

# **Manufacturing and Technochemical Properties of Some Natural low Calory Juices**



By  
**Mohamed Ben Mahmoud Massri**  
General Bachelor degree (Agriculture Engineering) 1990

A thesis submitted in partial fulfilment  
of  
the requirment for the degree of

**MASTER OF SCIENCE**

664-1  
M. BA

57664

In  
Agriculture  
(Food Science and Technology)



Department of Food Science  
Faculty of Agriculture  
Ain Shams University

1996





## Approval Sheet

**Manufacturing and Technochemical Properties of Some  
Natural low Calory Juices**

**By**

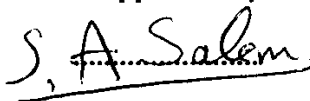
**Mohamed Ben Mahmoud Massri**

**General Bachelor degree (Agriculture Engineering) 1990**

**This Thesis for master of science degree has been approved by :**

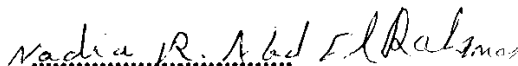
**Prof. Dr. E. Abd-El-Bar Salem**

Prof. of Food Technology  
Food Sci. and Dairy Dept.  
National Research Centre, Cairo



**Prof. Dr. Nadia R. Abd- El-Rahman**

Prof. of Food Science and Technology  
Ain Shams University, Faculty of Agric., Food Sci. Dept.



**Prof. Dr. M. Amin Abdallah**

Prof. of Food Science and Technology  
Ain Shams University, Faculty of Agric., Food Sci. Dept. and  
Dean of the Faculty of Specific Education, Cairo



**Date of examination : 19/10/1996**



**Manufacturing and Technochemical Properties of Some  
Natural low Calory Juices**

**By**  
**Mohamed Ben Mahmoud Massri**  
**General Bachelor degree (Agriculture Engineering) 1990**

**Under the Supervision of :**

**Prof. Dr. M. Amin Abdallh**  
Prof. of Food Sience and Technology  
Ain Shams University, Faculty of Agric., Food Sci. Dept. and  
Dean of the Faculty of Specific Education, Cairo,

**Prof. Dr. M. H. O. El-Kalyoubi**  
Prof. of Food Sience and Technology  
Ain Shams University, Faculty of Agric., Food Sci. Dept.

**Dr. Alaa Mohamed**  
Lecturer of Food Sci. and Technology  
Ain Shams University, Faculty of Agric., food Sci. Dept.



## Abstract

Mohamed Bin Mahmoud Massri . Manufacturing and Tecnochemical Properties of Some Natural Low Calory Juices. Unpublished Master of Science , Ain Shams University, Faculty of Agriculture , Department of Food Science , 1996 .

Low calory natural juices ( orange , carrot , orange - carrot mixture juices ) were prepared by using aspartame as artificial sweeteners in comparing with juices which sweetened with sucrose . The data proved that there is a noticeable increase in ( T.S. ) , ( T.S.S ) , ash content , total sugars , non - reducing sugars , reducing sugars and refractive index values in the juices sweetened with sucrose or sucrose - aspartame mixture . however, no changes were occurred when aspartame was used only . On the other hand , data indicated that decrease in total acidity ( as citric acid % ) , and total carotenoids where found when adding aspartame or sucrose - aspartame mixture to the investigated juices . However using aspartame as sweetener increase ascorbic acid content and without any effect on electrical conductivity . Such trend ( adding the aspartame ) lower the caloric content in relation to the unsweetened samples . The data also proved that all the pasteurized sweetened juice samples were non - Newtonian with pseudoplastic flow behavior . Statistical analysis of sensory evaluation proved that samples containing aspartame recorded lower values in relation to other samples , a trend which indicated the successful application aspartame in fruit juices .

**Key word :** Natural juices , low calory juices , sucrose , aspartame, physicochemical and rheological properties , sensory evaluation .





## ACKNOWLEDGMENT

The author wishes to express his deepest gratitude and infinities thanks to Prof. *Dr. M.AMIN ABD ALLAH* , Professor of Food Science and Technology Department , Faculty of Agriculture, Ain Shams University , Dean of the Faculty of Specific Education , Cairo , Egypt , for his paternal guidance , supervision constructive criticism . Without his help this work could not be performed .

Special thanks are also extended to Prof. *Dr. M.H.EL-KALYOUBI* , Professor of Food Science and Technology Department , Faculty of Agriculture, Ain Shams University , for his valuable supervision , and comments during the work and preparing of this thesis .

Sincere thanks to *Dr. A. ABD EL-RASHID*, Lecturer of Food Science and Technology , for his helping and kind co-operation during supervision and experimental work and preparing of the thesis.

Much gratitude is due to *Dr. NAHED M.ABD EL-MAGUID* , Food Science and Diry Departement National Research Center, Cairo, Egypt for her valuable and greatest efforts during statistical analysis by computer program .

