	4.01 ± 2.13 <sup>a</sup>
9	5.08 ± 2.25 <sup>b</sup>	5.76 ± 1.49 <sup>a</sup>	4.85 ± 2.44 <sup>a</sup>	5.24 ± 0.48 <sup>a</sup>	5.31 ± 3.78 <sup>a</sup>	5.05 ± 2.52 <sup>a</sup>
12	4.98 ± 3.06 <sup>b</sup>	4.61 ± 3.31 <sup>a</sup>	4.19 ± 3.10 <sup>a</sup>	5.29 ± 0.82 <sup>a</sup>	5.04 ± 3.97 <sup>a</sup>	5.53 ± 4.69 <sup>a</sup>
15	4.51 ± 3.28 <sup>b</sup>	4.14 ± 2.02 <sup>a</sup>	4.04 ± 2.67 <sup>a</sup>	3.81 ± 2.50 <sup>a</sup>	4.75 ± 2.97 <sup>a</sup>	3.61 ± 2.64 <sup>a</sup>

\*) Values within a column followed by different letters were significantly different ( $P \leq 0.05$ )

Table 2.6 Total color difference ( $\Delta E^*$ )

Storage time (day)	% orange juice sacs vs pH variation					
	0% vs pH3	0% vs pH3.5	0% vs pH4	3% vs pH3	3% vs pH 3.5	3% vs pH4
0	0.00 ± 0.00 <sup>a</sup>	6.20 ± 5.64 <sup>a</sup>	6.08 ± 5.52 <sup>a</sup>	5.63 ± 7.51 <sup>a</sup>	6.77 ± 5.42 <sup>a</sup>	7.30 ± 7.09 <sup>a</sup>
3	6.99 ± 6.46 <sup>b</sup>	6.20 ± 3.88 <sup>a</sup>	7.33 ± 5.24 <sup>a</sup>	6.32 ± 4.35 <sup>a</sup>	6.48 ± 3.84 <sup>a</sup>	8.77 ± 5.60 <sup>a</sup>
6	6.54 ± 6.25 <sup>b</sup>	6.44 ± 4.42 <sup>a</sup>	6.14 ± 5.22 <sup>a</sup>	5.94 ± 6.41 <sup>a</sup>	7.11 ± 3.94 <sup>a</sup>	6.39 ± 4.59 <sup>a</sup>
9	7.52 ± 5.31 <sup>b</sup>	7.27 ± 2.79 <sup>a</sup>	7.04 ± 2.74 <sup>a</sup>	7.15 ± 2.80 <sup>a</sup>	7.65 ± 3.79 <sup>a</sup>	7.36 ± 3.94 <sup>a</sup>
12	7.16 ± 5.87 <sup>b</sup>	6.82 ± 3.60 <sup>a</sup>	7.04 ± 3.30 <sup>a</sup>	7.47 ± 3.17 <sup>a</sup>	7.06 ± 3.34 <sup>a</sup>	9.03 ± 3.50 <sup>a</sup>
15	6.78 ± 6.10 <sup>b</sup>	5.95 ± 3.28 <sup>a</sup>	5.77 ± 4.53 <sup>a</sup>	6.02 ± 4.76 <sup>a</sup>	6.54 ± 3.71 <sup>a</sup>	6.26 ± 4.83 <sup>a</sup>

\*) Values within a column followed by different letters were significantly different ( $P \leq 0.05$ )

Table 2.7 Cloudiness (% T)

Storage time (day)	% orange juice sacs vs pH variation					
	0% vs pH3	0% vs pH3.5	0% vs pH4	3% vs pH3	3% vs pH 3.5	3% vs pH4
0	0.34 ± 0.02 <sup>a</sup>	0.34 ± 0.02 <sup>a</sup>	0.38 ± 0.05 <sup>a</sup>	0.36 ± 0.02 <sup>a</sup>	0.40 ± 0.07 <sup>a</sup>	0.76 ± 0.21 <sup>a</sup>
3	0.47 ± 0.03 <sup>a</sup>	0.41 ± 0.10 <sup>a</sup>	0.42 ± 0.08 <sup>a</sup>	0.35 ± 0.07 <sup>a</sup>	0.45 ± 0.08 <sup>a</sup>	1.50 ± 0.27 <sup>a,b</sup>
6	0.73 ± 0.04 <sup>b</sup>	0.44 ± 0.11 <sup>a</sup>	0.41 ± 0.06 <sup>a</sup>	0.43 ± 0.13 <sup>a</sup>	1.69 ± 0.11 <sup>b</sup>	2.27 ± 0.64 <sup>b</sup>
9	1.37 ± 0.05 <sup>c</sup>	0.71 ± 0.17 <sup>b</sup>	0.92 ± 0.27 <sup>a</sup>	0.53 ± 0.15 <sup>a</sup>	1.74 ± 0.38 <sup>b</sup>	2.41 ± 0.31 <sup>b</sup>
12	4.52 ± 0.15 <sup>d</sup>	0.86 ± 0.10 <sup>b</sup>	6.93 ± 1.38 <sup>b</sup>	2.34 ± 1.34 <sup>b</sup>	6.12 ± 1.31 <sup>c</sup>	4.22 ± 0.94 <sup>c</sup>
15	5.80 ± 0.14 <sup>e</sup>	1.33 ± 0.21 <sup>c</sup>	8.33 ± 0.74 <sup>c</sup>	6.14 ± 1.23 <sup>c</sup>	6.28 ± 0.86 <sup>c</sup>	4.59 ± 0.86 <sup>c</sup>

\*) Values within a column followed by different letters were significantly different ( $P \leq 0.05$ )

Table 2.8 pH value

Storage time (day)	% orange juice sacs vs pH variation					
	0% vs pH3	0% vs pH3.5	0% vs pH4	3% vs pH3	3% vs pH 3.5	3% vs pH4
0	3.02 ± 0.02 <sup>a</sup>	3.50 ± 0.00 <sup>a</sup>	4.00 ± 0.00 <sup>a</sup>	3.04 ± 0.02 <sup>a</sup>	3.50 ± 0.00 <sup>a</sup>	4.00 ± 0.00 <sup>a</sup>
3	3.02 ± 0.02 <sup>a</sup>	3.46 ± 0.05 <sup>b</sup>	3.98 ± 0.01 <sup>a</sup>	3.03 ± 0.03 <sup>a</sup>	3.49 ± 0.04 <sup>a</sup>	3.98 ± 0.02 <sup>a</sup>
6	2.98 ± 0.02 <sup>b</sup>	3.46 ± 0.03 <sup>b,c</sup>	3.93 ± 0.02 <sup>b</sup>	2.96 ± 0.01 <sup>b</sup>	3.48 ± 0.04 <sup>a</sup>	3.91 ± 0.03 <sup>b</sup>
9	2.96 ± 0.01 <sup>b</sup>	3.43 ± 0.02 <sup>c,d</sup>	3.86 ± 0.02 <sup>c</sup>	2.92 ± 0.03 <sup>b,c</sup>	3.46 ± 0.02 <sup>a</sup>	3.84 ± 0.04 <sup>c</sup>
12	2.90 ± 0.02 <sup>c</sup>	3.41 ± 0.03 <sup>d</sup>	3.83 ± 0.03 <sup>c</sup>	2.89 ± 0.05 <sup>c,d</sup>	3.40 ± 0.03 <sup>b</sup>	3.75 ± 0.08 <sup>d</sup>
15	2.89 ± 0.03 <sup>c</sup>	3.37 ± 0.03 <sup>e</sup>	3.74 ± 0.03 <sup>d</sup>	2.85 ± 0.01 <sup>d</sup>	3.36 ± 0.05 <sup>c</sup>	3.67 ± 0.06 <sup>c</sup>

\*) Values within a column followed by different letters were significantly different ( $P \leq 0.05$ )

Table 2.9 Total Soluble Solid (TSS) (<sup>o</sup>Brix)

Storage time (day)	% orange juice sacs vs pH variation					
	0% vs pH3	0% vs pH3.5	0% vs pH4	3% vs pH3	3% vs pH 3.5	3% vs pH4
0	18.07 ± 0.23 <sup>a</sup>	18.33 ± 0.42 <sup>a</sup>	18.30 ± 0.52 <sup>a</sup>	18.00 ± 0.00 <sup>a</sup>	18.67 ± 0.49 <sup>a</sup>	18.60 ± 0.35 <sup>a</sup>
3	18.33 ± 0.46 <sup>ab</sup>	18.60 ± 0.40 <sup>ab</sup>	18.53 ± 0.46 <sup>ab</sup>	18.27 ± 0.12 <sup>ab</sup>	18.53 ± 0.31 <sup>a</sup>	18.27 ± 0.12 <sup>a</sup>
6	18.67 ± 0.31 <sup>bc</sup>	18.93 ± 0.12 <sup>b</sup>	19.00 ± 0.00 <sup>b</sup>	18.80 ± 0.20 <sup>b</sup>	18.93 ± 0.12 <sup>a</sup>	18.67 ± 0.12 <sup>a</sup>
9	18.20 ± 0.72 <sup>ab</sup>	18.73 ± 0.31 <sup>b</sup>	18.87 ± 0.23 <sup>ab</sup>	18.33 ± 0.23 <sup>ab</sup>	18.73 ± 0.23 <sup>a</sup>	18.53 ± 0.42 <sup>a</sup>
12	19.07 ± 0.31 <sup>cd</sup>	19.33 ± 0.58 <sup>c</sup>	19.60 ± 0.55 <sup>c</sup>	19.53 ± 0.61 <sup>c</sup>	19.47 ± 0.81 <sup>a</sup>	19.67 ± 0.31 <sup>b</sup>
15	19.40 ± 0.40 <sup>d</sup>	19.60 ± 0.20 <sup>c</sup>	18.80 ± 0.20 <sup>ab</sup>	18.47 ± 0.12 <sup>ab</sup>	18.67 ± 0.31 <sup>a</sup>	18.67 ± 0.23 <sup>a</sup>

\*) Values within a column followed by different letters were significantly different ( $P \leq 0.05$ )

Table 2.10 Total titrable acidity (% citric acid)

Storage time (day)	% orange juice sacs vs pH variation					
	0% vs pH3	0% vs pH3.5	0% vs pH4	3% vs pH3	3% vs pH 3.5	3% vs pH4
0	0.34 ± 0.01 <sup>a</sup>	0.29 ± 0.01 <sup>a</sup>	0.23 ± 0.00 <sup>a</sup>	0.32 ± 0.00 <sup>a</sup>	0.28 ± 0.01 <sup>a</sup>	0.23 ± 0.01 <sup>a</sup>
3	0.34 ± 0.00 <sup>a</sup>	0.28 ± 0.01 <sup>a</sup>	0.24 ± 0.01 <sup>a</sup>	0.32 ± 0.02 <sup>a</sup>	0.28 ± 0.01 <sup>a</sup>	0.23 ± 0.01 <sup>a</sup>
6	0.31 ± 0.02 <sup>a</sup>	0.30 ± 0.02 <sup>a</sup>	0.24 ± 0.01 <sup>a</sup>	0.33 ± 0.02 <sup>a</sup>	0.30 ± 0.02 <sup>a</sup>	0.23 ± 0.00 <sup>a</sup>
9	0.33 ± 0.01 <sup>a</sup>	0.27 ± 0.03 <sup>a</sup>	0.23 ± 0.01 <sup>a</sup>	0.31 ± 0.01 <sup>a</sup>	0.28 ± 0.01 <sup>a</sup>	0.21 ± 0.02 <sup>a</sup>
12	0.33 ± 0.01 <sup>a</sup>	0.29 ± 0.03 <sup>a</sup>	0.24 ± 0.01 <sup>a</sup>	0.32 ± 0.02 <sup>a</sup>	0.28 ± 0.02 <sup>a</sup>	0.23 ± 0.01 <sup>a</sup>
15	0.34 ± 0.01 <sup>a</sup>	0.29 ± 0.01 <sup>a</sup>	0.25 ± 0.03 <sup>a</sup>	0.33 ± 0.02 <sup>a</sup>	0.30 ± 0.01 <sup>a</sup>	0.24 ± 0.01 <sup>a</sup>

\*) Values within a column followed by different letters were significantly different ( $P \leq 0.05$ )

Table 2.11 Moisture content (%)

Storage time (day)	% orange juice sacs vs pH variation					
	0% vs pH3	0% vs pH3.5	0% vs pH4	3% vs pH3	3% vs pH 3.5	3% vs pH4
0	84.26 ± 0.30 <sup>ab</sup>	83.55 ± 0.23 <sup>a</sup>	83.22 ± 0.32 <sup>a</sup>	84.35 ± 0.26 <sup>ab</sup>	83.67 ± 0.16 <sup>ab</sup>	83.56 ± 0.23 <sup>ab</sup>
3	84.07 ± 0.36 <sup>a</sup>	83.61 ± 0.44 <sup>a</sup>	82.90 ± 0.16 <sup>a</sup>	84.23 ± 0.27 <sup>ab</sup>	83.49 ± 0.05 <sup>ac</sup>	84.03 ± 0.40 <sup>c</sup>
6	84.95 ± 0.11 <sup>c</sup>	83.65 ± 0.60 <sup>a</sup>	83.75 ± 0.30 <sup>b</sup>	84.53 ± 0.65 <sup>a</sup>	84.85 ± 0.29 <sup>d</sup>	83.27 ± 0.20 <sup>ad</sup>
9	84.78 ± 0.31 <sup>bc</sup>	84.43 ± 0.17 <sup>b</sup>	83.73 ± 0.09 <sup>b</sup>	84.91 ± 0.17 <sup>a</sup>	83.97 ± 0.32 <sup>b</sup>	83.89 ± 0.19 <sup>bc</sup>
12	83.98 ± 0.33 <sup>a</sup>	83.28 ± 0.06 <sup>a</sup>	82.97 ± 0.15 <sup>a</sup>	83.75 ± 0.05 <sup>b</sup>	83.46 ± 0.44 <sup>ac</sup>	83.11 ± 0.09 <sup>d</sup>
15	83.88 ± 0.42 <sup>a</sup>	83.59 ± 0.05 <sup>a</sup>	82.90 ± 0.29 <sup>a</sup>	84.49 ± 0.38 <sup>a</sup>	83.22 ± 0.25 <sup>c</sup>	83.08 ± 0.07 <sup>d</sup>

\*) Values within a column followed by different letters were significantly different ( $P \leq 0.05$ )

Table 2.12 Total solid (TS) (%)

Storage time (day)	% orange juice sacs vs pH variation					
	0% vs pH3	0% vs pH3.5	0% vs pH4	3% vs pH3	3% vs pH 3.5	3% vs pH4
0	18.07 ± 0.23 <sup>a</sup>	18.33 ± 0.42 <sup>a</sup>	18.30 ± 0.52 <sup>a</sup>	18.00 ± 0.00 <sup>a</sup>	18.67 ± 0.49 <sup>a</sup>	18.60 ± 0.35 <sup>a</sup>
3	18.33 ± 0.46 <sup>ab</sup>	18.60 ± 0.40 <sup>ab</sup>	18.53 ± 0.46 <sup>ab</sup>	18.27 ± 0.12 <sup>ab</sup>	18.53 ± 0.31 <sup>a</sup>	18.27 ± 0.12 <sup>a</sup>
6	18.67 ± 0.31 <sup>bc</sup>	18.93 ± 0.12 <sup>b</sup>	19.00 ± 0.00 <sup>b</sup>	18.80 ± 0.20 <sup>b</sup>	18.93 ± 0.12 <sup>a</sup>	18.67 ± 0.12 <sup>a</sup>
9	18.20 ± 0.72 <sup>ab</sup>	18.73 ± 0.31 <sup>b</sup>	18.87 ± 0.23 <sup>ab</sup>	18.33 ± 0.23 <sup>ab</sup>	18.73 ± 0.23 <sup>a</sup>	18.53 ± 0.42 <sup>a</sup>
12	19.07 ± 0.31 <sup>cd</sup>	19.33 ± 0.58 <sup>c</sup>	19.60 ± 0.53 <sup>c</sup>	19.53 ± 0.61 <sup>c</sup>	19.47 ± 0.81 <sup>a</sup>	19.67 ± 0.31 <sup>b</sup>
15	19.40 ± 0.40 <sup>d</sup>	19.60 ± 0.20 <sup>c</sup>	18.80 ± 0.20 <sup>ab</sup>	18.47 ± 0.12 <sup>ab</sup>	18.67 ± 0.31 <sup>a</sup>	18.67 ± 0.23 <sup>a</sup>

