UNIVERSITI PUTRA MALAYSIA

DEVELOPMENT OF BULK PACKAGING AND STORAGE OF SHALLOT
(Allium ascalonium) PUREE

NOOR AZIZAH BINTI AHMAD

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(Allium ascalonium) PUREE

BY

NOOR AZIZAH BINTI AHMAD

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirement for the Degree of Master of Science.

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DEVELOPMENT OF BULK PACKAGING AND STORAGE OF SHALLOT 
(Allium ascalonium) PUREE

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December 2008

Chairman : Professor Russly Abdul Rahman, PhD
Faculty : Food Science and Technology

The present trend where modern housewives have limited time in preparing food and also the food industry and services need ingredients in convenience form in order to cut down extensive labour, has led to the increase of ready to use food ingredient. With this in mind, ready to use shallots (Allium ascalonium) is able to satisfy the needs of retail and institutional consumers. Studies on physico-chemical changes, microbiological test and sensory evaluation for development of processing treatments of shallot puree using mild heat and acidification were carried out. The L value (L*) and hue angle (Hab) of shallot puree increased significantly (p<0.05) during 8 weeks storage at 5±1 °C (85-95% RH), whilst, the chroma value (C*) decreased significantly (p<0.05). Total plate count (TPC) slowly increased during
storage period in all samples. The yeast and mould count increased in both acidified and control samples, whilst, the increment of coliforms was only detected in control sample. However, the mean scores on colour, odour and overall acceptability decreased significantly \((p<0.05)\) during storage period for all samples. Total soluble solid (TSS) and pH value slowly decreased during storage period. Sample that was acidified + heated could be kept for 8 weeks at 5±1 °C (85-95% RH) followed by 7 weeks for acidified sample. The shelf life of less than 2 weeks was obtained for both heated and control samples.

The optimal conditions of modified atmosphere storage were investigated, in order to provide a basis for the development of modified atmosphere packs for shallot puree. Qualities of shallot puree were tested at different atmospheric condition (with or without 5, 10, 15 and 20 % CO\(_2\)) and temperatures (5, 15 and 25) ±1 °C by using Onyl/LLDPE and PET/PE/Al/PE as packaging materials. The carbon dioxide content in shallot puree packed with Onyl/LLDPE decreased significantly \((p<0.05)\) for all treatments during 12 weeks of storage, whilst the oxygen content increased significantly \((p<0.05)\). The L value (L*) and hue angle (\(H_{ab}\)) showed significant \((p<0.05)\) increased in all samples. However, the chroma value (C*) and organoleptic evaluation decreased significantly \((p<0.05)\) throughout the storage period. TPC and \textit{Lactobacillus} spp. count increased slowly during storage period in all samples. However, the population of coliform, yeast and mould count and \textit{Pseudomonas} spp. count were undetected in all samples. The pH value and TSS decreased significantly
(p<0.05) in shallot puree packed with different carbon dioxide contents and packaging materials during storage period. Shallot puree packed in Ony/LLDPE with 10% carbon dioxide was found to be the best treatment for extending the storage life up to 12 weeks at 5±1 °C (85-95% RH). The quality changes of shallot puree stored at 10 % CO₂ and packed in Ony/LLDPE was studied in bulk form throughout storage. There was a significant (p<0.05) increase in the L value (L*) and hue angle (H_ab) but not in chroma value (C*) (p<0.05) for both treatments. There is a highly significant decrease (p<0.05) in sugar (fructose, glucose and sucrose) content of shallot puree throughout storage, whilst, total sugar showed no significant (p>0.05) difference between treatments during storage. Volatile oil of shallot puree contained sulphur group as major compounds. TPC and Lactobacillus spp. count gradually increased until the end of storage period.
Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains.

