STORAGE STABILITY OF CHILLED MINIMALLY PROCESSED SHREDDED CABBAGE

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Lihat sebelah

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By

ROSHITA BINTI IBRAHIM

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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To my beloved family & friends.....

Mak, Ayah, Kak Na, Kak Tie, Adik Nizam, Abang Amran, Abang Anwar, Abang Shah, Eja, Fanny, Ali, La, Kak Zie, Kak Norma, Ida, Anida, Kak Tie Kel, Kak Tie Mel, Nizam Lani, Fisal, Azam JB, Eed, Syafiq, Lynn Bio, Iza, Taufik and Along TJ.....

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirements for the degree of Master of Science

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July 2003

Chairman : Associate Professor Azizah Osman, Ph.D

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Minimally processed products are a rapidly growing segment for retail market and food service horticultural industry as they match the consumers' demand for product freshness and convenience. The shelf-life extension of these fresh-cut products is therefore relevant because of its economic impact. Packaging can be one of the important factors in determining the storage stability and quality of these fresh-cut products. The shelf life of minimally processed fruits and vegetables is often limited by enzymatic browning. The organoleptic properties of fruits and vegetables are strongly altered by the appearance of brown pigments. This study was conducted to determine the effects of using different types of polymeric films (Polypropylene (PP), Low Density Polyethylene (LDPE), High Density Polyethylene (HDPE) and PVC cling wrap (Control)) of varying permeabilities to gases and water vapour and also with and without the application of vacuum packaging on the physico-chemical, biochemical, microbiological characteristics and sensory aspects of the minimally processed (MP) shredded cabbage during storage at 5±1°C; 90-95% RH. A study was

also conducted on the effects of dipping into 4 different anti-browning solutions namely 1% ascorbic acid, 0.1% sodium metabisulphite, 0.5% L-cysteine + 0.1% citric acid and 0.1% acetic acid on the storage stability of shredded cabbage. Sample dipped in distilled water was used as a control. Physico-chemical characteristics were determined by quantitative measurements of weight loss, colour, texture, ascorbic acid content, pH, titratable acidity, total soluble solid, chlorophyll content, polyphenol oxidase (PPO) activity and degree of browning. Carbon dioxide and ethylene production in the package atmosphere during storage were also determined with gas chromatography. The microbial characteristics determined were mesophilic and psychrotrophic bacterial counts and mold and yeast counts. Sensory evaluation involved subjective acceptability and descriptive analyses. Data collected were analyzed using ANOVA and Duncan Multiple Range Test (DMRT) at 5% significant level. Generally, in almost all the analyses done, the quality of the MP shredded cabbage deteriorated with increase in storage time. Among all the packaging films used, it was found that PP which is the least permeable film for gases and water vapour, could extend the shelf life of the MP shredded cabbage almost up to 3 weeks with minimum colour change, reduction in ascorbic acid content and deterioration in sensory properties, and marginally low changes in other parameters tested. Whilst PVC cling wrap (control) was found to be the least effective packaging film. Different packaging systems did not affect the microflora of the shredded cabbage which was predominantly bacteria, small numbers of yeasts and only an occasional mold for both mesophilic and psychrotrophic microorganisms. Samples packed in vacuum packaging showed no significance difference with those in non-vacuum packaging in almost all the parameters tested for all the different packaging films, even though the air from the package headspace which can cause oxidation spoilage to the produce

had been removed. Anti-browning treatment of 0.1% sodium metabisulphite gave the best sensory properties and visual colour retention followed by 0.1% acetic acid solution. Mean while 0.5% L-cysteine + 0.1% citric acid and 1% ascorbic acid solutions were found to be not very good anti-browning agents for the MP shredded cabbage as they gave worse results compared to control.