\*) Values within a column followed by different letters were significantly different ( $P \leq 0.05$ )



Table 2.13 Reducing sugar (%)

Storage time (day)	% orange juice sacs vs pH variation						
	0% vs pH3	0% vs pH3.5	0% vs pH4	3% vs pH3	3% vs pH 3.5	3% vs pH4	
0	5.53 ± 0.39 <sup>a</sup>	5.49 ± 0.33 <sup>a</sup>	5.76 ± 0.32 <sup>a</sup>	5.79 ± 0.13 <sup>a</sup>	5.83 ± 0.13 <sup>ab</sup>	5.82 ± 0.13 <sup>a</sup>	
3	4.28 ± 0.18 <sup>c</sup>	4.83 ± 0.33 <sup>a</sup>	4.42 ± 0.97 <sup>a</sup>	4.61 ± 0.37 <sup>bc</sup>	4.82 ± 0.03 <sup>c</sup>	3.91 ± 0.20 <sup>c</sup>	
6	5.81 ± 0.13 <sup>a</sup>	5.55 ± 0.41 <sup>a</sup>	5.71 ± 1.15 <sup>a</sup>	5.14 ± 0.64 <sup>ab</sup>	6.24 ± 0.16 <sup>d</sup>	6.35 ± 0.26 <sup>d</sup>	
9	5.55 ± 0.22 <sup>a</sup>	5.46 ± 0.45 <sup>a</sup>	5.89 ± 0.33 <sup>a</sup>	4.93 ± 0.86 <sup>bc</sup>	5.98 ± 0.24 <sup>ad</sup>	5.69 ± 0.24 <sup>ab</sup>	
12	5.35 ± 0.09 <sup>ab</sup>	5.19 ± 0.59 <sup>a</sup>	5.62 ± 0.27 <sup>a</sup>	4.81 ± 0.87 <sup>bc</sup>	5.61 ± 0.24 <sup>b</sup>	5.39 ± 0.18 <sup>b</sup>	
15	4.98 ± 0.40 <sup>b</sup>	5.20 ± 0.30 <sup>a</sup>	4.81 ± 0.39 <sup>a</sup>	4.27 ± 0.05 <sup>c</sup>	4.79 ± 0.10 <sup>c</sup>	5.46 ± 0.12 <sup>ab</sup>	

\*) Values within a column followed by different letters were significantly different ( $P \leq 0.05$ )

Table 2.14 PE enzyme (PMEU/g.s / 10<sup>-4</sup>)

Storage time (day)	% orange juice sacs vs pH variation						
	0% vs pH3	0% vs pH3.5	0% vs pH4	3% vs pH3	3% vs pH 3.5	3% vs pH4	
0	4.24 ± 1.92 <sup>a</sup>	1.89 ± 0.66 <sup>a</sup>	2.32 ± 1.00 <sup>a</sup>	4.68 ± 0.98 <sup>a</sup>	3.91 ± 0.47 <sup>a</sup>	4.75 ± 1.02 <sup>a</sup>	
3	4.19 ± 0.97 <sup>a</sup>	1.86 ± 0.63 <sup>a</sup>	2.08 ± 0.74 <sup>a</sup>	4.62 ± 0.38 <sup>a</sup>	3.72 ± 0.98 <sup>a</sup>	3.98 ± 0.94 <sup>a</sup>	
6	5.14 ± 0.43 <sup>b</sup>	2.43 ± 0.61 <sup>a</sup>	1.82 ± 0.61 <sup>a</sup>	4.28 ± 0.59 <sup>a</sup>	3.85 ± 0.34 <sup>a</sup>	2.26 ± 0.35 <sup>a</sup>	
9	4.34 ± 0.36 <sup>b</sup>	2.26 ± 0.38 <sup>a</sup>	2.24 ± 0.93 <sup>a</sup>	4.18 ± 0.34 <sup>a</sup>	3.68 ± 0.05 <sup>a</sup>	2.90 ± 0.32 <sup>a</sup>	
12	3.82 ± 0.29 <sup>a</sup>	1.39 ± 0.37 <sup>a</sup>	2.36 ± 0.63 <sup>a</sup>	3.34 ± 0.34 <sup>a</sup>	3.74 ± 0.18 <sup>a</sup>	3.31 ± 0.34 <sup>a</sup>	
15	3.36 ± 0.40 <sup>a</sup>	1.57 ± 0.35 <sup>a</sup>	2.86 ± 0.35 <sup>a</sup>	3.53 ± 0.38 <sup>a</sup>	4.11 ± 0.42 <sup>a</sup>	3.90 ± 0.33 <sup>a</sup>	

\*) Values within a column followed by different letters were significantly different ( $P \leq 0.05$ )

Table 2.15 Fiber content (%)

Storage time (day)	% orange juice sacs vs pH variation					
	0% vs pH3	0% vs pH3.5	0% vs pH4	3% vs pH3	3% vs pH 3.5	3% vs pH4
0	0.51 ± 0.09 <sup>a</sup>	0.35 ± 0.12 <sup>a</sup>	0.41 ± 0.10 <sup>a</sup>	0.43 ± 0.10 <sup>a</sup>	0.49 ± 0.15 <sup>a</sup>	0.55 ± 0.07 <sup>a</sup>
7	0.57 ± 0.08 <sup>a</sup>	0.38 ± 0.09 <sup>a</sup>	0.43 ± 0.13 <sup>a</sup>	0.44 ± 0.11 <sup>a</sup>	0.79 ± 0.16 <sup>b</sup>	0.58 ± 0.19 <sup>a</sup>
15	0.62 ± 0.07 <sup>a</sup>	0.46 ± 0.12 <sup>a</sup>	0.49 ± 0.10 <sup>a</sup>	0.63 ± 0.24 <sup>a</sup>	0.80 ± 0.13 <sup>b</sup>	0.79 ± 0.16 <sup>a</sup>

\*) Values within a column followed by different letters were significantly different ( $P \leq 0.05$ )

Table 2.16 Total Plate Count (log CFU/ml)

Storage time (day)	% orange juice sacs vs pH variation					
	0% vs pH3	0% vs pH3.5	0% vs pH4	3% vs pH3	3% vs pH 3.5	3% vs pH4
0	1.31 ± 0.05 <sup>a</sup>	1.16 ± 0.11 <sup>a</sup>	0.10 ± 0.07 <sup>a</sup>	1.43 ± 0.08 <sup>a</sup>	1.63 ± 0.04 <sup>a</sup>	1.80 ± 0.05 <sup>a</sup>
3	1.32 ± 0.04 <sup>a</sup>	1.71 ± 0.02 <sup>b</sup>	1.89 ± 0.03 <sup>b</sup>	2.05 ± 0.04 <sup>b</sup>	2.14 ± 0.05 <sup>b</sup>	2.13 ± 0.10 <sup>ab</sup>
6	2.08 ± 0.05 <sup>b</sup>	2.87 ± 0.04 <sup>c</sup>	2.78 ± 0.09 <sup>c</sup>	2.15 ± 0.09 <sup>b</sup>	2.43 ± 0.08 <sup>c</sup>	2.59 ± 0.21 <sup>b</sup>
9	3.60 ± 0.05 <sup>c</sup>	3.77 ± 0.06 <sup>d</sup>	3.89 ± 0.05 <sup>d</sup>	3.55 ± 0.12 <sup>c</sup>	3.70 ± 0.07 <sup>d</sup>	3.83 ± 0.04 <sup>c</sup>
12	3.78 ± 0.07 <sup>d</sup>	3.95 ± 0.07 <sup>d</sup>	4.13 ± 0.07 <sup>e</sup>	4.66 ± 0.20 <sup>d</sup>	4.51 ± 0.03 <sup>e</sup>	4.54 ± 0.11 <sup>d</sup>
15	4.51 ± 0.08 <sup>e</sup>	4.73 ± 0.05 <sup>f</sup>	4.76 ± 0.04 <sup>f</sup>	4.80 ± 0.09 <sup>d</sup>	4.79 ± 0.06 <sup>f</sup>	5.06 ± 0.64 <sup>d</sup>

\*) Values within a column followed by different letters were significantly different ( $P \leq 0.05$ )

Table 2.17 Lactic acid bacteria (log CFU/ml)

Storage time (day)	% orange juice sacs vs pH variation					
	0% vs pH3	0% vs pH3.5	0% vs pH4	3% vs pH3	3% vs pH 3.5	3% vs pH4
0	1.17 ± 0.10 <sup>a</sup>	1.18 ± 0.09 <sup>a</sup>	1.11 ± 0.10 <sup>a</sup>	1.42 ± 0.12 <sup>a</sup>	1.20 ± 0.09 <sup>a</sup>	1.37 ± 0.17 <sup>a</sup>
3	1.44 ± 0.09 <sup>b</sup>	1.81 ± 0.06 <sup>b</sup>	1.72 ± 0.08 <sup>b</sup>	1.88 ± 0.02 <sup>b</sup>	1.58 ± 0.06 <sup>b</sup>	1.89 ± 0.08 <sup>b</sup>
6	2.23 ± 0.03 <sup>c</sup>	2.21 ± 0.06 <sup>c</sup>	2.45 ± 0.13 <sup>c</sup>	2.51 ± 0.18 <sup>c</sup>	2.59 ± 0.14 <sup>c</sup>	2.75 ± 0.12 <sup>c</sup>
9	2.84 ± 0.03 <sup>d</sup>	2.86 ± 0.00 <sup>d</sup>	2.92 ± 0.21 <sup>d</sup>	3.44 ± 0.49 <sup>d</sup>	3.17 ± 0.09 <sup>d</sup>	3.29 ± 0.25 <sup>d</sup>
12	3.27 ± 0.13 <sup>e</sup>	3.20 ± 0.06 <sup>e</sup>	3.61 ± 0.25 <sup>e</sup>	3.86 ± 0.10 <sup>e</sup>	3.86 ± 0.07 <sup>e</sup>	3.77 ± 0.06 <sup>e</sup>
15	3.83 ± 0.09 <sup>f</sup>	3.70 ± 0.13 <sup>f</sup>	3.79 ± 0.08 <sup>e</sup>	3.92 ± 0.07 <sup>f</sup>	4.07 ± 0.07 <sup>f</sup>	4.05 ± 0.11 <sup>f</sup>

\*) Values within a column followed by different letters were significantly different ( $P \leq 0.05$ )

Table 2.18 Yeast and mold (log CFU/ml)

Storage time (day)	% orange juice sacs vs pH variation					
	0% vs pH3	0% vs pH3.5	0% vs pH4	3% vs pH3	3% vs pH 3.5	3% vs pH4
0	1.49 ± 0.10 <sup>a</sup>	2.12 ± 0.02 <sup>a</sup>	2.19 ± 0.01 <sup>a</sup>	1.60 ± 0.03 <sup>a</sup>	1.93 ± 0.01 <sup>a</sup>	1.97 ± 0.03 <sup>a</sup>
15	2.63 ± 0.04 <sup>b</sup>	2.79 ± 0.05 <sup>b</sup>	3.13 ± 0.03 <sup>b</sup>	2.58 ± 0.06 <sup>b</sup>	3.03 ± 0.03 <sup>b</sup>	3.45 ± 0.05 <sup>b</sup>

\*) Values within a column followed by different letters were significantly different ( $P \leq 0.05$ )

Table 2.19 Vitamin C content (mg/100ml)

Storage time (day)	% orange juice sacs vs pH variation					
	0% vs pH3	0% vs pH3.5	0% vs pH4	3% vs pH3	3% vs pH 3.5	3% vs pH4
0	32.49 ± 0.16 <sup>a</sup>	32.48 ± 0.41 <sup>a</sup>	29.54 ± 0.29 <sup>a</sup>	30.37 ± 0.92 <sup>a</sup>	30.70 ± 0.18 <sup>a</sup>	29.91 ± 0.27 <sup>a</sup>
3	30.94 ± 0.64 <sup>b</sup>	31.74 ± 0.56 <sup>b</sup>	28.99 ± 0.51 <sup>ab</sup>	28.95 ± 0.83 <sup>b</sup>	29.70 ± 0.76 <sup>b</sup>	28.80 ± 0.57 <sup>b</sup>
6	30.31 ± 0.20 <sup>c</sup>	31.39 ± 0.78 <sup>b</sup>	28.61 ± 0.40 <sup>b</sup>	28.83 ± 0.87 <sup>b</sup>	28.95 ± 0.76 <sup>c</sup>	27.98 ± 0.74 <sup>c</sup>
9	30.04 ± 0.06 <sup>cd</sup>	30.21 ± 0.99 <sup>c</sup>	26.83 ± 0.91 <sup>c</sup>	28.72 ± 1.02 <sup>b</sup>	28.62 ± 0.10 <sup>c</sup>	26.33 ± 0.17 <sup>d</sup>
12	29.71 ± 0.09 <sup>d</sup>	29.25 ± 0.93 <sup>d</sup>	25.69 ± 0.90 <sup>d</sup>	28.35 ± 0.87 <sup>c</sup>	28.24 ± 0.21 <sup>c</sup>	25.51 ± 0.17 <sup>e</sup>
15	29.77 ± 0.10 <sup>d</sup>	28.46 ± 0.39 <sup>e</sup>	23.79 ± 0.40 <sup>e</sup>	27.57 ± 0.87 <sup>d</sup>	26.82 ± 0.23 <sup>d</sup>	23.39 ± 0.11 <sup>f</sup>

\*) Values within a column followed by different letters were significantly different ( $P \leq 0.05$ )

Table 2.20 Carotenoid content ( $\mu\text{g/ml}$ )

Storage time (day)	% orange juice sacs vs pH variation					
	0% vs pH3	0% vs pH3.5	0% vs pH4	3% vs pH3	3% vs pH 3.5	3% vs pH4
0	3.41 ± 0.37 <sup>a</sup>	3.81 ± 0.68 <sup>a</sup>	3.93 ± 0.74 <sup>a</sup>	3.77 ± 0.53 <sup>a</sup>	4.31 ± 1.05 <sup>a</sup>	4.21 ± 0.28 <sup>a</sup>
7	3.34 ± 0.68 <sup>a</sup>	3.42 ± 0.68 <sup>b</sup>	3.36 ± 0.39 <sup>a</sup>	3.72 ± 0.70 <sup>a</sup>	3.71 ± 0.70 <sup>a</sup>	3.78 ± 0.69 <sup>a</sup>
15	2.92 ± 0.35 <sup>a</sup>	3.51 ± 0.42 <sup>a</sup>	3.32 ± 0.52 <sup>a</sup>	2.92 ± 0.24 <sup>a</sup>	2.85 ± 0.39 <sup>a</sup>	2.97 ± 0.26 <sup>a</sup>

\*) Values within a column followed by different letters were significantly different ( $P \leq 0.05$ )