PERKEMBANGAN PEMBUNGKUSAN PUKAL DAN PENYIMPANAN PURI BAWANG MERAH (*Allium ascaloniu*m)

Oleh

NOOR AZIZAH BINTI AHMAD

Disember 2008

Pengerusi : Profesor Russly Abdul Rahman, PhD

Fakulti : Sains dan Teknologi Makanan

Gaya hidup moden di mana para suri rumah yang kesuntukan masa untuk menyediakan makanan dan juga dalam perkhidmatan dan industri makanan yang memerlukan bahan atau ramuan dalam bentuk yang mudah disediakan bagi mengurangkan pekerja menyebabkan ianya menjadikan faktor penting untuk meningkatkan penghasilan ramuan makanan yang sedia digunakan. Dengan mengambil kira faktor tersebut, bawang merah yang sedia digunakan adalah berupaya untuk memenuhi keperluan pelanggan jualan runcit dan institusi. Kajian ke atas perubahan-perubahan fiziko-kimia, ujian mikrobiologikal dan penilaian ujirasa bagi pembangunan perlakuan pemprosesan puri bawang merah (*Allium ascaloniu*m) menggunakan pemanasan sederhana dan pengasidan telah dijalankan.
Nilai L (L*) dan hue angle (Hab) puri bawang menunjukkan peningkatan yang sangat bererti ($p<0.05$) selama 8 minggu penyimpanan pada suhu 5±1 °C (85-95% RH), manakala nilai chroma (C*) menurun dengan berkesan ($p<0.05$). Jumlah kiraan plat (TPC) bagi semua sampel telah meningkat secara perlahan-lahan semasa penyimpanan. Kiraan yis dan kulat pula didapati meningkat pada sampel yang diberi perlakuan pengasidan dan juga kawalan, manakala peningkatan bakteria koliform semasa penyimpanan hanya dapat dilihat pada sampel kawalan sahaja. Walau bagaimanapun, penilaian organoleptik telah menurun dengan sangat bererti ($p<0.05$) semasa tempoh penyimpanan bagi semua sampel. Jumlah pepejal larut (TSS) dan nilai pH pula telah menurun secara perlahan semasa tempoh penyimpanan. Sampel yang diberi perlakuan asid + haba boleh disimpan selama 8 minggu pada suhu 5±1 °C (85-95% RH) dan diikuti selama 7 minggu untuk sampel yang hanya diberi perlakuan asid sahaja. Manakala sampel yang diberi perlakuan haba sahaja dan sampel kawalan mempunyai tempoh penyimpanan kurang dari 2 minggu.

Kondisi penyimpanan atmosfera terubahsuai yang optima telah dikaji untuk dijadikan asas terhadap pembangunan pembungkusan puri bawang merah secara atmosfera terubahsuai. Kualiti puri bawang merah telah diuji dalam keadaan atmosfera (tanpa atau dengan kehadiran kepekatan sebanyak 5, 10, 15 dan 20 peratus kandungan gas karbon dioksida) dan suhu (5, 15 dan 25) ±1 °C yang berbeza dengan menggunakan Onyl/LLDPE dan PET/PE/Al/PE sebagai bahan pembungkus. Penurunan nilai kandungan gas karbon dioksida menunjukkan perbezaan bererti
(p<0.05) dalam puri bawang merah yang dibungkus dalam Ony/LLDPE bagi semua perlakuan semasa tempoh 12 minggu penyimpanan, manakala nilai kandungan gas oksigen pula didapati meningkat dengan sangat bererti (p<0.05). Nilai L (L*) dan hue angle (Hab) pula menunjukkan peningkatan yang sangat bererti (p<0.05) bagi semua perlakuan. Walau bagaimanapun, nilai chroma (C*) dan penilaian organoleptik menunjukkan penurunan yang sangat bererti (p<0.05) semasa penyimpanan. Jumlah kiraan plat (TPC) dan kiraan Lactobacillus spp. meningkat secara perlahan semasa penyimpanan bagi semua perlakuan. Walau bagaimanapun, bakteria kolifom, kiraan yis dan kulat serta kiraan Pseudomonas spp. tidak dapat dikesan pada semua sampel. Kandungan pH dan TSS telah menunjukkan perbezaan penurunan yang sangat bererti (p<0.05) dalam puri bawang merah yang dibungkus dengan kandungan gas karbon dioksida dan bahan pembungkusan yang berbeza semasa tempoh penyimpanan. Puri bawang merah yang dibungkus menggunakan komposisis kandungan gas 10% karbon dioksida dalam Ony/LLDPE didapati telah memberi kesan perlakuan yang paling baik untuk memanjangkan hayat simpanan selama 12 minggu pada suhu 5±1 °C (85-95% RH). Perubahan mutu puri bawang merah yang disimpan dalam kandungan 10% karbon dioksida dan dibungkus dalam Ony/LLDPE telah dikaji dalam bentuk pukal sepanjang penyimpanan. Nilai L (L*) dan hue angle (Hab) menunjukkan peningkatan yang sangat bererti (p<0.05) tetapi nilai chroma (C*) pula menurun dengan sangat bererti (p<0.05) bagi kedua-dua perlakuan semasa penyimpanan. Kandungan gula (fruktosa, glukosa dan sukrosa) dalam puri bawang telah menurun dengan sangat bererti (p<0.05) bagi kedua-dua
perlakuan, manakala jumlah kandungan gula menunjukkan tiada perbezaan bererti \((p>0.05)\) di antara perlakuan semasa penyimpanan. Sebatian minyak merupai di dalam puri bawang merah telah menunjukkan bahawa sebahagian besarnya adalah terdiri dari kumpulan sulfur. Jumlah kiraan plat (TPC) dan kiraan \(Lactobacillus \) spp. pula meningkat secara perlahan sehingga akhir tempoh penyimpanan.
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I certify that a Thesis Examination Committee has met on 21 December 2008 to conduct the final examination of Noor Azizah binti Ahmad on her thesis entitled "Development of Bulk Packaging and Storage of Shallot (Allium ascalonium) Puree" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Master of Science.