Thanks to all stuff member of Food Scince and Technology Department Faculty of Agriculture , Ain Shams University for their encouragement .

I would like also to offer my gratitude to *AL-BAATH UNIVERSITY* for the very kind help which give me the opportunity to study in Egypt .

I highly offer my respect and gratitude to the *EGYPTIAN GOVERNMENT* who makes me on due course for organizing my career through the scholarship offered to me .



# Contents

	Page
Introduction .....	1
Review of Literature .....	4
1- Alternative sweeteners : Properties , Function and regulatory status .....	4
2- Aspartame as an sweetener .....	9
2-1 - Properties of aspartame .....	9
2-2 - Regulatory status .....	12
2-3 - Chemical structure .....	14
3- Sweetness evaluation of alternative sweeteners .....	14
3-1- Applications of alternative sweeteners .....	17
3-2- Alternative sweeteners as affected by food processing ....	21
4- Rheological properties of sweetened juices .....	23
5- Pasteurization process of juice .....	26
Materials and Methods .....	30
A- Materials .....	30
B- Methods .....	30
B-1- Technological process .....	30
B-1-1- Preparation of natural carrot juice .....	30
B-1-2- Preparation of natural orange juice .....	30

	Page
B-1-3- Preparation of mixed carrot and orange juice .....	31
B-1-4-Sweetening preparations.....	31
B-1-5-Pasteurization process. ....	31
B-2- Analytical methoeds .....	32
B-2-1- Moisture and total solids content .....	32
B-2-2- Total soluble solids and refractive index .....	32
B-2-3- Total ash .....	32
B-2-4- Titratable acidity .....	33
B-2-5- Ascorbie acid .....	33
B-2-6- Total and reducing sugars .....	33
B-2-7- Carotinoids determination .....	33
B-2-8- Browning determination .....	34
B-2-9- pH values.....	34
B-2-10- Determination of energy values .....	34
C-Rheological properties .....	34
C-1-Apparent viscosity .....	34
C-2- Thixotropy behaviour .....	35
D- Sensory evaluation .....	36
E-Statistical analysis .....	36
Results and Discussion .....	37
<b>Bart I - Effect of pasteurization and sweetening system on the physicochemical properties of orange , carrot juice and their mixture .....</b>	<b>37</b>
<b>I - Physicochmical proprties of fresh orange, carrot juices and their mixture .....</b>	<b>37</b>

	Page
<b>II- Physicochemical properties of the pasteurized and sweetened juices.....</b>	<b>41</b>
1- Moisture and total solids (T.S.).....	41
2- Total soluble solids ( T S S ) .....	46
3- Refractive index ( R I ) .....	46
4- Ash .....	49
5- Total acidity and pH values .....	53
6- Sugar Contents.....	57
7- Ascorbic acid content.....	60
8- Browning .....	71
9- Carotenoids .....	75
10- Energy values .....	79
 <b>Part II - Rheological properties of the investigated pasteurized juices .....</b>	 <b>83</b>
1- Apparent viscosity.....	83
2- Thixotropy behaviour.....	101
 <b>Part III - Sensory evaluation of pasteurized and sweetened orange , carrot juices and their mixture .....</b>	 <b>116</b>
 <b>Summary and conclusion .....</b>	 <b>134</b>
 <b>References .....</b>	 <b>138</b>
 <b>Arabic summary</b>	

## List of Tables

No	Title	Page
I	Major properties of some common non - nutritive sweeteners .....	7
II	Some common nutritive and non-nutritive sweeteners .....	8
III	Caloric content of various foods and beverages sweetened with sugar vs those sweetened with aspartame .....	11
1	Physicochemical properties of fresh orange, carrot juices and their mixture .....	38
2	Mean percentages of Moisture content of the pasteurized juices and sweetened with sucrose and aspartame .....	42
3	Mean percentages of total solids (T.S.) content of the pasteurized juices and sweetened with sucrose and aspartame .....	44
4	Mean percentages of total soluble solids (T.S.S) content of the pasteurized juices and sweetened with sucrose and aspartame .....	47
5	Refractive index (R.I) of the pasteurized juices and sweetened with sucrose and aspartame .....	50
6	Mean percentages of ash content of the pasteurized juices and sweetened with sucrose and aspartame .....	51
7	Mean percentages of total acidity content (as citric acid ) of the pasteurized juices and sweetened with sucrose and aspartame .....	54
8	pH values of pasteurized juices and sweetened with sucrose and aspartame .....	56
9	Mean percentages of total sugars content of the pasteurized juices and sweetened with sucrose and aspartame .....	58
10	Mean percentages of non-reducing sugars content of the pasteurized juices and sweetened with sucrose and aspartame .....	61