## II. The result of statistics analysis between different.

### 3. The effect of salt and sugar addition on orange juices stored at Chilled temperature

Table 3.1 L value

Storage time (day)	% sugar vs %salt									
	0% vs 0%	0% vs 0.05%	0% vs 0.1%	2.5% vs 0%	2.5% vs 0.05%	2.5% vs 0.1%	5% vs 0%	5% vs 0.05%	5% vs 0.1%	5% vs 0.1%
0	44.58 ± 0.20 <sup>a</sup>	45.86 ± 1.23 <sup>abc</sup>	47.40 ± 2.36 <sup>c</sup>	47.04 ± 1.50 <sup>bc</sup>	45.85 ± 0.25 <sup>abc</sup>	45.08 ± 0.63 <sup>a</sup>	44.42 ± 0.14 <sup>n</sup>	44.99 ± 0.20 <sup>a</sup>	45.43 ± 0.08 <sup>ab</sup>	
3	44.64 ± 0.55 <sup>a</sup>	46.14 ± 1.07 <sup>bc</sup>	48.24 ± 0.99 <sup>d</sup>	46.60 ± 0.56 <sup>c</sup>	46.30 ± 0.83 <sup>bc</sup>	45.47 ± 0.32 <sup>ab</sup>	44.76 ± 0.12 <sup>a</sup>	46.09 ± 0.14 <sup>bc</sup>	45.44 ± 0.14 <sup>ab</sup>	
6	45.64 ± 0.64 <sup>ab</sup>	46.68 ± 0.13 <sup>abc</sup>	48.49 ± 3.21 <sup>e</sup>	47.04 ± 0.52 <sup>bc</sup>	45.89 ± 0.10 <sup>ab</sup>	45.77 ± 1.04 <sup>ab</sup>	45.48 ± 0.44 <sup>ab</sup>	47.33 ± 0.20 <sup>bc</sup>	44.58 ± 0.17 <sup>a</sup>	
9	45.60 ± 0.09 <sup>ab</sup>	46.64 ± 0.11 <sup>bc</sup>	48.65 ± 3.00 <sup>e</sup>	46.98 ± 0.37 <sup>bc</sup>	45.77 ± 0.14 <sup>ab</sup>	45.65 ± 1.03 <sup>ab</sup>	45.53 ± 0.30 <sup>ab</sup>	47.26 ± 0.07 <sup>bc</sup>	44.46 ± 0.45 <sup>a</sup>	
12	46.29 ± 0.47 <sup>a</sup>	47.42 ± 0.62 <sup>a</sup>	47.57 ± 2.30 <sup>a</sup>	46.58 ± 0.31 <sup>a</sup>	44.39 ± 0.22 <sup>a</sup>	45.16 ± 0.73 <sup>a</sup>	44.80 ± 0.78 <sup>a</sup>	45.42 ± 0.96 <sup>a</sup>	46.34 ± 2.04 <sup>a</sup>	
15	46.75 ± 0.75 <sup>ab</sup>	49.58 ± 1.29 <sup>de</sup>	49.06 ± 1.87 <sup>de</sup>	49.65 ± 0.86 <sup>e</sup>	47.18 ± 0.28 <sup>abc</sup>	46.33 ± 1.40 <sup>a</sup>	47.58 ± 0.60 <sup>abc</sup>	48.64 ± 0.21 <sup>bcde</sup>	47.89 ± 0.10 <sup>abcde</sup>	

\*) Values within a row followed by different letters were significantly different ( $P \leq 0.05$ )

Table 3.2 a\* value

Storage time (day)	% sugar vs %salt									
	0% vs 0%	0% vs 0.05%	0% vs 0.1%	2.5% vs 0%	2.5% vs 0.05%	2.5% vs 0.1%	5% vs 0%	5% vs 0.05%	5% vs 0.1%	
0	-4.92 ± 1.99 <sup>a</sup>	-6.06 ± 0.68 <sup>ab</sup>	-7.63 ± 1.88 <sup>b</sup>	-7.58 ± 0.88 <sup>b</sup>	-6.83 ± 0.62 <sup>ab</sup>	-4.83 ± 1.55 <sup>a</sup>	-5.04 ± 1.42 <sup>a</sup>	-5.16 ± 0.23 <sup>a</sup>	-5.46 ± 1.28 <sup>ab</sup>	
3	-4.49 ± 1.00 <sup>a</sup>	-6.12 ± 0.46 <sup>abc</sup>	-7.57 ± 1.55 <sup>c</sup>	-7.93 ± 0.14 <sup>c</sup>	-7.11 ± 0.83 <sup>bc</sup>	-5.33 ± 1.71 <sup>ab</sup>	-5.40 ± 0.88 <sup>ab</sup>	-6.03 ± 1.19 <sup>abc</sup>	-5.42 ± 0.44 <sup>ab</sup>	
6	-3.76 ± 0.51 <sup>a</sup>	-6.64 ± 0.83 <sup>bcd</sup>	-7.63 ± 1.59 <sup>cd</sup>	-7.63 ± 0.78 <sup>cd</sup>	-7.96 ± 0.79 <sup>d</sup>	-5.72 ± 2.27 <sup>abc</sup>	-6.55 ± 0.24 <sup>bcd</sup>	-7.10 ± 0.36 <sup>cd</sup>	-4.77 ± 0.87 <sup>ab</sup>	
9	-3.45 ± 0.38 <sup>a</sup>	-6.14 ± 0.99 <sup>bcd</sup>	-7.40 ± 1.36 <sup>d</sup>	-7.45 ± 0.42 <sup>d</sup>	-7.40 ± 0.76 <sup>d</sup>	-5.51 ± 1.78 <sup>bc</sup>	-5.74 ± 0.42 <sup>bcd</sup>	-6.81 ± 0.56 <sup>cd</sup>	-4.68 ± 0.88 <sup>ab</sup>	
12	-6.73 ± 2.51 <sup>a</sup>	-8.14 ± 1.32 <sup>a</sup>	-8.54 ± 1.44 <sup>a</sup>	-9.07 ± 0.65 <sup>a</sup>	-9.44 ± 1.05 <sup>a</sup>	-8.06 ± 0.42 <sup>a</sup>	-6.42 ± 1.16 <sup>a</sup>	-8.21 ± 0.39 <sup>a</sup>	-8.28 ± 0.08 <sup>a</sup>	
15	-6.78 ± 2.70 <sup>a</sup>	-8.42 ± 0.99 <sup>a</sup>	-8.58 ± 1.52 <sup>a</sup>	-9.15 ± 0.75 <sup>a</sup>	-9.27 ± 1.00 <sup>a</sup>	-8.17 ± 0.34 <sup>a</sup>	-6.52 ± 1.19 <sup>a</sup>	-8.29 ± 0.35 <sup>a</sup>	-8.30 ± 0.07 <sup>a</sup>	

\*) Values within a row followed by different letters were significantly different ( $P \leq 0.05$ )

Table 3.3 b\* value

Storage time (day)	% sugar vs %salt									
	0% vs 0%	0% vs 0.05%	0% vs 0.1%	2.5% vs 0%	2.5% vs 0.05%	2.5% vs 0.1%	5% vs 0%	5% vs 0.05%	5% vs 0.1%	
0	25.00 ± 2.12 <sup>a</sup>	22.44 ± 1.52 <sup>abc</sup>	24.00 ± 1.01 <sup>c</sup>	25.58 ± 1.27 <sup>bc</sup>	32.29 ± 0.48 <sup>abc</sup>	28.04 ± 1.40 <sup>a</sup>	27.08 ± 0.80 <sup>a</sup>	32.10 ± 0.56 <sup>ab</sup>	27.80 ± 0.52 <sup>ab</sup>	
3	25.24 ± 1.82 <sup>a</sup>	25.09 ± 2.50 <sup>a</sup>	25.19 ± 2.26 <sup>a</sup>	26.84 ± 1.50 <sup>b</sup>	33.32 ± 0.48 <sup>d</sup>	27.58 ± 1.07 <sup>bc</sup>	28.36 ± 0.95 <sup>bc</sup>	33.76 ± 1.06 <sup>d</sup>	28.78 ± 0.76 <sup>c</sup>	
6	26.75 ± 2.60 <sup>a</sup>	28.08 ± 2.96 <sup>ab</sup>	27.52 ± 3.06 <sup>ab</sup>	29.88 ± 3.24 <sup>b</sup>	35.53 ± 0.25 <sup>c</sup>	28.14 ± 1.02 <sup>ab</sup>	29.14 ± 1.55 <sup>ab</sup>	35.06 ± 0.20 <sup>c</sup>	27.77 ± 0.52 <sup>ab</sup>	
9	26.56 ± 2.76 <sup>a</sup>	27.26 ± 3.9 <sup>a</sup>	27.25 ± 3.09 <sup>a</sup>	29.66 ± 3.46 <sup>a</sup>	35.46 ± 0.30 <sup>b</sup>	28.11 ± 0.87 <sup>a</sup>	28.51 ± 2.42 <sup>a</sup>	34.70 ± 0.15 <sup>b</sup>	27.99 ± 0.24 <sup>a</sup>	
12	27.08 ± 3.05 <sup>a</sup>	27.85 ± 3.90 <sup>ab</sup>	27.83 ± 3.40 <sup>ab</sup>	30.89 ± 4.12 <sup>b</sup>	35.44 ± 0.40 <sup>ab</sup>	29.23 ± 2.07 <sup>ab</sup>	29.11 ± 2.84 <sup>ab</sup>	35.13 ± 0.18 <sup>c</sup>	31.01 ± 0.48 <sup>b</sup>	
15	27.08 ± 2.96 <sup>a</sup>	27.96 ± 3.98 <sup>ab</sup>	27.95 ± 3.36 <sup>ab</sup>	30.87 ± 4.05 <sup>b</sup>	35.37 ± 0.22 <sup>c</sup>	29.37 ± 2.05 <sup>ab</sup>	29.13 ± 2.59 <sup>ab</sup>	35.27 ± 0.23 <sup>c</sup>	30.96 ± 0.37 <sup>b</sup>	

\*) Values within a row followed by different letters were significantly different ( $P \leq 0.05$ )

Table 3.4 Browning value

Storage time (day)	% sugar vs %salt									
	0% vs 0%	0% vs 0.05%	0% vs 0.1%	2.5% vs 0%	2.5% vs 0.05%	2.5% vs 0.1%	5% vs 0%	5% vs 0.05%	5% vs 0.1%	5% vs 0.1%
0	0.00 ± 0.00 <sup>a</sup>	3.52 ± 0.27 <sup>b</sup>	3.11 ± 0.75 <sup>b</sup>	2.75 ± 2.11 <sup>b</sup>	7.60 ± 1.83 <sup>c</sup>	3.63 ± 0.48 <sup>b</sup>	2.71 ± 0.77 <sup>b</sup>	7.32 ± 2.43 <sup>c</sup>	3.51 ± 1.52 <sup>b</sup>	
3	0.81 ± 0.72 <sup>a</sup>	2.31 ± 0.70 <sup>a,b</sup>	2.68 ± 1.49 <sup>b,c</sup>	3.74 ± 1.55 <sup>b,c</sup>	8.64 ± 1.91 <sup>d</sup>	3.15 ± 0.93 <sup>b,c</sup>	3.80 ± 0.86 <sup>b,c</sup>	9.20 ± 1.70 <sup>d</sup>	4.24 ± 1.32 <sup>c</sup>	
6	2.77 ± 0.87 <sup>a</sup>	3.84 ± 1.65 <sup>a,b</sup>	3.90 ± 0.56 <sup>a,b</sup>	5.71 ± 0.81 <sup>b</sup>	11.00 ± 2.20 <sup>e</sup>	3.87 ± 0.99 <sup>a,b</sup>	4.72 ± 0.69 <sup>a,b</sup>	10.45 ± 2.02 <sup>e</sup>	3.27 ± 2.34 <sup>a,b</sup>	
9	2.83 ± 1.17 <sup>a</sup>	2.97 ± 1.98 <sup>a</sup>	3.54 ± 0.56 <sup>a</sup>	5.50 ± 1.08 <sup>a</sup>	10.79 ± 1.92 <sup>b</sup>	3.74 ± 1.13 <sup>a</sup>	4.02 ± 0.70 <sup>a</sup>	10.08 ± 2.07 <sup>b</sup>	3.48 ± 2.16 <sup>a</sup>	
12	2.90 ± 0.91 <sup>a</sup>	4.54 ± 2.54 <sup>a,b</sup>	4.68 ± 0.98 <sup>a,b</sup>	7.46 ± 0.90 <sup>b</sup>	11.43 ± 2.26 <sup>c</sup>	5.50 ± 1.46 <sup>a,b</sup>	4.84 ± 0.93 <sup>a,b</sup>	10.72 ± 2.00 <sup>c</sup>	7.01 ± 1.98 <sup>b</sup>	
15	2.95 ± 0.90 <sup>a</sup>	4.82 ± 2.52 <sup>a,b</sup>	4.79 ± 0.96 <sup>a,b</sup>	7.49 ± 0.74 <sup>b</sup>	11.30 ± 2.40 <sup>c</sup>	5.65 ± 1.41 <sup>a,b</sup>	4.87 ± 0.73 <sup>a,b</sup>	10.88 ± 2.10 <sup>c</sup>	7.00 ± 2.06 <sup>b</sup>	

\*) Values within a row followed by different letters were significantly different ( $P \leq 0.05$ )

Table 3.5 Total color difference ( $\Delta E^*$ )

Storage time (day)	% sugar vs %salt									
	0% vs 0%	0% vs 0.05%	0% vs 0.1%	2.5% vs 0%	2.5% vs 0.05%	2.5% vs 0.1%	5% vs 0%	5% vs 0.05%	5% vs 0.1%	5% vs 0.1%
0	0.00 ± 0.00 <sup>a</sup>	3.87 ± 0.80 <sup>b</sup>	4.44 ± 1.72 <sup>b</sup>	3.83 ± 2.37 <sup>b</sup>	7.71 ± 1.82 <sup>c</sup>	3.69 ± 0.42 <sup>b</sup>	2.72 ± 0.76 <sup>b</sup>	7.34 ± 2.42 <sup>c</sup>	3.62 ± 1.52 <sup>b</sup>	
3	0.94 ± 0.62 <sup>a</sup>	2.84 ± 1.28 <sup>b</sup>	4.58 ± 1.62 <sup>c</sup>	4.35 ± 1.16 <sup>b,c</sup>	8.83 ± 1.88 <sup>d</sup>	3.28 ± 0.92 <sup>b,c</sup>	3.81 ± 0.87 <sup>b,c</sup>	9.33 ± 1.65 <sup>d</sup>	4.32 ± 1.33 <sup>b,c</sup>	
6	3.00 ± 0.72 <sup>a</sup>	4.41 ± 1.51 <sup>a,b,c</sup>	5.90 ± 1.89 <sup>b,c</sup>	6.25 ± 0.58 <sup>c</sup>	11.08 ± 2.18 <sup>d</sup>	4.11 ± 1.09 <sup>a,b,c</sup>	4.82 ± 0.78 <sup>a,b,c</sup>	10.81 ± 1.96 <sup>d</sup>	3.28 ± 2.34 <sup>a,b</sup>	
9	3.04 ± 1.05 <sup>a</sup>	3.74 ± 1.62 <sup>a</sup>	5.72 ± 1.79 <sup>a</sup>	6.03 ± 0.88 <sup>a</sup>	10.85 ± 1.91 <sup>b</sup>	3.97 ± 1.13 <sup>a</sup>	4.15 ± 0.66 <sup>a</sup>	10.43 ± 2.03 <sup>b</sup>	3.49 ± 2.16 <sup>a</sup>	
12	3.45 ± 0.64 <sup>a</sup>	5.43 ± 2.35 <sup>a,b</sup>	5.86 ± 0.65 <sup>a,b</sup>	7.74 ± 0.80 <sup>b</sup>	11.43 ± 2.26 <sup>c</sup>	5.57 ± 1.51 <sup>a,b</sup>	4.92 ± 0.81 <sup>a,b</sup>	10.78 ± 2.05 <sup>c</sup>	7.44 ± 1.65 <sup>b</sup>	
15	3.71 ± 1.06 <sup>a</sup>	7.13 ± 2.19 <sup>b,c</sup>	6.75 ± 0.81 <sup>b,c</sup>	9.10 ± 0.10 <sup>c</sup>	11.60 ± 2.32 <sup>d</sup>	6.02 ± 1.34 <sup>a,b</sup>	5.77 ± 0.20 <sup>a,b</sup>	11.62 ± 2.10 <sup>d</sup>	7.76 ± 1.96 <sup>b,c</sup>	

\*) Values within a row followed by different letters were significantly different ( $P \leq 0.05$ )

Table 3.6 Cloudiness (%T)