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Date: 14 May 2009
DECLARATION

I declare that the thesis is my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously, and is not concurrently submitted for any other degree at UPM or at any other institution.

NOOR AZIZAH BINTI AHMAD

Date: 24 April 2009
TABLE OF CONTENT

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABSTRACT</td>
<td>ii</td>
</tr>
<tr>
<td>ABSTRAK</td>
<td>v</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENT</td>
<td>ix</td>
</tr>
<tr>
<td>APPROVAL</td>
<td>xi</td>
</tr>
<tr>
<td>DECLARATION</td>
<td>xiii</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>xix</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>xxii</td>
</tr>
<tr>
<td>LIST OF SYMBOLS AND ABBREVIATIONS</td>
<td>xxiv</td>
</tr>
</tbody>
</table>

CHAPTER

1  GENERAL INTRODUCTION                                                1

2  LITERATURE REVIEW                                                  4

   History of Shallot                                                   4
   Flavour Compound                                                    7
   Antimicrobial Activity                                              9
   Other Chemical Constituents                                         11
   Shallot Puree                                                        13
   Modified Atmosphere Packaging (MAP)                                 14

   Effect of the MAP on the Microbiological, Chemical, Biochemical,    16
   and Physical Properties of Foods
   MAP Gases                                                            19
       Carbon Dioxide                                                   19

xiv
Nitrogen
Oxygen
Gas Mixture

Packaging Materials for MAP Foods
- Polyamide (PA)
- Polyethylene (PE)
- Polypropylene (PP)
- Polyethylene Terephthalate (Polyester or PET)

Storage Temperature of MAP Product

Bulk Packaging System
- Bag-In-Box
- Corrugated Fibreboard Boxes

3 ESTABLISHMENT OF PROCESSING PARAMETERS FOR PRODUCTION OF SHALLOT (Allium ascalonium) PUREE DURING STORAGE

Introduction
Materials and Methods
- Preparation of Puree
- Processing Treatments
- Packaging and Storage
- Sensory Evaluation
Determination of Colour

Determination of pH

Determination of Total Soluble Solids (TSS)

Microbiological Analysis

Statistical Analyses

Results and Discussion

Organoleptic Evaluation

Colour Measurement

Microbiological Analysis

pH Value

Total Soluble Solids Content

Conclusion

4 EFFECTS OF MODIFIED ATMOSPHERE PACKAGING ON STORAGE QUALITY OF SHALLOT (*Allium ascalonium*)

PUREE

Introduction

Materials and Methods

Preparation of Product

Sampling

Gas Analysis

Packaging Material Permeability

Sensory Evaluation
Determination of Colour

Microbiological Analysis

Determination of pH

Determination of Total Soluble Solids (TSS)

Results and Discussion

Gases Concentration

Sensory Evaluation

Colour Measurement

Microbiological Test

Total Plate Count (TPC)