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Produk-produk pemprosesan minima berkembang pesat di dalam pasaran jualan runcit dan industri perkhidmatan makanan berasaskan produk hortikultur kerana ia memenuhi permintaan pengguna terhadap produk yang segar dan mudah penyediaannya. Pemanjangan hayat penyimpanan produk-produk potong-segar ini adalah penting kerana penjimatannya dari segi ekonomi. Pembungkusan boleh menjadi salah satu daripada faktor penting dalam mengekalkan hayat penyimpanan produk-produk pemprosesan minima ini. Hayat penyimpanan pemprosesan minima buah-buahan dan sayur-sayuran selalunya terhad disebabkan oleh masalah keperangan akibat aktiviti enzim. Ciri-ciri organoleptiknya juga berubah dengan wujudnya kesan keperangan pada produk itu. Kajian ini telah dijalankan untuk menentukan kesan-kesan yang didapati dengan penggunaan filem-filem plastik yang berbeza untuk pembungkusan iaitu, Polipropilena (PP), Polietilina berketumpatan rendah (LDPE), Polietilina berketumpatan tinggi (HDPE) dan selaput nipis Poli vinilklorida (PVC)(kawalan) yang mempunyai ketelapan yang berbeza terhadap gas dan wap air

serta dengan pengaplikasian pembungkusan vakum dan tanpa vakum terhadap ciri-ciri fisiko-kimia, biokimia, mikrobiologi dan aspek-aspek deria ke atas pemprosesan minimal hirisan kobis semasa penyimpanan pada suhu 5±1°C dan kelembapan relatif 90-95%. Kajian terhadap kesan-kesan penggunaan larutan penyahperang yang berlainan terhadap hayat penyimpanan hirisan kobis juga dijalankan. Larutan-larutan penyahperang yang digunakan ialah 1% asid askorbik, 0.1% natrium metabisulfite, campuran 0.5% L-cysteine dan 0.1% asid sitrik dan 0.1% asid asetik. Air suling digunakan sebagai larutan kawalan. Ciri-ciri fisiko-kimia yang ditentukan secara kuantitatif merangkumi ujian-ujian seperti % kehilangan berat sampel, perubahan warna, tekstur, kandungan asid askorbik, pH, keasidan titratan, jumlah pepejal larut, kandungan klorofil, aktiviti enzim polyphenol oxidase (PPO) dan tahap keperangan sampel. Penghasilan gas karbon dioksida dan etilina di dalam bungkusan sampel semasa penyimpanan juga ditentukan dengan kromatografi gas. Analisa mikrob dilakukan untuk melihat kehadiran bakteria mesofilik dan psikrotropik serta kulat dan yis. Penilaian deria pula dilakukan berdasarkan penerimaan subjektif dan analisa perubahan rupa bentuk sampel. Data dianalisa dengan ANOVA dan Duncan Multiple Range Test (DMRT) pada tahap signifikan 5%. Secara umumnya, dalam hampir semua ujian yang dilakukan kualiti hirisan kobis semakin menurun dengan bertambahnya masa penyimpanan. Antara semua filem-filem plastik pembungkus yang digunakan, PP merupakan filem yang paling tidak telap kepada gas dan wap air, boleh memanjangkan hayat penyimpanan hirisan kobis kepada hampir 3 minggu dengan perubahan warna, pengurangan kandungan asid askorbik dan pengurangan ciri-ciri deria yang minimal serta sedikit perubahan dalam ujian-ujian lainnya. Sementara selaput nipis PVC (kawalan) merupakan filem yang paling tidak efektif. Kaedah pembungkusan yang berbeza tidak menunjukkan perbezaan yang bererti

kepada pertumbuhan mikrob di dalam hirisan kobis yang kebanyakannya terdiri daripada bakteria, sedikit yis serta kulat untuk kedua-dua jenis mesofilik dan psikrotropik. Walaupun udara di dalam bungkusan telah dinyahkan, pembungkusan vakum tidak menunjukkan perbezaan yang bererti dengan pembungkusan tanpa vakum dalam hampir kesemua parameter-parameter yang diuji untuk berlainan jenis filem-filem plastik yang digunakan. Larutan penyahperang 0.1% natrium metabisulfite memberikan keputusan yang terbaik dari segi ciri-ciri deria dan pengekalan warna sampel, diikuti oleh larutan 0.1% asid asetik. Manakala larutan campuran 0.5% L-cysteine dan 0.1% asid sitrik dan larutan 1% asid askorbik tidak boleh menjadi agen-agen penyahperang yang baik bagi hirisan kobis memandangkan larutan-larutan ini memberikan keputusan yang lebih buruk daripada larutan kawalan.