Storage time (day)	% sugar vs %salt									
	0% vs 0%	0% vs 0.05%	0% vs 0.1%	2.5% vs 0%	2.5% vs 0.05%	2.5% vs 0.1%	5% vs 0%	5% vs 0.05%	5% vs 0.1%	5% vs 0.1%
0	11.05 ± 1.53 <sup>a</sup>	11.27 ± 0.93 <sup>a</sup>	11.71 ± 1.36 <sup>a</sup>	12.10 ± 1.35 <sup>a</sup>	10.01 ± 1.44 <sup>a</sup>	10.29 ± 0.35 <sup>a</sup>	7.59 ± 0.54 <sup>a</sup>	9.74 ± 1.50 <sup>a</sup>	8.60 ± 1.33 <sup>a</sup>	
3	11.19 ± 1.66 <sup>a</sup>	11.68 ± 1.55 <sup>a</sup>	11.43 ± 0.81 <sup>a</sup>	12.08 ± 1.41 <sup>a</sup>	10.38 ± 1.35 <sup>a</sup>	10.45 ± 0.49 <sup>a</sup>	8.58 ± 1.51 <sup>a</sup>	9.92 ± 1.50 <sup>a</sup>	9.44 ± 0.85 <sup>a</sup>	
6	11.16 ± 0.94 <sup>a</sup>	12.46 ± 1.44 <sup>a</sup>	11.85 ± 0.65 <sup>a</sup>	12.07 ± 1.59 <sup>a</sup>	10.64 ± 1.31 <sup>a</sup>	10.61 ± 0.76 <sup>a</sup>	10.16 ± 0.34 <sup>a</sup>	11.07 ± 1.01 <sup>a</sup>	10.07 ± 0.20 <sup>a</sup>	
9	12.04 ± 0.70 <sup>a</sup>	12.13 ± 1.59 <sup>a</sup>	12.86 ± 0.50 <sup>a</sup>	12.31 ± 1.20 <sup>a</sup>	11.15 ± 1.01 <sup>a</sup>	11.35 ± 0.32 <sup>a</sup>	10.14 ± 0.09 <sup>a</sup>	11.58 ± 1.22 <sup>a</sup>	10.79 ± 0.06 <sup>a</sup>	
12	12.53 ± 0.78 <sup>a</sup>	12.47 ± 0.84 <sup>a</sup>	13.36 ± 1.31 <sup>a</sup>	12.71 ± 1.12 <sup>a</sup>	12.19 ± 1.10 <sup>a</sup>	12.24 ± 0.16 <sup>a</sup>	12.16 ± 1.17 <sup>a</sup>	12.89 ± 0.82 <sup>a</sup>	11.77 ± 0.46 <sup>a</sup>	
15	13.59 ± 1.58 <sup>a</sup>	12.99 ± 0.64 <sup>a</sup>	15.06 ± 0.83 <sup>a</sup>	13.44 ± 0.62 <sup>a</sup>	12.74 ± 0.31 <sup>a</sup>	13.19 ± 1.66 <sup>a</sup>	12.89 ± 0.65 <sup>a</sup>	13.85 ± 1.65 <sup>a</sup>	13.01 ± 1.51 <sup>a</sup>	

\*) Values within a row followed by different letters were significantly different ( $P \leq 0.05$ )

Table 3.7 Viscosity (cps)

Storage time (day)	% sugar vs %salt									
	0% vs 0%	0% vs 0.05%	0% vs 0.1%	2.5% vs 0%	2.5% vs 0.05%	2.5% vs 0.1%	5% vs 0%	5% vs 0.05%	5% vs 0.1%	5% vs 0.1%
0	2.27 ± 0.09 <sup>a</sup>	2.57 ± 0.24 <sup>ab</sup>	2.95 ± 0.28 <sup>bc</sup>	3.34 ± 0.26 <sup>c</sup>	2.63 ± 0.21 <sup>ab</sup>	2.97 ± 0.33 <sup>bc</sup>	2.82 ± 0.69 <sup>abc</sup>	2.93 ± 0.55 <sup>bc</sup>	2.89 ± 0.10 <sup>bc</sup>	
7	2.11 ± 0.19 <sup>a</sup>	2.40 ± 0.29 <sup>ab</sup>	2.52 ± 0.10 <sup>abc</sup>	2.95 ± 0.25 <sup>c</sup>	2.35 ± 0.18 <sup>ab</sup>	2.63 ± 0.08 <sup>bc</sup>	2.44 ± 0.34 <sup>ab</sup>	2.67 ± 0.33 <sup>bc</sup>	2.70 ± 0.15 <sup>bc</sup>	
15	1.95 ± 0.24 <sup>ab</sup>	2.14 ±	2.22 ± 0.24 <sup>abc,d</sup>	2.48 ± 0.19 <sup>d</sup>	1.84 ± 0.27 <sup>a</sup>	2.37 ± 0.24 <sup>d</sup>	2.08 ± 0.19 <sup>abc</sup>	2.51 ± 0.27 <sup>d</sup>	2.27 ± 0.13 <sup>bc,d</sup>	

\*) Values within a row followed by different letters were significantly different ( $P \leq 0.05$ )



Table 3.8 pH value

Storage time (day)	% sugar vs %salt									
	0% vs 0%	0% vs 0.05%	0% vs 0.1%	2.5% vs 0%	2.5% vs 0.05%	2.5% vs 0.1%	5% vs 0%	5% vs 0.05%	5% vs 0.1%	5% vs 0.1%
0	3.29 ± 0.10 <sup>a</sup>	3.33 ± 0.11 <sup>a</sup>	3.30 ± 0.14 <sup>a</sup>	3.44 ± 0.02 <sup>a</sup>	3.30 ± 0.06 <sup>a</sup>	3.28 ± 0.10 <sup>a</sup>	3.34 ± 0.04 <sup>a</sup>	3.39 ± 0.06 <sup>a</sup>	3.34 ± 0.04 <sup>a</sup>	3.40 ± 0.08 <sup>a</sup>
3	3.19 ± 0.04 <sup>a</sup>	3.22 ± 0.06 <sup>a</sup>	3.22 ± 0.13 <sup>a</sup>	3.30 ± 0.01 <sup>a</sup>	3.21 ± 0.05 <sup>a</sup>	3.18 ± 0.10 <sup>a</sup>	3.21 ± 0.03 <sup>a</sup>	3.27 ± 0.06 <sup>a</sup>	3.21 ± 0.03 <sup>a</sup>	3.31 ± 0.08 <sup>a</sup>
6	3.09 ± 0.06 <sup>ab</sup>	3.12 ± 0.09 <sup>ab</sup>	3.10 ± 0.12 <sup>ab</sup>	3.19 ± 0.08 <sup>ab</sup>	3.09 ± 0.03 <sup>ab</sup>	3.07 ± 0.05 <sup>a</sup>	3.07 ± 0.04 <sup>a</sup>	3.20 ± 0.02 <sup>b</sup>	3.07 ± 0.04 <sup>a</sup>	3.19 ± 0.04 <sup>ab</sup>
9	2.95 ± 0.08 <sup>a</sup>	3.12 ± 0.16 <sup>a</sup>	3.10 ± 0.17 <sup>a</sup>	3.15 ± 0.03 <sup>a</sup>	3.10 ± 0.08 <sup>a</sup>	3.05 ± 0.13 <sup>a</sup>	3.00 ± 0.05 <sup>a</sup>	3.14 ± 0.04 <sup>a</sup>	3.00 ± 0.05 <sup>a</sup>	3.13 ± 0.08 <sup>a</sup>
12	2.99 ± 0.10 <sup>a</sup>	3.13 ± 0.11 <sup>a</sup>	3.08 ± 0.17 <sup>a</sup>	3.20 ± 0.05 <sup>a</sup>	3.08 ± 0.07 <sup>a</sup>	3.07 ± 0.07 <sup>a</sup>	3.01 ± 0.07 <sup>a</sup>	3.12 ± 0.04 <sup>a</sup>	3.01 ± 0.07 <sup>a</sup>	3.09 ± 0.07 <sup>a</sup>
15	3.10 ± 0.07 <sup>a</sup>	3.12 ± 0.09 <sup>a</sup>	3.08 ± 0.13 <sup>a</sup>	3.19 ± 0.07 <sup>a</sup>	3.08 ± 0.02 <sup>a</sup>	3.08 ± 0.03 <sup>a</sup>	3.11 ± 0.01 <sup>a</sup>	3.16 ± 0.05 <sup>a</sup>	3.11 ± 0.01 <sup>a</sup>	3.16 ± 0.06 <sup>a</sup>

\*) Values within a row followed by different letters were significantly different ( $P \leq 0.05$ )

Table 3.9 Total soluble solid (TSS) (°Brix)

Storage time (day)	% sugar vs %salt									
	0% vs 0%	0% vs 0.05%	0% vs 0.1%	2.5% vs 0%	2.5% vs 0.05%	2.5% vs 0.1%	5% vs 0%	5% vs 0.05%	5% vs 0.1%	5% vs 0.1%
0	12.13 ± 0.23 <sup>a</sup>	11.47 ± 0.50 <sup>b</sup>	11.67 ± 0.76 <sup>a</sup>	14.00 ± 0.00 <sup>a</sup>	13.87 ± 0.23 <sup>a</sup>	13.93 ± 1.01 <sup>a</sup>	15.80 ± 1.00 <sup>a</sup>	16.33 ± 0.70 <sup>a</sup>	15.80 ± 1.00 <sup>a</sup>	16.53 ± 0.50 <sup>a</sup>
3	11.67 ± 0.58 <sup>a</sup>	11.67 ± 0.61 <sup>a</sup>	11.87 ± 0.81 <sup>a</sup>	13.93 ± 0.12 <sup>a</sup>	14.47 ± 0.50 <sup>b</sup>	14.00 ± 0.92 <sup>a</sup>	15.33 ± 1.15 <sup>a</sup>	15.47 ± 2.00 <sup>a</sup>	15.33 ± 1.15 <sup>a</sup>	16.47 ± 0.61 <sup>a</sup>
6	10.87 ± 0.90 <sup>a</sup>	11.27 ± 0.50 <sup>b</sup>	11.87 ± 0.31 <sup>a</sup>	14.07 ± 0.31 <sup>a</sup>	14.40 ± 0.40 <sup>a</sup>	14.33 ± 0.64 <sup>a</sup>	15.33 ± 1.15 <sup>a</sup>	15.40 ± 1.97 <sup>a</sup>	15.33 ± 1.15 <sup>a</sup>	16.60 ± 0.69 <sup>a</sup>
9	10.93 ± 0.81 <sup>a</sup>	11.33 ± 0.42 <sup>b</sup>	11.67 ± 0.50 <sup>b</sup>	14.00 ± 0.20 <sup>a</sup>	14.47 ± 0.46 <sup>a</sup>	14.07 ± 0.58 <sup>a</sup>	15.33 ± 0.99 <sup>a</sup>	15.47 ± 2.00 <sup>a</sup>	15.33 ± 0.99 <sup>a</sup>	16.60 ± 0.72 <sup>a</sup>
12	10.87 ± 0.90 <sup>a</sup>	11.27 ± 0.23 <sup>a</sup>	11.27 ± 1.42 <sup>a</sup>	13.93 ± 0.50 <sup>a</sup>	14.67 ± 0.42 <sup>a</sup>	13.80 ± 0.53 <sup>a</sup>	15.33 ± 1.15 <sup>a</sup>	15.60 ± 1.97 <sup>a</sup>	15.33 ± 1.15 <sup>a</sup>	16.93 ± 0.90 <sup>a</sup>
15	11.20 ± 0.92 <sup>a</sup>	11.40 ± 0.53 <sup>a</sup>	11.13 ± 0.76 <sup>a</sup>	13.93 ± 0.61 <sup>b</sup>	14.33 ± 0.31 <sup>b</sup>	13.40 ± 0.53 <sup>b</sup>	14.67 ± 0.92 <sup>b</sup>	16.33 ± 2.04 <sup>a</sup>	14.67 ± 0.92 <sup>b</sup>	17.53 ± 0.81 <sup>a</sup>

\*) Values within a row followed by different letters were significantly different ( $P \leq 0.05$ )

Table 3.10 Total titrable acidity (% citric acid)

Storage time (day)	% sugar vs %salt									
	0% vs 0%	0% vs 0.05%	0% vs 0.1%	2.5% vs 0%	2.5% vs 0.05%	2.5% vs 0.1%	5% vs 0%	5% vs 0.05%	5% vs 0.1%	5% vs 0.1%
0	0.29 ± 0.04 <sup>a</sup>	0.28 ± 0.05 <sup>a</sup>	0.30 ± 0.05 <sup>a</sup>	0.25 ± 0.03 <sup>a</sup>	0.31 ± 0.05 <sup>a</sup>	0.31 ± 0.07 <sup>a</sup>	0.29 ± 0.02 <sup>a</sup>	0.24 ± 0.02 <sup>a</sup>	0.23 ± 0.03 <sup>a</sup>	0.23 ± 0.03 <sup>a</sup>
3	0.29 ± 0.03 <sup>a,b,c</sup>	0.27 ± 0.06 <sup>a,b,c</sup>	0.27 ± 0.02 <sup>a,b,c</sup>	0.24 ± 0.02 <sup>a</sup>	0.31 ± 0.04 <sup>c</sup>	0.29 ± 0.06 <sup>b,c</sup>	0.28 ± 0.02 <sup>a,b,c</sup>	0.26 ± 0.02 <sup>a,b</sup>	0.25 ± 0.02 <sup>a,b</sup>	0.25 ± 0.02 <sup>a,b</sup>
6	0.29 ± 0.03 <sup>a</sup>	0.27 ± 0.05 <sup>a</sup>	0.29 ± 0.05 <sup>a</sup>	0.25 ± 0.03 <sup>a</sup>	0.29 ± 0.01 <sup>a</sup>	0.30 ± 0.04 <sup>a</sup>	0.30 ± 0.03 <sup>a</sup>	0.25 ± 0.01 <sup>a</sup>	0.25 ± 0.02 <sup>a</sup>	0.25 ± 0.02 <sup>a</sup>
9	0.27 ± 0.03 <sup>a,b</sup>	0.30 ± 0.02 <sup>b,c</sup>	0.32 ± 0.02 <sup>c</sup>	0.28 ± 0.02 <sup>a,b</sup>	0.28 ± 0.01 <sup>a,b</sup>	0.32 ± 0.01 <sup>c</sup>	0.31 ± 0.01 <sup>c</sup>	0.25 ± 0.01 <sup>a</sup>	0.25 ± 0.01 <sup>a</sup>	0.25 ± 0.01 <sup>a</sup>
12	0.30 ± 0.05 <sup>a</sup>	0.27 ± 0.03 <sup>a</sup>	0.30 ± 0.05 <sup>a</sup>	0.25 ± 0.03 <sup>a</sup>	0.33 ± 0.09 <sup>a</sup>	0.30 ± 0.04 <sup>a</sup>	0.30 ± 0.03 <sup>a</sup>	0.25 ± 0.02 <sup>a</sup>	0.26 ± 0.01 <sup>a</sup>	0.26 ± 0.01 <sup>a</sup>
15	0.31 ± 0.06 <sup>a</sup>	0.27 ± 0.04 <sup>a</sup>	0.30 ± 0.04 <sup>a</sup>	0.26 ± 0.03 <sup>a</sup>	0.29 ± 0.02 <sup>a</sup>	0.31 ± 0.04 <sup>a</sup>	0.31 ± 0.03 <sup>a</sup>	0.25 ± 0.01 <sup>a</sup>	0.26 ± 0.01 <sup>a</sup>	0.26 ± 0.01 <sup>a</sup>

\*) Values within a row followed by different letters were significantly different ( $P \leq 0.05$ )

Table 3.11 Moisture content (%)

Storage time (day)	% sugar vs %salt									
	0% vs 0%	0% vs 0.05%	0% vs 0.1%	2.5% vs 0%	2.5% vs 0.05%	2.5% vs 0.1%	5% vs 0%	5% vs 0.05%	5% vs 0.1%	5% vs 0.1%
0	90.15 ± 0.08 <sup>a</sup>	90.05 ± 0.14 <sup>a</sup>	89.76 ± 0.32 <sup>a</sup>	87.89 ± 0.15 <sup>a</sup>	88.04 ± 0.19 <sup>a</sup>	87.44 ± 0.15 <sup>a</sup>	86.11 ± 0.13 <sup>a</sup>	85.63 ± 0.14 <sup>a</sup>	85.41 ± 0.10 <sup>a</sup>	85.41 ± 0.10 <sup>a</sup>
3	90.18 ± 0.06 <sup>a</sup>	90.12 ± 0.10 <sup>a</sup>	89.66 ± 0.41 <sup>b</sup>	88.04 ± 0.11 <sup>c</sup>	87.90 ± 0.17 <sup>c</sup>	87.34 ± 0.10 <sup>d</sup>	86.36 ± 0.34 <sup>a</sup>	85.37 ± 0.27 <sup>f</sup>	85.46 ± 0.11 <sup>f</sup>	85.46 ± 0.11 <sup>f</sup>
6	90.74 ± 0.13 <sup>a</sup>	90.75 ± 0.20 <sup>a</sup>	90.05 ± 0.35 <sup>b</sup>	88.35 ± 0.06 <sup>c</sup>	88.18 ± 0.07 <sup>c,d</sup>	87.88 ± 0.09 <sup>d</sup>	86.70 ± 0.19 <sup>e</sup>	85.70 ± 0.28 <sup>f</sup>	85.43 ± 0.18 <sup>f</sup>	85.43 ± 0.18 <sup>f</sup>
9	91.23 ± 0.15 <sup>a</sup>	91.07 ± 0.19 <sup>a</sup>	90.26 ± 0.23 <sup>b</sup>	88.73 ± 0.14 <sup>c</sup>	88.42 ± 0.16 <sup>c,d</sup>	88.27 ± 0.14 <sup>d</sup>	87.07 ± 0.31 <sup>e</sup>	85.62 ± 0.29 <sup>f</sup>	85.68 ± 0.23 <sup>f</sup>	85.68 ± 0.23 <sup>f</sup>
12	90.70 ± 0.24 <sup>a</sup>	90.67 ± 0.37 <sup>a</sup>	89.97 ± 0.34 <sup>b</sup>	88.99 ± 0.25 <sup>c</sup>	88.12 ± 0.20 <sup>d</sup>	88.73 ± 0.15 <sup>e</sup>	86.79 ± 0.14 <sup>e</sup>	85.35 ± 0.50 <sup>f</sup>	85.35 ± 0.39 <sup>f</sup>	85.35 ± 0.39 <sup>f</sup>
15	90.20 ± 0.37 <sup>a</sup>	90.28 ± 0.20 <sup>a</sup>	90.57 ± 0.02 <sup>a</sup>	88.50 ± 0.23 <sup>c</sup>	87.76 ± 0.16 <sup>d</sup>	89.20 ± 0.28 <sup>b</sup>	87.12 ± 0.24 <sup>e</sup>	85.10 ± 0.50 <sup>f</sup>	85.38 ± 0.30 <sup>f</sup>	85.38 ± 0.30 <sup>f</sup>

