



UNIVERSITI PUTRA MALAYSIA

**EFFECTS OF POSTHARVEST COATINGS AND HEAT TREATMENT ON
QUALITY OF STORED PINEAPPLE FRUITS**

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**DOCTOR OF PHILOSOPHY
UNIVERSITI PUTRA MALAYSIA**

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QUALITY OF STORED PINEAPPLE FRUITS**

By

ZAULIA OTHMAN

**Thesis Submitted in Fulfilment of the Requirements for the
Degree of Doctor of Philosophy in the Faculty of
Food Science and Technology
Universiti Putra Malaysia**

July 2008



Specially Dedicated
To my beloved

parents
Othman Yusuf and Fatimah Abidin

husband
Md. Hafnee Sepon

sons and daughter
Muhammad Syafiq, A'isyah, Muhammad Nazhan,
and Muhammad Taufiiqul Hakim



Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirements for the Degree of Doctor Philosophy

**EFFECTS OF POSTHARVEST COATINGS AND HEAT TREATMENT ON
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By

ZAULIA OTHMAN

July 2008

Chairman: Professor Suhaila Mohamed, PhD

Faculty: Food Science and Technology

Studies on the effect of postharvest treatments (surface coating, heat, and, combination of surface coating and heat treatments) on the changes in physico-chemical characteristics, rate of respiration, diseases and physiological disorder of fresh N36 and Gandul pineapples during storage at $10 \pm 1^{\circ}\text{C}$ were carried out. Studies on the effect of various surface coating emulsion (paraffin, palm oil and Semperfresh) showed that palm oil was effective in maintaining the skin firmness, prolonging shelf life, significantly ($p < 0.05$) increasing SSC and subsequently receiving the highest scores in appearance, colour and texture in sensory evaluation of N36 pineapples. Palm oil treatment significantly ($p < 0.05$) reduced ascorbic acid (AA) content, fructose, sucrose and total sugar for Gandul pineapples. Paraffin retarded the ripening, significantly ($p < 0.05$) increased pH, SSC:TA ratio, fructose and glucose content and scores for odour, and sourness but reduced SSC of N36 pineapples. In Gandul



pineapples, paraffin significantly ($p < 0.05$) increased AA, TA and fructose content but reduced pH. All the surface treatments were able to significantly reduce weight loss, except for Semperfresh. Semperfresh increased fructose and glucose content and reduced SSC of N36 pineapples. In Gandul pineapples, Semperfresh significantly lowered ($p < 0.05$) pH, fructose, sucrose and total sugar content. CO₂ production can only be reduced by paraffin treatment in Gandul pineapple.

Heat treatment (HT) (38-42⁰C for 24 hours) and combination of heat and surface coating treatment (CHT) were applied to N36 and Gandul pineapples before storage at 10 ± 1°C, 85 – 88% relative humidity. HT reduced internal browning (IB) and decayed fruit, promoted colour development on skin and pulp but increased weight loss in both cultivars. The positive effects of HT were more significant ($p < 0.05$) in Gandul cultivar than N36 cultivar. HT significantly increased ($p < 0.05$) fructose, glucose, SSC and AA in Gandul cultivar and sensory scores of N36 cultivar. CHT significantly reduced ($p < 0.05$) weight loss during heating and increased SSC:TA ratio in both cultivars. It also increased ($p < 0.05$) total sugar and SSC in N36 cultivar, and increased the sensory taste for Gandul cultivar. HT did not affect CO₂ production of N36 and Gandul pineapples stored at low temperature.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk Ijazah Doktor Falsafah

**KESAN SALUTAN LEPASTUAI DAN RAWATAN HABA TERHADAP
KUALITI BUAH NANAS DALAM PENYIMPANAN**

Oleh

ZAULIA OTHMAN

Julai 2008

Pengerusi: Profesor Suhaila Mohamed, Ph.D

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Kajian dilakukan terhadap kesan rawatan selepas tuai (salutan permukaan, haba dan kombinasi salutan permukaan dan haba) ke atas perubahan ciri-ciri fiziko-kimia, kadar respirasi, penyakit dan fisiologi nanas segar N36 dan Gandul semasa penyimpanan pada $10 \pm 1^{\circ}\text{C}$. Rawatan menggunakan berbagai emulsi bahan penyalutan (paraffin, minyak kelapa sawit dan Semperfresh) menunjukkan minyak kelapa sawit berkesan untuk mengekalkan kekerasan, memanjangkan hayat simpanan, jumlah pepejal terlarut dan mencapai skor tertinggi untuk rupabentuk, warna dan tekstur nanas N36 di dalam penilaian deria. Nanas Gandul yang disalut dengan minyak kelapa sawit menurunkan dengan bererti ($p < 0.05$) kandungan asid askorbik, fruktosa, sukrosa dan jumlah gula. Paraffin merencatkan kemasakan, meningkatkan dengan bererti ($p < 0.05$) nilai pH dan nisbah pepejal terlarut kepada keasidan tertitrat, kandungan fruktosa dan glukosa, dan skor bau dan kemasaman, tetapi menurunkan dengan bererti ($p < 0.05$) jumlah pepejal terlarut. Bagi nanas Gandul, paraffin meningkatkan dengan bererti kandungan asid

askorbik, keasidan tertitrat dan kandungan fruktosa, tetapi menurunkan pH. Semua perlakuan penyalutan berupaya menurunkan dengan bererti kehilangan berat, kecuali Semperfresh. Semperfresh, meningkatkan kandungan fruktosa dan glukosa, dan menurunkan jumlah pepejal terlarut nanas N36. Bagi nanas Gandul, Semperfresh menurunkan dengan bererti nilai pH, fruktosa, sukrosa dan jumlah keseluruhan gula. Penghasilan gas CO₂ hanya boleh dikurangkan oleh rawatan paraffin ke atas nanas Gandul.

Perlakuan haba (38-42⁰C selama 24 jam) dan kombinasi perlakuan haba dan salutan permukaan dilakukan ke atas nanas N36 dan Gandul sebelum disimpan pada suhu 10 ± 1°C, 85 – 88% kelembapan relatif. Perlakuan haba boleh menurunkan pemerangan dalam dan pembusukan buah, menggalakkan pembentukan warna pada kulit dan isi buah, tetapi menyebabkan peningkatan kehilangan berat pada kedua-dua kultivar nanas. Kesan positif perlakuan haba adalah lebih ketara bagi kultivar Gandul berbanding N36. Perlakuan haba meningkatkan dengan ketara ($p < 0.05$) kandungan fruktosa, glukosa, jumlah pepejal terlarut dan asid askorbik bagi kultivar Gandul dan skor penilaian deria untuk nanas N36. Bagi kultivar Gandul, kombinasi perlakuan haba dan salutan permukaan menurunkan dengan bererti ($p < 0.05$) kehilangan berat semasa pemanasan dan meningkatkan skor citarasa. Rawatan haba tidak mempengaruhi penghasilan gas CO₂ ke atas nanas N36 dan Gandul yang disimpan pada suhu sejuk.

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I certify that a Thesis Examination Committee has met on 16 July 2008 to conduct the final examination of Zaulia binti Othman on her thesis entitled “Postharvest coatings and heat treatment effects on stored pineapple fruit quality” in accordance with the Universities and University Colleges Act 1971 and Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Doctor of Philosophy.

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DECLARATION

I hereby declare that the thesis is based on 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 Universiti Putra Malaysia or at any other institutions.

ZAULIA OTHMAN

Date: 2 April 2009



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