

INTRODUCTION

One of the main contributing factors involved in incidences of primary hypertension (HTN) is the excessive consumption of sodium, found in common salt which is used to enhance the flavor of food. The sodium found in seawater, however, is in an ionic form, thus greatly reduces its dietary availability, while additionally providing a balanced variety of trace minerals.

There is a significant body of scientific literature that attributes a variety of beneficial health properties to seawater. The integration of seawater into the diet through its incorporation into products that have been until now commonly prepared using salt, could significantly improve the quality of life of the consumer.

MATERIALS & METHODS

Materials

- Treated seawater
- Ingredients for the preparation of the sauces
- Mixer, vacuum steam jacketed kettle, steam jacketed kettle, tin cans.

Methods

1. Concentration of seawater
2. Determination of sodium chloride content in concentrated and unconcentrated seawater: ICP chemical element analysis and conversion by theoretical calculation.
3. Preparation of tomato sauces

DATE:	NAME:	SAMPLE CODE						
ASPECT		1	2	3	4	5	6	7
COLOR		1	2	3	4	5	6	7
FLAVOR		1	2	3	4	5	6	7
TEXTURE		1	2	3	4	5	6	7
ACCEPTANCE		1	2	3	4	5	6	7
OBSERVATIONS:								
1: Dislike it very much								
2: Dislike it quite bit								
3: Dislike slightly								
4: Neither like nor dislike it								
5: Like it slightly								
6: Like it quite bit								
7: Like it very much								

Figure 2. Sensory acceptance test card

4. Acceptance test (figure 2): sensorial testing was carried out by means of acceptance testing (Meilgaard, M. 1991)
5. Determination of salt content in water of the end products: ICP chemical element analysis and conversion by theoretical calculation.



Vacuum steam jacketed kettle

RESULTS & DISCUSSION

Concentrated seawater was elaborated by evaporating water in a vacuum steam jacketed kettle. This reached up to 16.7% NaCl. The tomato based products were then elaborated with concentrated seawater and subjected to sensory analysis by means of acceptability testing. The sensory tests returned the following results.

Table 1. Products with concentrated seawater sensory acceptance test results

ATTRIBUTES	Fried tomato sauce with concentrated seawater	Homemade fried tomato sauce with concentrated seawater	Pizza sauce with concentrated seawater	Barbecue sauce with concentrated seawater
ASPECT	7.0	7.0	7.0	7.0
COLOR	6.8	6.9	6.7	6.9
FLAVOR	3.0	3.5	2.9	2.8
TEXTURE	6.7	6.8	6.9	6.8
ACCEPTANCE	3.0	3.2	2.8	2.7

Products were then prepared with non concentrated seawater and acceptability tests were carried out until a positive result was obtained. The results of the acceptability tests of these products are shown in Table 2.

Table 2. Products with seawater sensory acceptance test results

ATTRIBUTES	Fried tomato sauce with seawater	Homemade fried tomato sauce with seawater	Pizza sauce with seawater	Barbecue sauce with seawater
ASPECT	7	7	7	7
COLOR	6,7	6,9	6,8	6,9
FLAVOR	6,8	6,9	6,5	6,8
TEXTURE	6,8	6,9	6,9	6,8
ACCEPTANCE	6,8	6,9	6,8	6,9

Table 3. % NaCl

Product	%NaCl	Product	%NaCl
Fried tomato sauce	2.33	Fried tomato sauce with seawater	1.60
Homemade fried tomato sauce	2.27	Homemade fried tomato sauce with seawater	1.50
Pizza sauce	1.84	Pizza sauce with seawater	1.18
Barbecue sauce	0.55	Barbecue sauce with seawater	2.84

Once the final products were obtained their salt content was analyzed. The original products were also analyzed in order to make a comparison between both. The results are shown in Table 3.

Discussion

The maximum concentration of salt that can be reached in the elaboration of concentrated seawater will be 16.7% NaCl. The sensory analysis (figure 3) results shown in demonstrate that in products made with concentrated seawater, the salt flavor is enhanced in excess of acceptable levels.

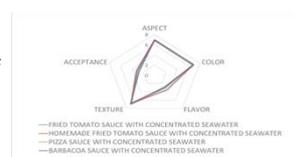


Figure 3. Spider chart products with concentrated seawater

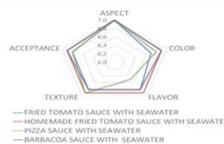


Figure 4. Spider chart products with concentrated seawater

Then it was decided that subsequent trials would be conducted using non concentrated seawater. After successive trials and sensory analysis testing to determine the appropriate concentration of seawater, tomato based products were produced that were sensorially acceptable (Figure 4).

The results show that the content of NaCl in fried tomato was reduced from 2.33% to 1.60%, and from 2.27% to 1.50% in homemade fried tomato. For pizza sauce and barbecue sauce, however, the substitution of common salt was not possible as products made with seawater required a higher amount of NaCl in the trial product than in the original product.

CONCLUSIONS

The reduction of the amount of Na in fried tomato and homemade fried tomato is possible by replacing common salt with seawater in its preparation. The reduction was of 31.3% and 33.9%, respectively.

The reduction of NaCl in pizza sauce or barbecue sauce was not possible, as in order to reach a sensorially acceptable result, it was necessary to add a quantity of seawater which resulted in a higher NaCl concentration than products made with common salt as an ingredient.

According to data from Innova Market Insights, in the last three years, the food industry has launched 252.545 labelled as healthy products. The tomato based products that are the subject of this study fall into this category. Given its relationship with hypertension, cardiovascular disease, osteoporosis, kidney stones and gastric cancer, any reduction in Na content in food will also have a beneficial effect for society in general.

Acknowledgments

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Literature cited

Meilgaard, M., Civille, G.V. and Carr, B.T. (1991). Sensory evaluation techniques, 2nd ed. CRC Press, London, chapter 6.1 (pp 60), chapter 6.2 (pp 103-106), chapter 9 (pp 193-195), chapter 10 (pp 211-212).