\*) Values within a row followed by different letters were significantly different ( $P \leq 0.05$ )

Table 3.12 Total solid (TS) (%)

Storage time (day)	% sugar vs %salt									
	0% vs 0%	0% vs 0.05%	0% vs 0.1%	2.5% vs 0%	2.5% vs 0.05%	2.5% vs 0.1%	5% vs 0%	5% vs 0.05%	5% vs 0.1%	5% vs 0.1%
0	9.85 ± 0.08 <sup>a</sup>	9.95 ± 0.14 <sup>a</sup>	10.24 ± 0.32 <sup>a</sup>	12.11 ± 0.15 <sup>a</sup>	11.96 ± 0.19 <sup>a</sup>	12.56 ± 0.15 <sup>a</sup>	13.89 ± 0.13 <sup>a</sup>	14.37 ± 0.14 <sup>a</sup>	14.59 ± 0.10 <sup>a</sup>	14.59 ± 0.10 <sup>a</sup>
3	9.82 ± 0.06 <sup>a</sup>	9.88 ± 0.10 <sup>a</sup>	10.34 ± 0.41 <sup>b</sup>	11.96 ± 0.11 <sup>c</sup>	12.10 ± 0.17 <sup>c</sup>	12.66 ± 0.10 <sup>d</sup>	13.64 ± 0.34 <sup>c</sup>	14.63 ± 0.27 <sup>f</sup>	14.54 ± 0.11 <sup>f</sup>	14.54 ± 0.11 <sup>f</sup>
6	9.26 ± 0.14 <sup>a</sup>	9.25 ± 0.20 <sup>a</sup>	9.95 ± 0.35 <sup>b</sup>	11.65 ± 0.06 <sup>c</sup>	11.82 ± 0.07 <sup>c,d</sup>	12.12 ± 0.09 <sup>d</sup>	13.30 ± 0.19 <sup>c</sup>	14.30 ± 0.28 <sup>f</sup>	14.57 ± 0.18 <sup>f</sup>	14.57 ± 0.18 <sup>f</sup>
9	8.77 ± 0.15 <sup>a</sup>	8.93 ± 0.19 <sup>a</sup>	9.74 ± 0.23 <sup>b</sup>	11.27 ± 0.14 <sup>c</sup>	11.58 ± 0.16 <sup>c,d</sup>	11.73 ± 0.14 <sup>d</sup>	12.93 ± 0.31 <sup>e</sup>	14.38 ± 0.29 <sup>f</sup>	14.32 ± 0.23 <sup>f</sup>	14.32 ± 0.23 <sup>f</sup>
12	9.30 ± 0.24 <sup>a</sup>	9.33 ± 0.37 <sup>a</sup>	10.03 ± 0.34 <sup>b</sup>	11.01 ± 0.25 <sup>c</sup>	11.88 ± 0.20 <sup>d</sup>	11.27 ± 0.15 <sup>e</sup>	13.21 ± 0.14 <sup>e</sup>	14.65 ± 0.49 <sup>f</sup>	14.64 ± 0.39 <sup>f</sup>	14.64 ± 0.39 <sup>f</sup>
15	9.80 ± 0.37 <sup>a</sup>	9.72 ± 0.20 <sup>a</sup>	9.43 ± 0.02 <sup>a</sup>	11.50 ± 0.23 <sup>c</sup>	12.24 ± 0.16 <sup>d</sup>	10.80 ± 0.28 <sup>b</sup>	12.87 ± 0.24 <sup>e</sup>	15.27 ± 0.46 <sup>e</sup>	14.62 ± 0.30 <sup>f</sup>	14.62 ± 0.30 <sup>f</sup>

\*) Values within a row followed by different letters were significantly different ( $P \leq 0.05$ )

Table 3.13 Reducing sugar (%)

Storage time (day)	% sugar vs %salt									
	0% vs 0%	0% vs 0.05%	0% vs 0.1%	2.5% vs 0%	2.5% vs 0.05%	2.5% vs 0.1%	5% vs 0%	5% vs 0.05%	5% vs 0.1%	5% vs 0.1%
0	5.51 ± 0.11 <sup>a</sup>	5.48 ± 0.32 <sup>a</sup>	5.14 ± 0.56 <sup>a</sup>	4.76 ± 0.70 <sup>a</sup>	5.08 ± 0.71 <sup>a</sup>	5.41 ± 0.61 <sup>a</sup>	5.04 ± 0.91 <sup>a</sup>	5.25 ± 0.33 <sup>a</sup>	5.35 ± 0.24 <sup>a</sup>	5.35 ± 0.24 <sup>a</sup>
3	5.29 ± 0.10 <sup>b</sup>	5.53 ± 0.43 <sup>a</sup>	5.11 ± 0.39 <sup>a</sup>	5.23 ± 0.34 <sup>b</sup>	5.03 ± 0.82 <sup>a</sup>	5.35 ± 0.64 <sup>a</sup>	5.39 ± 0.42 <sup>a</sup>	5.17 ± 0.25 <sup>a</sup>	5.41 ± 0.48 <sup>a</sup>	5.41 ± 0.48 <sup>a</sup>
6	4.93 ± 0.13 <sup>a</sup>	5.24 ± 0.11 <sup>a</sup>	5.07 ± 0.16 <sup>a</sup>	5.10 ± 0.18 <sup>a</sup>	5.14 ± 0.42 <sup>a</sup>	5.21 ± 0.31 <sup>a</sup>	4.97 ± 0.15 <sup>a</sup>	5.09 ± 0.33 <sup>a</sup>	5.06 ± 0.36 <sup>a</sup>	5.06 ± 0.36 <sup>a</sup>
9	4.97 ± 0.14 <sup>a</sup>	5.05 ± 0.41 <sup>a</sup>	5.06 ± 0.26 <sup>a</sup>	4.95 ± 0.29 <sup>a</sup>	5.09 ± 0.46 <sup>a</sup>	5.05 ± 0.47 <sup>a</sup>	5.11 ± 0.19 <sup>a</sup>	5.11 ± 0.46 <sup>a</sup>	5.11 ± 0.40 <sup>a</sup>	5.11 ± 0.40 <sup>a</sup>
12	4.51 ± 0.17 <sup>a</sup>	4.72 ± 0.49 <sup>a</sup>	4.74 ± 0.51 <sup>a</sup>	4.85 ± 0.10 <sup>a</sup>	4.60 ± 0.69 <sup>a</sup>	4.80 ± 0.44 <sup>a</sup>	4.50 ± 0.63 <sup>a</sup>	4.77 ± 0.30 <sup>a</sup>	4.69 ± 0.66 <sup>a</sup>	4.69 ± 0.66 <sup>a</sup>
15	4.41 ± 0.20 <sup>a</sup>	4.62 ± 0.42 <sup>a</sup>	4.66 ± 0.53 <sup>a</sup>	4.72 ± 0.16 <sup>a</sup>	4.57 ± 0.66 <sup>a</sup>	4.79 ± 0.45 <sup>a</sup>	4.32 ± 0.58 <sup>a</sup>	4.73 ± 0.16 <sup>a</sup>	4.28 ± 0.34 <sup>a</sup>	4.28 ± 0.34 <sup>a</sup>

\*) Values within a row followed by different letters were significantly different ( $P \leq 0.05$ )

Table 3.14 PE enzyme (PMEu/g.s.s / 10<sup>-4</sup>)

Storage time (day)	% sugar vs %salt									
	0% vs 0%	0% vs 0.05%	0% vs 0.1%	2.5% vs 0%	2.5% vs 0.05%	2.5% vs 0.1%	5% vs 0%	5% vs 0.05%	5% vs 0.1%	5% vs 0.1%
0	5.57 ± 1.39 <sup>a</sup>	6.07 ± 0.56 <sup>a</sup>	5.49 ± 1.13 <sup>a</sup>	5.37 ± 0.66 <sup>a</sup>	5.43 ± 1.44 <sup>a</sup>	5.05 ± 1.01 <sup>a</sup>	6.83 ± 0.97 <sup>a</sup>	3.96 ± 1.05 <sup>a</sup>	6.83 ± 0.97 <sup>a</sup>	4.56 ± 0.67 <sup>a</sup>
3	5.94 ± 1.89 <sup>b</sup>	6.02 ± 1.13 <sup>a</sup>	6.32 ± 0.43 <sup>a</sup>	6.54 ± 1.31 <sup>a</sup>	5.19 ± 0.52 <sup>a</sup>	4.97 ± 0.36 <sup>a</sup>	6.37 ± 1.54 <sup>a</sup>	4.53 ± 0.48 <sup>a</sup>	6.37 ± 1.54 <sup>a</sup>	4.91 ± 1.13 <sup>a</sup>
6	6.41 ± 0.43 <sup>ab</sup>	8.10 ± 2.10 <sup>a</sup>	4.97 ± 0.70 <sup>a</sup>	4.96 ± 0.69 <sup>a</sup>	5.99 ± 1.85 <sup>a</sup>	7.15 ± 1.51 <sup>a</sup>	4.55 ± 0.50 <sup>a</sup>	6.03 ± 1.29 <sup>a</sup>	4.55 ± 0.50 <sup>a</sup>	4.20 ± 0.49 <sup>a</sup>
9	5.98 ± 1.90 <sup>a</sup>	6.66 ± 1.84 <sup>a</sup>	7.35 ± 0.51 <sup>a</sup>	6.13 ± 0.58 <sup>a</sup>	7.42 ± 0.58 <sup>a</sup>	6.08 ± 1.10 <sup>a</sup>	5.26 ± 1.04 <sup>a</sup>	6.64 ± 0.68 <sup>a</sup>	5.26 ± 1.04 <sup>a</sup>	5.51 ± 0.67 <sup>a</sup>
12	9.97 ± 3.31 <sup>a</sup>	7.60 ± 2.07 <sup>a</sup>	8.61 ± 1.44 <sup>a</sup>	5.83 ± 2.24 <sup>a</sup>	5.85 ± 0.52 <sup>a</sup>	6.62 ± 1.78 <sup>a</sup>	5.56 ± 1.30 <sup>a</sup>	5.95 ± 1.27 <sup>a</sup>	5.56 ± 1.30 <sup>a</sup>	5.12 ± 1.71 <sup>a</sup>
15	8.27 ± 3.28 <sup>a</sup>	8.05 ± 1.92 <sup>a</sup>	10.26 ± 5.07 <sup>a</sup>	6.57 ± 0.93 <sup>a</sup>	7.09 ± 2.24 <sup>a</sup>	6.43 ± 0.89 <sup>a</sup>	7.00 ± 1.11 <sup>a</sup>	6.06 ± 0.81 <sup>a</sup>	7.00 ± 1.11 <sup>a</sup>	5.49 ± 1.98 <sup>a</sup>

\*) Values within a row followed by different letters were significantly different (P ≤ 0.05)

Table 3.15 Total Plate Count (log CFU/ml)

Storage time (day)	% sugar vs %salt									
	0% vs 0%	0% vs 0.05%	0% vs 0.1%	2.5% vs 0%	2.5% vs 0.05%	2.5% vs 0.1%	5% vs 0%	5% vs 0.05%	5% vs 0.1%	5% vs 0.1%
0	2.50 ± 0.14 <sup>ab</sup>	2.55 ± 0.06 <sup>a</sup>	2.14 ± 0.02 <sup>dc</sup>	2.52 ± 0.08 <sup>ab</sup>	2.27 ± 0.10 <sup>cd</sup>	2.38 ± 0.10 <sup>bc</sup>	2.60 ± 0.05 <sup>a</sup>	2.06 ± 0.11 <sup>c</sup>	2.60 ± 0.05 <sup>a</sup>	2.37 ± 0.03 <sup>bc</sup>
3	2.67 ± 0.07 <sup>ab</sup>	2.52 ± 0.15 <sup>bc</sup>	2.28 ± 0.19 <sup>d</sup>	2.37 ± 0.01 <sup>cd</sup>	2.73 ± 0.05 <sup>a</sup>	2.94 ± 0.02 <sup>c</sup>	2.69 ± 0.08 <sup>ab</sup>	2.71 ± 0.06 <sup>ab</sup>	2.69 ± 0.08 <sup>ab</sup>	2.25 ± 0.13 <sup>d</sup>
6	2.91 ± 0.03 <sup>a</sup>	2.93 ± 0.03 <sup>a</sup>	2.84 ± 0.09 <sup>a</sup>	2.49 ± 0.08 <sup>b</sup>	3.17 ± 0.15 <sup>c</sup>	2.33 ± 0.10 <sup>b</sup>	2.79 ± 0.12 <sup>a</sup>	2.41 ± 0.20 <sup>b</sup>	2.79 ± 0.12 <sup>a</sup>	2.81 ± 0.08 <sup>a</sup>
9	3.16 ± 0.07 <sup>a</sup>	3.29 ± 0.10 <sup>a</sup>	2.85 ± 0.13 <sup>b</sup>	2.54 ± 0.05 <sup>c</sup>	3.55 ± 0.09 <sup>d</sup>	3.15 ± 0.10 <sup>a</sup>	2.79 ± 0.14 <sup>b</sup>	2.56 ± 0.22 <sup>c</sup>	2.79 ± 0.14 <sup>b</sup>	3.12 ± 0.06 <sup>a</sup>
12	3.46 ± 0.11 <sup>a</sup>	3.80 ± 0.09 <sup>b</sup>	3.32 ± 0.07 <sup>a</sup>	3.02 ± 0.12 <sup>c</sup>	3.83 ± 0.09 <sup>b</sup>	4.11 ± 0.13 <sup>d</sup>	3.06 ± 0.16 <sup>c</sup>	3.32 ± 0.28 <sup>a</sup>	3.06 ± 0.16 <sup>c</sup>	3.98 ± 0.11 <sup>bd</sup>
15	4.23 ± 0.18 <sup>a</sup>	4.20 ± 0.16 <sup>a</sup>	4.42 ± 0.55 <sup>a</sup>	4.36 ± 0.18 <sup>a</sup>	5.05 ± 0.06 <sup>a</sup>	5.02 ± 0.09 <sup>a</sup>	3.99 ± 0.05 <sup>a</sup>	4.58 ± 0.13 <sup>a</sup>	3.99 ± 0.05 <sup>a</sup>	4.58 ± 0.40 <sup>a</sup>

\*) Values within a row followed by different letters were significantly different (P ≤ 0.05)

Table 3.16 Lactic acid bacteria (log CFU/ml)

