IMPROVEMENT OF QUALITY AND STORAGE STABILITY OF GINGER (*ZINGIBER OFFICINALE* ROSC.) DRINK

By

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

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Especially dedicated to my beloved parents

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

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March 2004

Chairman: Professor Salmah binti Yusof, Ph.D.

Faculty: Food Science and Biotechnology

A study was conducted to determine the physico-chemical characteristics of fresh ginger (*Zingiber officinale* Rosc.). The fresh ginger of Gajah/Betul variety of commercial maturity was used. The parameters analysed were weight, length, diameter, pH, titratable acidity (TA), total soluble solids (TSS), moisture content and crude fibre. This study concentration of the amount of pungent compounds in ginger such as 6-gingerol, 8-gingerol and 10-gingerol was determine by high performance liquid chromatography (HPLC). The concentration of 6-gingerol, 8-gingerol and 10-gingerol was 0.48 mg/100g, 0.04 mg/100 g and 0.05 mg/100 g, respetively.

The optimum formulation for preparation of ginger drink was determined by using Response Surface Methodology (RSM). Ginger-sugar combinations in the range of 5-10 g and 8-12°Brix, respectively were the independent variables and their effect on gingerol

content were evaluated. The ratio of fresh ginger and water were 1:11 (w/v).The drinks were prepared using white and brown sugar and their quality were compared. The results showed that the acceptance of gingerol content of ginger drink with white sugar were significantly (p<0.05) lower than the brown sugar. The responses measured by sensory panelists were colour, odour, hotness, sweetness and bitterness of ginger drink. The results showed that the formulation of ginger drink with brown sugar was more preferred compared to the ginger drink with white sugar. The combination formula of 5 g fresh ginger and 12°Brix for brown sugar was chosen as the best formulation for ginger drink.

Changes in physico-chemical characteristics and gingerol content during storage and the effect of adding carboxymethylcellulose (CMC) to the ginger drink were carried out. The influence of different storage temperature (5°C and 28°C) was also investigated. Losses in gingerol content were very small during 12 weeks storage at 5°C as compared to storage at 28°C. The addition of carboxymethylcellulose in ginger drink slowed down the sedimentation process and the losses of gingerol content.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia
sebagai memenuhi keperluan untuk ijazah Master Sains

PENINGKATAN KUALITI DAN KESTABILAN SIMPANAN MINUMAN HALIA (*ZINGIBER OFFICINALE* ROSC.)

Oleh

FADNEY RANTAWATY

Mac 2004

Pengerusi: Profesor Salmah binti Yusof, Ph.D.

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Satu kajian telah dijalankan untuk menentukan sifat-sifat fisikal dan kimia halia (*Zingiber officinale* Rosc.). Halia segar daripada varieti Gajah/ Betul yang mempunyai kematangan komersial digunakan. Parameter yang dianalisis meliputi berat, panjang, diameter, pH, keasidan titratan (TA), jumlah pepejal larut (TSS), kandungan kelembapan dan serat kasar. Kajian juga dijalankan untuk mengkaji amaun sebatian kepedasan yang terdapat pada halia seperti 6-gingerol, 8-gingerol dan 10-gingerol dengan menggunakan Kromatografi Cecair Berpretasi Tinggi (HPLC). Jumlah bagi 6-gingerol, 8-gingerol dan 10-gingerol adalah 0.48 mg/100 g, 0.004 mg100 g dan 0.05 mg/100 g.

Formulasi optimum penyediaan minuman halia telah ditentukan dengan menggunakan Methodologi Rangsangan Permukaan (RSM). Kombinasi halia-gula dalam lingkungan 5-10 g dan 8-12°Brix masing-masing merupakan variasi bebas dan kesan terhadap

kandungan gingerol telah dikaji. Perbandingan antara halia dan air yang digunakan ialah 1:11. Perbandingan kualiti diantara minuman yang disediakan menggunakan gula putih dan gula merah telah dilakukan. Keputusan menunjukkan bahawa penerimaan keatas gingerol bagi minuman halia yang dicampur dengan gula putih adalah lebih rendah (p<0.05) berbanding gula merah. Reaksi daripada panel-panel deria telah dikaji. Ini termasuk warna, bau, kepedasan, kemanisan dan kepedasan minuman halia. Keputusan menunjukkan bahawa formulasi optimum minuman halia dengan gula perang lebih disukai berbanding dengan minuman halia dengan gula putih. Kombinasi 5 g halia dan 12°Brix untuk gula perang telah dipilih sebagai formulasi terbaik minuman halia.

Perubahan dalam sifat fisikal-kimia dan kandungan gingerol semasa penyimpanan pada suhu 5 dan 28°C serta kesan dari penambahan karboksimetilsellulose (CMC) pada minuman halia telah dilakukan. Kehilangan kandungan gingerol adalah sangat kecil sepanjang 12 minggu penyimpanan pada 5°C jika dibandingkan dengan penyimpanan pada 28°C. Penambahan CMC dalam minuman halia melambatkan pemendakan dan kehilangan kandungan gingerol.

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I certify that an Examination Committee met on 10th March 2004 to conduct the final examination of Fadney Rantawaty on her Master of Science thesis entitled "Improvement of Quality and Storage Stability of Ginger (*Zingiber officinale* Rosc.) Drink" in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulations 1981. The Committee recommends that the candidate be awarded the relevant degree. Members of the Examination Committee are as follows:

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This thesis submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Master of Science. The members of the Supervisory Committee are as follows:

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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 or concurrently submitted for any degree at Universiti Putra Malaysia or other institutions.

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