Lactobacillus spp. Count

Other Microorganisms

pH Value

Total Soluble Solid Content

Conclusion

5 EFFECT OF BULK PACKAGING ON STORAGE QUALITY OF SHALLOT (Allium ascalonium) PUREE

Introduction

Materials and Methods

Preparation of Puree
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sampling</td>
<td>97</td>
</tr>
<tr>
<td>Determination of Colour</td>
<td>98</td>
</tr>
<tr>
<td>Extraction and Determination of Sugar Profiles</td>
<td>98</td>
</tr>
<tr>
<td>Extraction and Analysis of Volatile Compound</td>
<td>99</td>
</tr>
<tr>
<td>Microbiological Analyses</td>
<td>100</td>
</tr>
<tr>
<td>Results and Discussion</td>
<td>100</td>
</tr>
<tr>
<td>Changes in Colour</td>
<td>100</td>
</tr>
<tr>
<td>Changes in Sugar Content</td>
<td>105</td>
</tr>
<tr>
<td>Volatile Compound</td>
<td>111</td>
</tr>
<tr>
<td>Microbiological Test</td>
<td>115</td>
</tr>
<tr>
<td>Conclusion</td>
<td>120</td>
</tr>
</tbody>
</table>

6 CONCLUSION AND RECOMMENDATIONS

General Conclusions                                                   121

Recommendations                                                      122

REFERENCES                                                           124

APPENDICES                                                           140

BIODATA OF STUDENT                                                   184
### LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
</tr>
</tbody>
</table>

1. Flavour precursors detected in edible *Alliums*
2. Antibacterial activity of essential oil extracts of Allium plants against *Staphylococcus aureus* after 48 h
3. Antibacterial activity of essential oil extracts of Allium plants against *Salmonella Enteritidis* after 48 h
4. Nutrient composition of edible portion
5. Oxygen requirements of some microorganisms of relevance in modified atmosphere packaging
6. Sensitivity of microorganisms relevant to modified atmosphere packaging to carbon dioxide
7. Recommended gas mixtures of MAP product
8. Common forms of corrugated fiberboard
9. Effect of different processing treatments on sensory evaluation (colour) of shallot puree during chill storage
10. Effect of different processing treatments on sensory evaluation (odour) of shallot puree during chill storage
11. Effect of different processing treatments on sensory evaluation (overall acceptability) of shallot puree during chill storage
12. Effect of different processing treatments on yeast and mould count (CFU g⁻¹) of shallot puree during chill storage
13. Effect of different processing treatments on coliforms count (MPNg⁻¹) of shallot puree during chill storage
14. Effect of modified atmosphere packaging (MAP) with different packaging materials on CO₂ concentration (%) of shallot puree stored at 5±1 °C for 12 weeks
15 Effect of modified atmosphere packaging (MAP) with different packaging materials on O₂ concentration (%) of shallot puree stored at 5±1 °C for 12 weeks

16 Effect of modified atmosphere packaging (MAP) with different packaging materials on colour acceptability of shallot puree stored at 5±1 °C for 12 weeks

17 Effect of modified atmosphere packaging (MAP) with different packaging materials on odour acceptability of shallot puree stored at 5±1 °C for 12 weeks

18 Effect of modified atmosphere packaging (MAP) with different packaging materials on overall acceptability of shallot puree stored at 5±1 °C for 12 weeks

19 Effect of modified atmosphere packaging (MAP) with different packaging materials on L* value of shallot puree stored at 5±1 °C for 12 weeks

20 Effect of modified atmosphere packaging (MAP) with different packaging materials on Hue angle of shallot puree stored at 5±1 °C for 12 weeks

21 Effect of modified atmosphere packaging (MAP) with different packaging materials on chroma value of shallot puree stored at 5±1 °C for 12 weeks

22 Effect of modified atmosphere packaging (MAP) with different packaging materials on total plate count (CFU g⁻¹) of shallot puree stored at 5±1 °C for 12 weeks

23 Effect of modified atmosphere packaging (MAP) with different packaging materials on Lactobacillus count (CFU g⁻¹) of shallot puree stored at 5±1 °C for 12 weeks

24 Effect of modified atmosphere packaging (MAP) with different packaging materials on pH value of shallot puree stored at 5±1 °C for 12 weeks

25 Effect of modified atmosphere packaging (MAP) with different packaging materials on total soluble solids content (°Brix) of shallot puree stored at 5±1 °C for 12 weeks
26 Volatile oil compounds present in untreated (control) shallot puree stored at 5±1 °C 112