Storage time (day)	% sugar vs %salt									
	0% vs 0%	0% vs 0.05%	0% vs 0.1%	2.5% vs 0%	2.5% vs 0.05%	2.5% vs 0.1%	5% vs 0%	5% vs 0.05%	5% vs 0.1%	5% vs 0.1%
0	2.16 ± 0.10 <sup>a,b</sup>	2.17 ± 0.25 <sup>a,b</sup>	1.96 ± 0.11 <sup>b,c</sup>	2.14 ± 0.17 <sup>a,b</sup>	2.24 ± 0.17 <sup>b</sup>	2.05 ± 0.29 <sup>a,b</sup>	2.37 ± 0.25 <sup>b</sup>	1.68 ± 0.13 <sup>c</sup>	2.25 ± 0.11 <sup>a,b</sup>	
3	1.82 ± 0.35 <sup>a,b</sup>	1.33 ± 0.14 <sup>a,c</sup>	0.85 ± 0.79 <sup>c</sup>	0.78 ± 0.68 <sup>c</sup>	1.47 ± 0.43 <sup>a,c</sup>	2.52 ± 0.16 <sup>b</sup>	2.44 ± 0.17 <sup>b</sup>	2.62 ± 0.10 <sup>b</sup>	1.93 ± 0.39 <sup>a,b</sup>	
6	1.93 ± 0.34 <sup>a</sup>	2.39 ± 0.31 <sup>b,c</sup>	1.71 ± 0.22 <sup>a</sup>	2.02 ± 0.10 <sup>a,b</sup>	2.74 ± 0.13 <sup>c</sup>	2.60 ± 0.10 <sup>c</sup>	2.60 ± 0.25 <sup>e</sup>	1.11 ± 0.25 <sup>d</sup>	2.55 ± 0.13 <sup>c</sup>	
9	2.42 ± 0.17 <sup>a,b</sup>	2.58 ± 0.12 <sup>a,b,c</sup>	2.15 ± 0.22 <sup>a</sup>	2.64 ± 0.22 <sup>a,b,c</sup>	2.74 ± 0.16 <sup>b,c</sup>	2.38 ± 0.27 <sup>a,b</sup>	2.41 ± 0.15 <sup>a,b</sup>	0.77 ± 0.68 <sup>d</sup>	3.01 ± 0.08 <sup>c</sup>	
12	3.30 ± 0.09 <sup>a,b</sup>	3.13 ± 0.05 <sup>b</sup>	2.95 ± 0.19 <sup>a,b,c</sup>	2.65 ± 0.27 <sup>c,d</sup>	2.70 ± 0.15 <sup>a,c,d</sup>	2.67 ± 0.08 <sup>c,d</sup>	2.39 ± 0.13 <sup>d</sup>	1.65 ± 0.20 <sup>c</sup>	3.52 ± 0.16 <sup>f</sup>	
15	3.58 ± 0.16 <sup>a,b</sup>	3.45 ± 0.01 <sup>a,c</sup>	3.46 ± 0.14 <sup>a,c</sup>	2.98 ± 0.09 <sup>d</sup>	3.83 ± 0.26 <sup>b,g</sup>	3.21 ± 0.17 <sup>c,d</sup>	2.36 ± 0.22 <sup>e</sup>	2.04 ± 0.09 <sup>f</sup>	4.09 ± 0.17 <sup>g</sup>	

\*) Values within a row followed by different letters were significantly different ( $P \leq 0.05$ )

Table 3.17 Yeast and mold (log CFU/ml)

Storage time (Day)	% sugar vs %salt							
	0% vs 0%	0% vs 0.05%	0% vs 0.1%	2.5% vs 0%	2.5% vs 0.05%	2.5% vs 0.1%	5% vs 0%	5% vs 0.05%
0	2.45 ± 0.18 <sup>a</sup>	2.56 ± 0.08 <sup>a</sup>	2.11 ± 0.23 <sup>b,c,d</sup>	2.39 ± 0.15 <sup>a,b</sup>	2.47 ± 0.11 <sup>a</sup>	2.33 ± 0.02 <sup>a,b,c</sup>	2.16 ± 0.01 <sup>b,c,d</sup>	1.99 ± 0.09 <sup>d</sup>
15	5.36 ± 0.31 <sup>a</sup>	5.25 ± 0.19 <sup>a</sup>	4.17 ± 0.05 <sup>c</sup>	3.21 ± 0.19 <sup>c</sup>	5.41 ± 0.14 <sup>a</sup>	4.56 ± 0.28 <sup>b</sup>	4.28 ± 0.12 <sup>b,c</sup>	3.69 ± 0.29 <sup>d</sup>

\*) Values within a row followed by different letters were significantly different ( $P \leq 0.05$ )

Table 3.18 Vitamin C content (mg/100ml)

Storage time (day)	% sugar vs %salt									
	0% vs 0%	0% vs 0.05%	0% vs 0.1%	2.5% vs 0%	2.5% vs 0.05%	2.5% vs 0.1%	5% vs 0%	5% vs 0.05%	5% vs 0.1%	
0	28.48 ± 0.29 <sup>a</sup>	31.03 ± 0.29 <sup>b</sup>	25.93 ± 0.25 <sup>c</sup>	33.41 ± 0.14 <sup>d</sup>	26.50 ± 0.14 <sup>e</sup>	22.22 ± 0.25 <sup>f</sup>	30.53 ± 0.28 <sup>g</sup>	28.81 ± 0.29 <sup>h</sup>	24.20 ± 0.25 <sup>i</sup>	
3	30.45 ± 0.38 <sup>a</sup>	31.52 ± 0.28 <sup>b</sup>	25.51 ± 0.14 <sup>c</sup>	34.40 ± 0.38 <sup>d</sup>	27.32 ± 0.38 <sup>e</sup>	22.64 ± 0.14 <sup>f</sup>	29.79 ± 0.28 <sup>g</sup>	29.39 ± 0.43 <sup>h</sup>	24.36 ± 0.29 <sup>i</sup>	
6	27.82 ± 0.29 <sup>ab</sup>	30.04 ± 0.38 <sup>c</sup>	25.02 ± 0.29 <sup>d</sup>	34.49 ± 0.14 <sup>e</sup>	26.91 ± 0.00 <sup>f</sup>	22.97 ± 0.43 <sup>g</sup>	28.64 ± 0.25 <sup>h</sup>	29.88 ± 0.43 <sup>i</sup>	25.43 ± 1.50 <sup>j</sup>	
9	24.28 ± 0.38 <sup>a</sup>	27.08 ± 0.29 <sup>b</sup>	24.20 ± 0.43 <sup>c</sup>	33.91 ± 0.14 <sup>d</sup>	27.08 ± 0.38 <sup>e</sup>	23.46 ± 0.25 <sup>f</sup>	27.32 ± 0.28 <sup>g</sup>	28.72 ± 0.14 <sup>h</sup>	20.58 ± 1.43 <sup>i</sup>	
12	21.23 ± 0.25 <sup>a</sup>	24.20 ± 0.25 <sup>b</sup>	23.37 ± 0.14 <sup>c</sup>	32.27 ± 0.14 <sup>d</sup>	24.86 ± 0.29 <sup>e</sup>	22.80 ± 0.14 <sup>f</sup>	27.00 ± 0.38 <sup>g</sup>	28.40 ± 0.25 <sup>h</sup>	18.60 ± 0.38 <sup>i</sup>	
15	22.06 ± 0.29 <sup>a</sup>	24.03 ± 0.14 <sup>b</sup>	20.91 ± 0.14 <sup>c</sup>	28.97 ± 0.14 <sup>d</sup>	22.31 ± 0.28 <sup>e</sup>	19.92 ± 0.14 <sup>f</sup>	24.53 ± 0.28 <sup>g</sup>	25.35 ± 0.14 <sup>h</sup>	18.35 ± 0.14 <sup>i</sup>	

\*) Values within a row followed by different letters were significantly different ( $P \leq 0.05$ )

Table 3.19 Carotenoid content (µg/ml)

Storage time (day)	% sugar vs %salt									
	0% vs 0%	0% vs 0.05%	0% vs 0.1%	2.5% vs 0%	2.5% vs 0.05%	2.5% vs 0.1%	5% vs 0%	5% vs 0.05%	5% vs 0.1%	
0	4.54 ± 0.46 <sup>a</sup>	4.63 ± 0.51 <sup>a</sup>	4.49 ± 0.58 <sup>a</sup>	5.46 ± 0.96 <sup>a</sup>	5.26 ± 0.63 <sup>a</sup>	5.03 ± 0.88 <sup>a</sup>	5.83 ± 0.21 <sup>a</sup>	6.00 ± 0.51 <sup>a</sup>	5.85 ± 0.15 <sup>a</sup>	
7	6.05 ± 0.57 <sup>a</sup>	5.91 ± 0.64 <sup>a</sup>	5.92 ± 0.70 <sup>a</sup>	5.82 ± 0.33 <sup>a</sup>	5.66 ± 0.67 <sup>a</sup>	5.59 ± 0.86 <sup>a</sup>	5.69 ± 0.31 <sup>a</sup>	5.56 ± 0.50 <sup>a</sup>	5.47 ± 0.66 <sup>a</sup>	
15	6.34 ± 1.26 <sup>a</sup>	6.21 ± 0.98 <sup>a</sup>	6.12 ± 1.28 <sup>a</sup>	5.80 ± 0.36 <sup>a</sup>	5.92 ± 0.29 <sup>a</sup>	5.79 ± 0.34 <sup>a</sup>	5.90 ± 0.65 <sup>a</sup>	5.87 ± 0.75 <sup>a</sup>	5.96 ± 0.65 <sup>a</sup>	

\*) Values within a row followed by different letters were significantly different ( $P \leq 0.05$ )

#### 4. The effect of orange juice sacs and pH values on orange juices stored at 4° Brix).

Table 4.1 Viscosity (cps)

Storage time (day)	% orange juice sacs vs pH variation					
	0% vs pH3	0% vs pH3.5	0% vs pH4	3% vs pH3	3% vs pH3.5	3% vs pH4
0	6.32 ± 0.26 <sup>a</sup>	6.18 ± 0.72 <sup>a</sup>	5.54 ± 0.91 <sup>a</sup>	6.79 ± 0.36 <sup>a</sup>	5.54 ± 0.59 <sup>a</sup>	5.94 ± 0.75 <sup>a</sup>
7	6.83 ± 0.84 <sup>a</sup>	6.29 ± 0.44 <sup>a</sup>	7.08 ± 1.06 <sup>a</sup>	6.82 ± 1.08 <sup>a</sup>	6.52 ± 0.89 <sup>a</sup>	5.95 ± 0.75 <sup>a</sup>
15	5.57 ± 0.95 <sup>ab, bc</sup>	5.95 ± 0.50 <sup>ab</sup>	5.30 ± 0.28 <sup>bc</sup>	6.52 ± 0.95 <sup>a</sup>	4.73 ± 0.39 <sup>c</sup>	4.47 ± 0.20 <sup>c</sup>

\*) Values within a row followed by different letters were significantly different ( $P \leq 0.05$ )

Table 4.2 L\* value

Storage time (day)	% orange juice sacs vs pH variation					
	0% vs pH3	0% vs pH3.5	0% vs pH4	3% vs pH3	3% vs pH3.5	3% vs pH4
0	55.81 ± 5.77 <sup>a</sup>	52.50 ± 0.44 <sup>a</sup>	51.32 ± 1.60 <sup>a</sup>	51.51 ± 0.31 <sup>a</sup>	52.01 ± 0.58 <sup>a</sup>	51.67 ± 2.00 <sup>a</sup>
3	53.31 ± 1.73 <sup>a</sup>	54.11 ± 0.63 <sup>a</sup>	53.31 ± 0.33 <sup>a</sup>	52.82 ± 0.23 <sup>a</sup>	53.76 ± 0.40 <sup>a</sup>	52.41 ± 2.12 <sup>a</sup>
6	53.01 ± 1.76 <sup>a</sup>	53.25 ± 1.16 <sup>a</sup>	53.15 ± 0.81 <sup>a</sup>	51.99 ± 1.17 <sup>a</sup>	51.84 ± 2.65 <sup>a</sup>	52.72 ± 1.21 <sup>a</sup>
9	53.06 ± 1.84 <sup>a</sup>	54.28 ± 0.22 <sup>a</sup>	54.68 ± 0.56 <sup>a</sup>	53.13 ± 0.61 <sup>a</sup>	53.25 ± 1.54 <sup>a</sup>	53.09 ± 0.76 <sup>a</sup>
12	53.25 ± 1.64 <sup>a</sup>	53.79 ± 0.69 <sup>a</sup>	54.62 ± 1.22 <sup>a</sup>	52.91 ± 0.53 <sup>a</sup>	54.33 ± 1.23 <sup>a</sup>	53.92 ± 2.51 <sup>a</sup>
15	53.08 ± 1.75 <sup>a</sup>	54.48 ± 0.85 <sup>a</sup>	53.44 ± 1.33 <sup>a</sup>	52.23 ± 0.85 <sup>a</sup>	53.36 ± 0.88 <sup>a</sup>	52.73 ± 0.84 <sup>a</sup>

\*) Values within a row followed by different letters were significantly different ( $P \leq 0.05$ )

Table 4.3 a\* value

Storage time (day)	% orange juice sacs vs pH variation					
	0% vs pH3	0% vs pH3.5	0% vs pH4	3% vs pH3	3% vs pH 3.5	3% vs pH4
0	-1.24 ± 1.25 <sup>a</sup>	-0.91 ± 1.18 <sup>a</sup>	-0.50 ± 0.78 <sup>a</sup>	0.16 ± 1.19 <sup>a</sup>	0.14 ± 1.25 <sup>a</sup>	0.00 ± 0.24 <sup>a</sup>
3	0.04 ± 0.74 <sup>a</sup>	0.06 ± 0.92 <sup>a</sup>	0.03 ± 0.89 <sup>a</sup>	0.72 ± 1.02 <sup>a</sup>	0.65 ± 0.95 <sup>a</sup>	0.41 ± 1.01 <sup>a</sup>
6	-0.49 ± 0.46 <sup>a</sup>	-0.10 ± 0.90 <sup>a</sup>	-0.06 ± 0.17 <sup>a</sup>	0.12 ± 0.82 <sup>a</sup>	0.17 ± 1.51 <sup>a</sup>	-0.02 ± 0.56 <sup>a</sup>
9	0.20 ± 0.83 <sup>a</sup>	0.10 ± 1.42 <sup>a</sup>	0.02 ± 0.61 <sup>a</sup>	0.72 ± 0.91 <sup>a</sup>	0.53 ± 1.36 <sup>a</sup>	0.61 ± 0.57 <sup>a</sup>
12	-0.35 ± 0.99 <sup>a</sup>	-0.12 ± 1.10 <sup>a</sup>	0.14 ± 0.70 <sup>a</sup>	0.81 ± 0.45 <sup>a</sup>	0.40 ± 1.58 <sup>a</sup>	0.60 ± 0.71 <sup>a</sup>
15	-0.61 ± 0.71 <sup>a</sup>	-0.22 ± 1.09 <sup>a</sup>	-0.17 ± 0.29 <sup>a</sup>	0.23 ± 0.50 <sup>a</sup>	0.07 ± 1.08 <sup>a</sup>	-0.26 ± 0.19 <sup>a</sup>

\*) Values within a row followed by different letters were significantly different ( $P \leq 0.05$ )

Table 4.4 b\* value

Storage time (day)	% orange juice sacs vs pH variation					
	0% vs pH3	0% vs pH3.5	0% vs pH4	3% vs pH3	3% vs pH 3.5	3% vs pH4
0	24.30 ± 4.00 <sup>a</sup>	31.25 ± 3.03 <sup>a</sup>	31.54 ± 2.53 <sup>a</sup>	32.61 ± 2.50 <sup>a</sup>	33.18 ± 0.36 <sup>a</sup>	33.51 ± 0.32 <sup>a</sup>
3	31.07 ± 2.95 <sup>a</sup>	29.80 ± 2.43 <sup>a</sup>	30.09 ± 3.95 <sup>a</sup>	28.84 ± 2.92 <sup>a</sup>	29.19 ± 1.82 <sup>a</sup>	29.46 ± 3.82 <sup>a</sup>
6	30.52 ± 1.66 <sup>a</sup>	29.83 ± 2.79 <sup>a</sup>	29.60 ± 1.04 <sup>a</sup>	30.06 ± 1.27 <sup>a</sup>	30.00 ± 2.03 <sup>a</sup>	30.50 ± 0.67 <sup>a</sup>
9	29.52 ± 2.51 <sup>a</sup>	28.25 ± 2.79 <sup>a</sup>	28.23 ± 1.50 <sup>a</sup>	27.5 ± 2.69 <sup>a</sup>	27.89 ± 2.20 <sup>a</sup>	27.98 ± 1.46 <sup>a</sup>
12	30.32 ± 3.14 <sup>a</sup>	28.04 ± 2.08 <sup>a</sup>	29.44 ± 1.24 <sup>a</sup>	27.38 ± 1.98 <sup>a</sup>	28.79 ± 2.24 <sup>a</sup>	27.41 ± 2.93 <sup>a</sup>
15	30.27 ± 2.56 <sup>a</sup>	28.75 ± 0.90 <sup>a</sup>	29.63 ± 1.36 <sup>a</sup>	28.42 ± 0.29 <sup>a</sup>	29.39 ± 2.33 <sup>a</sup>	29.56 ± 0.70 <sup>a</sup>

