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## EDUCATION

1996-2000: **School of Food Science and Technology, Wuxi University of Light Industry, Wuxi, Jiangsu Province:** Bachelor's degree in Food Engineering, July 2000

2003-2006: **School of Food Science and Technology, Southern Yangtze University, Wuxi, Jiangsu Province:** Master's degree in Food Science and Technology, July 2006

2007-2010: **School of Food Science and Technology, Jiangnan University, Wuxi, Jiangsu Province:** Candidate for PhD in Food Science and Technology

## EXPERIENCE & TRAINING

2008-2010: Research on Quick Freeze-drying of Fresh-cut Vegetables Based on Combinative (Osmotic, Microwave-vacuum) Dehydration Process and Study on Storage Mechanisms of the Dried Products

2004-2006: Research on production, purification and characterization of an endoinulinase from *Penicillium purpurogenum*

1999-2000: Studies on a New Flavor Ham Product: manufacture and color stabilization

### **Studies on the effects of different drying methods on the quality of edible fresh vegetables: case of the main pigments and nutrients of carrots**

**Advisor: Prof. Min Zhang, Jiangnan University, Wuxi, China**

**Co-Advisor: Prof. Arun S. Mujumdar, National University of Singapore, Singapore**

## Abstract

### Introduction

#### Chapter1. Literature review

1.1. Understanding the meaning and process of drying

1.2. History of drying in food processing technology

1.2.1. General considerations

1.2.2. Case of vegetable processing mainly focusing on carrots

1.3. Reviewing the different drying techniques applicable to carrots

1.3.1. Advantages of drying carrots

1.3.1.1. Shelf life considerations

1.3.1.2. Convenient and snack food considerations

1.3.1.3. Ingredient for new food formulations

1.3.2. Adverse effects on carrot drying

1.3.2.1. From the point of view of the stability of the main pigments during the drying process

1.3.2.1. Stability of other main nutrients during the drying processes

1.4. Categorizing the carrots among the functional foods

1.4.1. Defining and understanding the meaning of functional food

1.4.2. Role of different pigments in functional properties of carrots

- 1.4.2.1. Main pigments
  - 1.4.2.1.1. Beta carotene
  - 1.4.2.1.2. Alfa carotene
- 1.4.2.2. Minor pigments
- 1.4.3. Vitamin C in carrots
- 1.5. Methods of extracting and analyzing the pigments of carrots
  - 1.5.1. Sample preparations
  - 1.5.2. Open Column Chromatography
  - 1.5.3. High Performance Liquid Chromatography
- 1.6. Objectives of this thesis
  - 1.6.1. Focus on the functional properties of carrots
  - 1.6.2. Focus on nutritional value of carrots
  - 1.6.2. Focus on the physical properties of carrots
  - 1.6.3. Focus on subjective and object sensory analysis of the dried products

## **Chapter2. Effects of Microwave Vacuum Drying (MVD) on contents of alfa and beta carotenoids**

## **Chapter3. Effects of hot air drying (HAD) on contents of alfa and beta carotenoids**

## **Chapter4. Effects of freeze drying (FD) on contents of alfa and beta carotenoids**

## **Chapter5. Effects of Microwave Vacuum Freeze Drying (MFD) on contents of alfa and beta carotenoids**

## **Chapter6. Effects of osmodehydration (OD) on the contents of alfa and beta carotenoids**

## **Chapter7. Effects of combined drying methods on the contents of alfa and beta carotenoids**

- 6.1. Combining microwave vacuum and hot air drying of carrots
- 6.2. Combining osmotic and microwave vacuum drying of carrots
- 6.3. Combining osmotic and hot air drying of carrots
- 6.4. Triple combination drying of microwave vacuum, hot air and osmotic drying of carrots

## **Chap8. Choosing the proper drying methods**

- 8.1. Summary of the analysis of the data of the effects of different drying techniques on the contents of alfa and beta carotene in carrots
- 8.2. Judging the drying methods based on the analysis of physical changes in the dried product
  - 8.2.1. Size, shape, volume, density, porosity, shrinkage of dried products from different drying techniques
  - 8.2.2. Water activity of dried products from different drying techniques
  - 8.2.3. Moisture sorption isotherms of dried products from different drying techniques
  - 8.2.4. Glass transition temperature of dried products from different drying techniques
- 8.3. Subjective sensory evaluation of dried products from different drying techniques
  - 8.3.1. Color
  - 8.3.2. Sweetness
  - 8.3.3. Texture
    - 8.3.3.1. Crispiness
    - 8.3.3.2. Hardness
- 8.4. Objective sensory evaluation of texture by TPA (texture profile analysis)
- 8.5. Structural analysis of the dried products by SEM (scanning electron microscope)
- 8.6. Considering other nutritive qualities in dried products from different drying techniques
  - 8.6.1. Analysis of the content of Vitamin C
    - 8.6.1.1. Vitamin C in fresh carrots
    - 8.6.1.2. Vitamin C in dried carrots from different drying techniques
    - 8.6.1.3. Comparing results, discussing and concluding on the stability of vitamin C in carrots subjected to different drying methods
  - 8.6.2. Analysis of total sugars

8.6.2.1. Contents of sugars in the raw material

8.6.2.2. Content of sugars in the dried carrots

8.6.2.3. Comparing results, discussion and concluding remarks on stability of sugars in carrots subjected to different drying methods

### **Chapter9. General discussion of results, conclusions and recommendations**

9.1. Recapitulation of effects of different drying techniques to the main carotenoids and nutrients in carrots-  
summary on results, discussion and partial conclusions

9.2. General discussion of the results

9.2. General conclusions

9.3. Recommendations

### **10. References**