27 Volatile oil compounds present in shallot puree treated with 10% CO₂ stored at 5±1 °C 113
**LIST OF FIGURES**

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Effect of different processing treatments on colour changes (L* value) of shallot puree during chill storage</td>
<td>47</td>
</tr>
<tr>
<td>2</td>
<td>Effect of different processing treatments on colour changes (expressed in chroma value) of shallot puree during chill storage</td>
<td>48</td>
</tr>
<tr>
<td>3</td>
<td>Effect of different processing treatments on colour changes (expressed in hue angle) of shallot puree during chill storage</td>
<td>48</td>
</tr>
<tr>
<td>4</td>
<td>Effect of different processing treatments on total plate count (TPC) of shallot puree during chill storage</td>
<td>50</td>
</tr>
<tr>
<td>5</td>
<td>Effect of different processing treatments on pH value of shallot puree during chill storage</td>
<td>54</td>
</tr>
<tr>
<td>6</td>
<td>Effect of different processing treatments on total soluble solids of shallot puree during chill storage</td>
<td>55</td>
</tr>
<tr>
<td>7</td>
<td>L value of control and 10% CO₂ Ony/LLDPE packaging shallot puree during storage at 5±1 °C for 12 weeks.</td>
<td>101</td>
</tr>
<tr>
<td>8</td>
<td>Chroma value of control and 10% CO₂ Ony/LLDPE packaging shallot puree during storage at 5±1 °C for 12 weeks</td>
<td>102</td>
</tr>
<tr>
<td>9</td>
<td>Hue angle of control and 10% CO₂ Ony/LLDPE packaging shallot puree during storage at 5±1 °C for 12 weeks</td>
<td>103</td>
</tr>
<tr>
<td>10</td>
<td>Fructose content of control and 10% CO₂ Ony/LLDPE packaging shallot puree during storage at 5±1 °C for 12 weeks</td>
<td>106</td>
</tr>
<tr>
<td>11</td>
<td>Glucose content of control and 10% CO₂ Ony/LLDPE packaging shallot puree during storage at 5±1 °C for 12 weeks</td>
<td>107</td>
</tr>
<tr>
<td>12</td>
<td>Sucrose content of control and 10% CO₂ Ony/LLDPE packaging shallot puree during storage at 5±1 °C for 12 weeks</td>
<td>109</td>
</tr>
</tbody>
</table>
Total sugar content of control and 10% CO₂ Ony/LLDPE packaging shallot puree during storage at 5±1 °C for 12 weeks

GCMS chromatogram of extracted volatile oil compound in control shallot puree stored at 5±1 °C

GCMS chromatogram of extracted volatile oil compound in treated shallot puree stored at 5±1 °C

Total plate count of control and 10% CO₂ Ony/LLDPE packaging shallot puree during storage at 5±1 °C for 12 weeks

*Lactobacillus* spp. count of control and 10% CO₂ Ony/LLDPE packaging shallot puree during storage at 5±1 °C for 12 weeks
# LIST OF SYMBOLS AND ABBREVIATIONS

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Abbreviation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>BC</td>
<td>Before Century</td>
<td></td>
</tr>
<tr>
<td>%</td>
<td>Percent</td>
<td></td>
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<tr>
<td>&lt;</td>
<td>Less than</td>
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<td>&gt;</td>
<td>More than</td>
<td></td>
</tr>
<tr>
<td>μL</td>
<td>Micro liter</td>
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<tr>
<td>μm</td>
<td>Micron</td>
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</tr>
<tr>
<td>°C</td>
<td>Degree Celcius</td>
<td></td>
</tr>
<tr>
<td>BGP</td>
<td>Bulk Gas pack</td>
<td></td>
</tr>
<tr>
<td>cc</td>
<td>Centimeter Cubic</td>
<td></td>
</tr>
<tr>
<td>CFU</td>
<td>Colony Forming Unit</td>
<td></td>
</tr>
<tr>
<td>cm</td>
<td>Centimeter</td>
<td></td>
</tr>
<tr>
<td>CO₂</td>
<td>Carbon dioxide</td>
<td></td>
</tr>
<tr>
<td>CO₂TR</td>
<td>Carbon dioxide Transmission Rate</td>
<td></td>
</tr>
<tr>
<td>EMA</td>
<td>Equilibrium Modified Atmosphere</td>
<td></td>
</tr>
<tr>
<td>EVOH</td>
<td>Ethyl Vinyl Alcohol</td>
<td></td>
</tr>
<tr>
<td>g</td>
<td>Gram</td>
<td></td>
</tr>
<tr>
<td>G/p</td>
<td>Ratio volume of gas and volume of product</td>
<td></td>
</tr>
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