\*) Values within a row followed by different letters were significantly different ( $P \leq 0.05$ )



Table 4.5 Browning value

Storage time (day)	% orange juice sacs vs pH variation						
	0% vs pH3	0% vs pH3.5	0% vs pH4	3% vs pH3	3% vs pH 3.5	3% vs pH4	
0	0.00 ± 0.00 <sup>a</sup>	4.19 ± 3.83 <sup>a</sup>	3.89 ± 4.06 <sup>a</sup>	3.43 ± 4.64 <sup>a</sup>	5.00 ± 2.82 <sup>a</sup>	4.73 ± 3.59 <sup>a</sup>	
3	4.73 ± 3.98 <sup>a</sup>	4.92 ± 2.43 <sup>a</sup>	5.90 ± 3.13 <sup>a</sup>	4.34 ± 1.19 <sup>a</sup>	4.95 ± 2.25 <sup>a</sup>	6.29 ± 3.57 <sup>a</sup>	
6	4.11 ± 3.47 <sup>a</sup>	4.47 ± 3.79 <sup>a</sup>	3.94 ± 3.21 <sup>a</sup>	3.52 ± 2.47 <sup>a</sup>	4.84 ± 2.41 <sup>a</sup>	4.01 ± 2.13 <sup>a</sup>	
9	5.08 ± 2.25 <sup>a</sup>	5.76 ± 1.49 <sup>a</sup>	4.85 ± 2.44 <sup>a</sup>	5.24 ± 0.48 <sup>a</sup>	5.31 ± 3.78 <sup>a</sup>	5.05 ± 2.52 <sup>a</sup>	
12	4.98 ± 3.06 <sup>a</sup>	4.61 ± 3.31 <sup>a</sup>	4.19 ± 3.10 <sup>a</sup>	5.29 ± 0.82 <sup>a</sup>	5.04 ± 3.97 <sup>a</sup>	5.53 ± 4.69 <sup>a</sup>	
15	4.51 ± 3.28 <sup>a</sup>	4.14 ± 2.02 <sup>a</sup>	4.04 ± 2.67 <sup>a</sup>	3.81 ± 2.50 <sup>a</sup>	4.75 ± 2.97 <sup>a</sup>	3.61 ± 2.64 <sup>a</sup>	

\*) Values within a row followed by different letters were significantly different ( $P \leq 0.05$ )

Table 4.6 Total color difference ( $\Delta E^*$ )

Storage time (day)	% orange sacs vs pH variation						
	0% vs pH3	0% vs pH3.5	0% vs pH4	3% vs pH3	3% vs pH 3.5	3% vs pH4	
0	0.00 ± 0.00 <sup>a</sup>	6.20 ± 5.64 <sup>a</sup>	6.08 ± 5.52 <sup>a</sup>	5.63 ± 7.51 <sup>a</sup>	6.77 ± 5.42 <sup>a</sup>	7.30 ± 7.09 <sup>a</sup>	
3	6.99 ± 6.46 <sup>a</sup>	6.20 ± 3.88 <sup>a</sup>	7.33 ± 5.24 <sup>a</sup>	6.32 ± 4.35 <sup>a</sup>	6.48 ± 3.84 <sup>a</sup>	8.77 ± 5.60 <sup>a</sup>	
6	6.54 ± 6.25 <sup>a</sup>	6.44 ± 4.42 <sup>a</sup>	6.14 ± 5.22 <sup>a</sup>	5.94 ± 6.41 <sup>a</sup>	7.11 ± 3.94 <sup>a</sup>	6.39 ± 4.59 <sup>a</sup>	
9	7.52 ± 5.31 <sup>a</sup>	7.27 ± 2.79 <sup>a</sup>	7.04 ± 2.74 <sup>a</sup>	7.15 ± 2.80 <sup>a</sup>	7.65 ± 3.79 <sup>a</sup>	7.36 ± 3.94 <sup>a</sup>	
12	7.16 ± 5.87 <sup>a</sup>	6.82 ± 3.60 <sup>a</sup>	7.04 ± 3.30 <sup>a</sup>	7.47 ± 3.17 <sup>a</sup>	7.06 ± 3.34 <sup>a</sup>	9.03 ± 3.50 <sup>a</sup>	
15	6.78 ± 6.10 <sup>a</sup>	5.95 ± 3.28 <sup>a</sup>	5.77 ± 4.53 <sup>a</sup>	6.02 ± 4.76 <sup>a</sup>	6.54 ± 3.71 <sup>a</sup>	6.26 ± 4.83 <sup>a</sup>	

\*) Values within a row followed by different letters were significantly different ( $P \leq 0.05$ )

Table 4.7 Cloudiness (%T)

Storage time (day)	% orange juice sacs vs pH variation					
	0% vs pH3	0% vs pH3.5	0% vs pH4	3% vs pH3	3% vs pH 3.5	3% vs pH4
0	0.34 ± 0.02 <sup>a</sup>	0.34 ± 0.02 <sup>a</sup>	0.38 ± 0.05 <sup>a</sup>	0.36 ± 0.02 <sup>a</sup>	0.40 ± 0.07 <sup>a</sup>	0.76 ± 0.21 <sup>b</sup>
3	0.47 ± 0.03 <sup>a</sup>	0.41 ± 0.10 <sup>a</sup>	0.42 ± 0.08 <sup>a</sup>	0.35 ± 0.07 <sup>a</sup>	0.45 ± 0.08 <sup>a</sup>	1.50 ± 0.27 <sup>b</sup>
6	0.73 ± 0.04 <sup>a</sup>	0.44 ± 0.11 <sup>a</sup>	0.41 ± 0.06 <sup>a</sup>	0.43 ± 0.13 <sup>a</sup>	1.69 ± 0.11 <sup>b</sup>	2.27 ± 0.64 <sup>c</sup>
9	1.37 ± 0.05 <sup>a</sup>	0.71 ± 0.17 <sup>bc</sup>	0.92 ± 0.27 <sup>b</sup>	0.53 ± 0.15 <sup>c</sup>	1.74 ± 0.38 <sup>d</sup>	2.41 ± 0.31 <sup>c</sup>
12	4.52 ± 0.15 <sup>a</sup>	0.86 ± 0.10 <sup>b</sup>	6.93 ± 1.38 <sup>c</sup>	2.34 ± 1.34 <sup>b</sup>	6.12 ± 1.31 <sup>c</sup>	4.22 ± 0.94 <sup>a</sup>
15	5.80 ± 0.14 <sup>a</sup>	1.33 ± 0.21 <sup>b</sup>	8.33 ± 0.74 <sup>c</sup>	6.14 ± 1.23 <sup>a</sup>	6.28 ± 0.86 <sup>b</sup>	4.59 ± 0.86 <sup>d</sup>

\*) Values within a row followed by different letters were significantly different ( $P \leq 0.05$ )

Table 4.8 pH value

Storage time (day)	% orange juice sacs vs pH variation					
	0% vs pH3	0% vs pH3.5	0% vs pH4	3% vs pH3	3% vs pH 3.5	3% vs pH4
0	3.02 ± 0.02 <sup>a</sup>	3.50 ± 0.00 <sup>a</sup>	4.00 ± 0.00 <sup>b</sup>	3.04 ± 0.02 <sup>a</sup>	3.50 ± 0.00 <sup>a</sup>	4.00 ± 0.00 <sup>a</sup>
3	3.02 ± 0.02 <sup>a</sup>	3.46 ± 0.05 <sup>a</sup>	3.98 ± 0.01 <sup>a</sup>	3.03 ± 0.03 <sup>a</sup>	3.49 ± 0.04 <sup>a</sup>	3.98 ± 0.02 <sup>a</sup>
6	2.98 ± 0.02 <sup>a</sup>	3.46 ± 0.03 <sup>a</sup>	3.93 ± 0.02 <sup>a</sup>	2.96 ± 0.01 <sup>a</sup>	3.48 ± 0.04 <sup>a</sup>	3.91 ± 0.03 <sup>a</sup>
9	2.96 ± 0.01 <sup>a</sup>	3.43 ± 0.02 <sup>b</sup>	3.86 ± 0.02 <sup>c</sup>	2.92 ± 0.03 <sup>a</sup>	3.46 ± 0.02 <sup>b</sup>	3.84 ± 0.04 <sup>c</sup>
12	2.90 ± 0.02 <sup>a</sup>	3.41 ± 0.03 <sup>a</sup>	3.83 ± 0.03 <sup>a</sup>	2.89 ± 0.05 <sup>a</sup>	3.40 ± 0.03 <sup>a</sup>	3.75 ± 0.08 <sup>a</sup>
15	2.89 ± 0.03 <sup>a</sup>	3.37 ± 0.03 <sup>a</sup>	3.74 ± 0.03 <sup>a</sup>	2.85 ± 0.01 <sup>a</sup>	3.36 ± 0.05 <sup>a</sup>	3.67 ± 0.06 <sup>a</sup>

\*) Values within a row followed by different letters were significantly different ( $P \leq 0.05$ )

Table 4.9 Total Soluble Solid (TSS) (°Brix)

Storage time (day)	% orange juice sacs vs pH variation					
	0% vs pH3	0% vs pH3.5	0% vs pH4	3% vs pH3	3% vs pH3.5	3% vs pH4
0	18.07 ± 0.23 <sup>a</sup>	18.33 ± 0.42 <sup>a</sup>	18.30 ± 0.52 <sup>a</sup>	18.00 ± 0.00 <sup>a</sup>	18.67 ± 0.49 <sup>b</sup>	18.60 ± 0.35 <sup>a</sup>
3	18.33 ± 0.46 <sup>a</sup>	18.60 ± 0.40 <sup>a</sup>	18.53 ± 0.46 <sup>a</sup>	18.27 ± 0.12 <sup>a</sup>	18.53 ± 0.31 <sup>a</sup>	18.27 ± 0.12 <sup>a</sup>
6	18.67 ± 0.31 <sup>a</sup>	18.93 ± 0.12 <sup>a</sup>	19.00 ± 0.00 <sup>b</sup>	18.80 ± 0.20 <sup>a</sup>	18.93 ± 0.12 <sup>a</sup>	18.67 ± 0.12 <sup>a</sup>
9	18.20 ± 0.72 <sup>a</sup>	18.73 ± 0.31 <sup>a</sup>	18.87 ± 0.23 <sup>a</sup>	18.33 ± 0.23 <sup>a</sup>	18.73 ± 0.23 <sup>a</sup>	18.53 ± 0.42 <sup>a</sup>
12	19.07 ± 0.31 <sup>a</sup>	19.33 ± 0.58 <sup>a</sup>	19.60 ± 0.53 <sup>a</sup>	19.53 ± 0.61 <sup>a</sup>	19.47 ± 0.81 <sup>a</sup>	19.67 ± 0.31 <sup>a</sup>
15	19.40 ± 0.40 <sup>a</sup>	19.60 ± 0.20 <sup>a</sup>	18.80 ± 0.20 <sup>b</sup>	18.47 ± 0.12 <sup>b</sup>	18.67 ± 0.31 <sup>b</sup>	18.67 ± 0.23 <sup>b</sup>

\*) Values within a row followed by different letters were significantly different ( $P \leq 0.05$ )

Table 4.10 Total titrable acidity (% citric acid)

Storage time (day)	% orange juice sacs vs pH variation					
	0% vs pH3	0% vs pH3.5	0% vs pH4	3% vs pH3	3% vs pH3.5	3% vs pH4
0	0.34 ± 0.01 <sup>a</sup>	0.29 ± 0.01 <sup>b</sup>	0.23 ± 0.00 <sup>c</sup>	0.32 ± 0.00 <sup>d</sup>	0.28 ± 0.01 <sup>b</sup>	0.23 ± 0.01 <sup>c</sup>
3	0.34 ± 0.00 <sup>a</sup>	0.28 ± 0.01 <sup>a</sup>	0.24 ± 0.01 <sup>a</sup>	0.32 ± 0.02 <sup>a</sup>	0.28 ± 0.01 <sup>a</sup>	0.23 ± 0.01 <sup>a</sup>
6	0.31 ± 0.02 <sup>a</sup>	0.30 ± 0.02 <sup>a</sup>	0.24 ± 0.01 <sup>a</sup>	0.33 ± 0.02 <sup>a</sup>	0.30 ± 0.02 <sup>a</sup>	0.23 ± 0.00 <sup>a</sup>
9	0.33 ± 0.01 <sup>a</sup>	0.27 ± 0.03 <sup>a</sup>	0.23 ± 0.01 <sup>a</sup>	0.31 ± 0.01 <sup>a</sup>	0.28 ± 0.01 <sup>a</sup>	0.21 ± 0.02 <sup>a</sup>
12	0.33 ± 0.01 <sup>a</sup>	0.29 ± 0.03 <sup>a</sup>	0.24 ± 0.01 <sup>a</sup>	0.32 ± 0.02 <sup>a</sup>	0.28 ± 0.02 <sup>a</sup>	0.23 ± 0.01 <sup>a</sup>
15	0.34 ± 0.01 <sup>a</sup>	0.29 ± 0.01 <sup>a</sup>	0.25 ± 0.03 <sup>a</sup>	0.33 ± 0.02 <sup>a</sup>	0.30 ± 0.01 <sup>a</sup>	0.24 ± 0.01 <sup>a</sup>

\*) Values within a row followed by different letters were significantly different ( $P \leq 0.05$ )

Table 4.11 Moisture content (%)

Storage time (day)	% orange juice sacs vs pH variation					
	0% vs pH3	0% vs pH3.5	0% vs pH4	3% vs pH3	3% vs pH 3.5	3% vs pH4
0	84.26 ± 0.30 <sup>a</sup>	83.55 ± 0.23 <sup>a</sup>	83.22 ± 0.32 <sup>a</sup>	84.35 ± 0.26 <sup>a</sup>	83.67 ± 0.16 <sup>a</sup>	83.56 ± 0.23 <sup>a</sup>
3	84.07 ± 0.36 <sup>ab</sup>	83.61 ± 0.44 <sup>ab</sup>	82.90 ± 0.16 <sup>c</sup>	84.23 ± 0.27 <sup>b</sup>	83.49 ± 0.05 <sup>abc</sup>	84.03 ± 0.40 <sup>ab</sup>
6	84.95 ± 0.11 <sup>a</sup>	83.65 ± 0.60 <sup>b</sup>	83.75 ± 0.30 <sup>bc</sup>	84.53 ± 0.65 <sup>abc</sup>	84.85 ± 0.29 <sup>a</sup>	83.27 ± 0.20 <sup>b</sup>
9	84.78 ± 0.31 <sup>a</sup>	84.43 ± 0.17 <sup>a</sup>	83.73 ± 0.09 <sup>a</sup>	84.91 ± 0.17 <sup>a</sup>	83.97 ± 0.32 <sup>a</sup>	83.89 ± 0.19 <sup>a</sup>
12	83.98 ± 0.33 <sup>a</sup>	83.28 ± 0.06 <sup>a</sup>	82.97 ± 0.15 <sup>a</sup>	83.75 ± 0.05 <sup>a</sup>	83.97 ± 0.32 <sup>a</sup>	83.89 ± 0.19 <sup>a</sup>
15	83.88 ± 0.42 <sup>a</sup>	83.59 ± 0.05 <sup>a</sup>	82.90 ± 0.29 <sup>a</sup>	84.49 ± 0.38 <sup>a</sup>	83.22 ± 0.25 <sup>a</sup>	83.08 ± 0.07 <sup>a</sup>

\*) Values within a row followed by different letters were significantly different ( $P \leq 0.05$ )

Table 4.12 Total solid (TS) (%)

Storage time (day)	% orange juice sacs vs pH variation					
	0% vs pH3	0% vs pH3.5	0% vs pH4	3% vs pH3	3% vs pH 3.5	3% vs pH4
0	15.74 ± 0.30 <sup>a</sup>	16.45 ± 0.23 <sup>a</sup>	16.78 ± 0.32 <sup>a</sup>	15.65 ± 0.26 <sup>a</sup>	16.33 ± 0.16 <sup>a</sup>	16.44 ± 0.23 <sup>a</sup>
3	15.93 ± 0.36 <sup>ab</sup>	16.39 ± 0.44 <sup>ab</sup>	17.10 ± 0.16 <sup>c</sup>	15.77 ± 0.27 <sup>a</sup>	16.51 ± 0.05 <sup>bc</sup>	15.97 ± 0.40 <sup>ab</sup>
6	15.05 ± 0.11 <sup>a</sup>	16.35 ± 0.60 <sup>b</sup>	16.25 ± 0.30 <sup>bc</sup>	15.47 ± 0.65 <sup>abc</sup>	15.15 ± 0.29 <sup>a</sup>	16.73 ± 0.20 <sup>c</sup>
9	15.22 ± 0.31 <sup>a</sup>	15.60 ± 0.23 <sup>a</sup>	16.27 ± 0.09 <sup>a</sup>	15.09 ± 0.18 <sup>a</sup>	16.03 ± 0.32 <sup>a</sup>	16.11 ± 0.19 <sup>a</sup>
12	16.02 ± 0.33 <sup>a</sup>	16.72 ± 0.06 <sup>a</sup>	17.03 ± 0.15 <sup>a</sup>	16.25 ± 0.05 <sup>a</sup>	16.54 ± 0.44 <sup>a</sup>	16.89 ± 0.09 <sup>a</sup>
15	16.12 ± 0.41 <sup>a</sup>	16.41 ± 0.05 <sup>a</sup>	17.10 ± 0.30 <sup>b</sup>	15.51 ± 0.38 <sup>a</sup>	16.78 ± 0.25 <sup>a</sup>	16.92 ± 0.07 <sup>a</sup>

\*) Values within a row followed by different letters were significantly different ( $P \leq 0.05$ )

Table 4.13 Reducing sugar (%)

Storage time (day)	% orange juice sacs vs pH variation					
	0% vs pH3	0% vs pH3.5	0% vs pH4	3% vs pH3	3% vs pH 3.5	3% vs pH4
0	5.53 ± 0.39 <sup>a</sup>	5.49 ± 0.33 <sup>a</sup>	5.76 ± 0.32 <sup>a</sup>	5.79 ± 0.13 <sup>a</sup>	5.83 ± 0.13 <sup>a</sup>	5.82 ± 0.13 <sup>a</sup>
3	4.28 ± 0.18 <sup>a</sup>	4.83 ± 0.33 <sup>a</sup>	4.42 ± 0.97 <sup>a</sup>	4.61 ± 0.37 <sup>a</sup>	4.82 ± 0.03 <sup>a</sup>	3.91 ± 0.20 <sup>a</sup>
6	5.81 ± 0.13 <sup>a</sup>	5.55 ± 0.41 <sup>a</sup>	5.71 ± 1.15 <sup>a</sup>	5.14 ± 0.64 <sup>a</sup>	6.24 ± 0.16 <sup>a</sup>	6.35 ± 0.26 <sup>a</sup>
9	5.55 ± 0.22 <sup>a</sup>	5.46 ± 0.45 <sup>a</sup>	5.89 ± 0.33 <sup>a</sup>	4.93 ± 0.86 <sup>a</sup>	5.98 ± 0.24 <sup>a</sup>	5.69 ± 0.24 <sup>a</sup>
12	5.35 ± 0.09 <sup>a</sup>	5.19 ± 0.59 <sup>a</sup>	5.62 ± 0.27 <sup>a</sup>	4.81 ± 0.87 <sup>a</sup>	5.61 ± 0.24 <sup>a</sup>	5.39 ± 0.18 <sup>a</sup>
15	4.98 ± 0.40 <sup>ab</sup>	5.20 ± 0.30 <sup>ab</sup>	4.81 ± 0.39 <sup>a</sup>	4.27 ± 0.05 <sup>c</sup>	4.79 ± 0.10 <sup>a</sup>	5.46 ± 0.12 <sup>b</sup>

\*) Values within a row followed by different letters were significantly different ( $P \leq 0.05$ )

Table 4.14 PE enzyme (PMEu/g.s.s / 10<sup>-4</sup>)

Storage time (day)	% orange juice sacs vs pH variation					
	0% vs pH3	0% vs pH3.5	0% vs pH4	3% vs pH3	3% vs pH 3.5	3% vs pH4
0	4.24 ± 1.92 <sup>a</sup>	1.89 ± 0.66 <sup>a</sup>	2.32 ± 1.00 <sup>a</sup>	4.68 ± 0.98 <sup>a</sup>	3.91 ± 0.47 <sup>a</sup>	4.75 ± 1.02 <sup>a</sup>
3	4.19 ± 0.97 <sup>a</sup>	1.86 ± 0.63 <sup>a</sup>	2.08 ± 0.74 <sup>a</sup>	4.62 ± 0.38 <sup>a</sup>	3.72 ± 0.98 <sup>a</sup>	3.98 ± 0.94 <sup>a</sup>
6	5.14 ± 0.43 <sup>a</sup>	2.43 ± 0.61 <sup>a</sup>	1.82 ± 0.61 <sup>a</sup>	4.28 ± 0.59 <sup>a</sup>	3.85 ± 0.34 <sup>a</sup>	2.26 ± 0.35 <sup>a</sup>
9	4.34 ± 0.36 <sup>a</sup>	2.26 ± 0.38 <sup>a</sup>	2.24 ± 0.93 <sup>a</sup>	4.18 ± 0.34 <sup>a</sup>	3.68 ± 0.05 <sup>a</sup>	2.90 ± 0.32 <sup>a</sup>
12	3.82 ± 0.29 <sup>a</sup>	1.39 ± 0.37 <sup>a</sup>	2.36 ± 0.63 <sup>a</sup>	3.34 ± 0.34 <sup>a</sup>	3.74 ± 0.18 <sup>a</sup>	3.31 ± 0.34 <sup>a</sup>
15	3.36 ± 0.40 <sup>a</sup>	1.57 ± 0.35 <sup>a</sup>	2.86 ± 0.35 <sup>a</sup>	3.53 ± 0.38 <sup>a</sup>	4.11 ± 0.42 <sup>a</sup>	3.90 ± 0.33 <sup>a</sup>

\*) Values within a row followed by different letters were significantly different ( $P \leq 0.05$ )

Table 4.15 Fiber content (%)

Storage time (day)	% orange juice sacs vs pH variation					
	0% vs pH3	0% vs pH3.5	0% vs pH4	3% vs pH3	3% vs pH 3.5	3% vs pH4
0	0.51 ± 0.09 <sup>a</sup>	0.35 ± 0.12 <sup>a</sup>	0.41 ± 0.10 <sup>a</sup>	0.43 ± 0.10 <sup>a</sup>	0.49 ± 0.15 <sup>a</sup>	0.55 ± 0.07 <sup>a</sup>
7	0.57 ± 0.08 <sup>ab</sup>	0.38 ± 0.09 <sup>a</sup>	0.43 ± 0.15 <sup>a</sup>	0.44 ± 0.11 <sup>a</sup>	0.79 ± 0.16 <sup>b</sup>	0.58 ± 0.19 <sup>ab</sup>
15	0.62 ± 0.07 <sup>a</sup>	0.46 ± 0.12 <sup>a</sup>	0.49 ± 0.10 <sup>a</sup>	0.63 ± 0.24 <sup>a</sup>	0.80 ± 0.13 <sup>a</sup>	0.79 ± 0.16 <sup>a</sup>

\*) Values within a row followed by different letters were significantly different ( $P \leq 0.05$ )

Table 4.16 Total Plate Count (log CFU/ml)

Storage time (day)	% orange juice sacs vs pH variation					
	0% vs pH3	0% vs pH3.5	0% vs pH4	3% vs pH3	3% vs pH 3.5	3% vs pH4
0	1.31 ± 0.05 <sup>a</sup>	1.16 ± 0.11 <sup>b</sup>	0.10 ± 0.07 <sup>c</sup>	1.43 ± 0.08 <sup>e</sup>	1.63 ± 0.04 <sup>f</sup>	1.80 ± 0.05 <sup>e</sup>
3	1.32 ± 0.04 <sup>a</sup>	1.71 ± 0.02 <sup>b</sup>	1.89 ± 0.03 <sup>c</sup>	2.05 ± 0.04 <sup>d</sup>	2.14 ± 0.05 <sup>de</sup>	2.13 ± 0.10 <sup>de</sup>
6	2.08 ± 0.05 <sup>a</sup>	2.87 ± 0.04 <sup>b</sup>	2.78 ± 0.09 <sup>bc</sup>	2.15 ± 0.09 <sup>a</sup>	2.43 ± 0.08 <sup>d</sup>	2.59 ± 0.21 <sup>d</sup>
9	3.60 ± 0.05 <sup>a</sup>	3.77 ± 0.06 <sup>a</sup>	3.89 ± 0.05 <sup>a</sup>	3.55 ± 0.12 <sup>a</sup>	3.70 ± 0.07 <sup>a</sup>	3.83 ± 0.04 <sup>a</sup>
12	3.78 ± 0.07 <sup>a</sup>	3.95 ± 0.07 <sup>a</sup>	4.13 ± 0.07 <sup>a</sup>	4.66 ± 0.20 <sup>a</sup>	4.51 ± 0.03 <sup>a</sup>	4.54 ± 0.11 <sup>a</sup>
15	4.51 ± 0.08 <sup>a</sup>	4.73 ± 0.05 <sup>a</sup>	4.76 ± 0.04 <sup>a</sup>	4.80 ± 0.09 <sup>a</sup>	4.79 ± 0.06 <sup>a</sup>	5.06 ± 0.64 <sup>a</sup>

\*) Values within a row followed by different letters were significantly different ( $P \leq 0.05$ )

Table 4.17 Lactic acid bacteria (log CFU/ml)

Storage time (day)	% orange juice sacs vs pH variation					
	0% vs pH3	0% vs pH3.5	0% vs pH4	3% vs pH3	3% vs pH 3.5	3% vs pH4
0	1.17 ± 0.10 <sup>a</sup>	1.18 ± 0.09 <sup>a</sup>	1.11 ± 0.10 <sup>a</sup>	1.42 ± 0.12 <sup>a</sup>	1.20 ± 0.09 <sup>a</sup>	1.37 ± 0.17 <sup>a</sup>
3	1.44 ± 0.09 <sup>a</sup>	1.81 ± 0.06 <sup>b,c</sup>	1.72 ± 0.08 <sup>b</sup>	1.88 ± 0.02 <sup>c</sup>	1.58 ± 0.06 <sup>a</sup>	1.89 ± 0.08 <sup>c</sup>
6	2.23 ± 0.03 <sup>a</sup>	2.21 ± 0.06 <sup>a</sup>	2.45 ± 0.13 <sup>a</sup>	2.51 ± 0.18 <sup>a</sup>	2.59 ± 0.14 <sup>a</sup>	2.75 ± 0.12 <sup>a</sup>
9	2.84 ± 0.03 <sup>a</sup>	2.86 ± 0.00 <sup>a</sup>	2.92 ± 0.21 <sup>a</sup>	3.44 ± 0.49 <sup>a</sup>	3.17 ± 0.09 <sup>a</sup>	3.29 ± 0.25 <sup>a</sup>
12	3.27 ± 0.13 <sup>a</sup>	3.20 ± 0.06 <sup>a,b</sup>	3.61 ± 0.25 <sup>b</sup>	3.86 ± 0.10 <sup>c</sup>	3.86 ± 0.07 <sup>c</sup>	3.77 ± 0.06 <sup>c</sup>
15	3.83 ± 0.09 <sup>a</sup>	3.70 ± 0.13 <sup>a</sup>	3.79 ± 0.08 <sup>a</sup>	3.92 ± 0.07 <sup>a</sup>	4.07 ± 0.07 <sup>a</sup>	4.05 ± 0.11 <sup>a</sup>

\*) Values within a row followed by different letters were significantly different ( $P \leq 0.05$ )

Table 4.18 Yeast and mold (log CFU/ml)

Storage time (day)	% orange juice sacs vs pH variation					
	0% vs pH3	0% vs pH3.5	0% vs pH4	3% vs pH3	3% vs pH 3.5	3% vs pH4
0	1.49 ± 0.10 <sup>a</sup>	2.12 ± 0.02 <sup>b</sup>	2.19 ± 0.01 <sup>b</sup>	1.60 ± 0.03 <sup>c</sup>	1.93 ± 0.01 <sup>d</sup>	1.97 ± 0.03 <sup>d</sup>
15	2.63 ± 0.04 <sup>a</sup>	2.79 ± 0.05 <sup>b</sup>	3.13 ± 0.03 <sup>c</sup>	2.58 ± 0.06 <sup>a</sup>	3.03 ± 0.03 <sup>d</sup>	3.45 ± 0.05 <sup>e</sup>

\*) Values within a row followed by different letters were significantly different ( $P \leq 0.05$ )

Table 4.19 Vitamin C content (mg/100ml)

Storage time (day)	% orange juice sacs vs pH variation					
	0% vs pH3	0% vs pH3.5	0% vs pH4	3% vs pH3	3% vs pH 3.5	3% vs pH4
0	32.49 ± 0.16 <sup>a</sup>	32.48 ± 0.41 <sup>a</sup>	29.54 ± 0.29 <sup>b</sup>	30.37 ± 0.92 <sup>b,c</sup>	30.70 ± 0.18 <sup>c</sup>	29.91 ± 0.27 <sup>b,c</sup>
3	30.94 ± 0.64 <sup>a</sup>	31.74 ± 0.56 <sup>a</sup>	28.99 ± 0.51 <sup>a</sup>	28.95 ± 0.83 <sup>a</sup>	29.70 ± 0.76 <sup>a</sup>	28.80 ± 0.57 <sup>a</sup>
6	30.31 ± 0.20 <sup>a</sup>	31.39 ± 0.78 <sup>a</sup>	28.61 ± 0.40 <sup>a</sup>	28.83 ± 0.87 <sup>a</sup>	28.95 ± 0.76 <sup>a</sup>	27.98 ± 0.74 <sup>a</sup>
9	30.04 ± 0.06 <sup>a</sup>	30.21 ± 0.99 <sup>b</sup>	26.83 ± 0.91 <sup>a</sup>	28.72 ± 1.02 <sup>a</sup>	28.62 ± 0.10 <sup>a</sup>	26.33 ± 0.17 <sup>a</sup>
12	29.71 ± 0.09 <sup>a</sup>	29.25 ± 0.93 <sup>a</sup>	25.69 ± 0.90 <sup>a</sup>	28.35 ± 0.87 <sup>a</sup>	28.24 ± 0.21 <sup>a</sup>	25.51 ± 0.17 <sup>a</sup>
15	29.77 ± 0.10 <sup>a</sup>	28.46 ± 0.39 <sup>b</sup>	23.79 ± 0.40 <sup>c</sup>	27.57 ± 0.87 <sup>d</sup>	26.82 ± 0.23 <sup>d</sup>	23.39 ± 0.11 <sup>c</sup>

\*) Values within a row followed by different letters were significantly different ( $P \leq 0.05$ )

Table 4.20 Carotenoid content ( $\mu\text{g/ml}$ )

Storage time (day)	% orange juice sacs vs pH variation					
	0% vs pH3	0% vs pH3.5	0% vs pH4	3% vs pH3	3% vs pH 3.5	3% vs pH4
0	3.41 ± 0.37 <sup>a</sup>	3.81 ± 0.68 <sup>a</sup>	3.93 ± 0.74 <sup>a</sup>	3.77 ± 0.53 <sup>a</sup>	4.31 ± 1.05 <sup>a</sup>	4.21 ± 0.28 <sup>a</sup>
7	3.34 ± 0.68 <sup>a</sup>	3.42 ± 0.68 <sup>a</sup>	3.36 ± 0.39 <sup>a</sup>	3.72 ± 0.70 <sup>a</sup>	3.71 ± 0.70 <sup>a</sup>	3.78 ± 0.69 <sup>a</sup>
15	2.92 ± 0.35 <sup>a</sup>	3.51 ± 0.42 <sup>a</sup>	3.32 ± 0.52 <sup>a</sup>	2.92 ± 0.24 <sup>a</sup>	2.85 ± 0.39 <sup>a</sup>	2.97 ± 0.26 <sup>a</sup>

\*) Values within a row followed by different letters were significantly different ( $P \leq 0.05$ )



## Curriculum Vitae

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