

**PHYSICOCHEMICAL PROPERTIES, SENSORY EVALUATION AND
STORAGE STABILITY OF VITAMIN E FORTIFIED PINK GUAVA JUICE**



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Tuan/Puan,

TAJUK PROJEK FRGS : "EFFECT OF HOMOGENISATION AND STABILISERS ON PHYSICOCHEMICAL PROPERTIES OF PINK GUAVA JUICE"

Dengan hormatnya perkara di atas adalah dirujuk.

Sukacita dimaklumkan Kementerian Pengajian Tinggi Malaysia telah meluluskan projek seperti tersebut di atas dengan catatan di bawah ini :

'Recommended with reduced budget'

Kelulusan ini juga tertakluk kepada syarat-syarat seperti berikut :

- i. Tempoh projek penyelidikan ini ialah 2 tahun, iaitu bermula **15 September 2007**.
- ii. Kos yang diluluskan ialah sebanyak **RM 58,000.00** sahaja. Sila kemukakan bajet yang baru mengikut kos yang diluluskan dengan menggunakan borang Bahagian E – Budget/Belanjawan. Perbelanjaan hendaklah mengikut butiran belanjawan yang telah diluluskan.

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5.2 Enhanced Executive Summary

The experimental work of this research project was divided into three phases. In the preliminary study (Phase 1), physicochemical properties (nutrient components, titratable acidity, pH, total soluble solids, water activity, viscosity and colour) of the freshly made pink guava juice (PGJ) were analysed. The effects of stabiliser and emulsifier combinations together with ultrasonic treatment towards particle sedimentation and particle size of PGJ respectively were studied. Series of trials derived from combination of six stabilisers (guar gum, carboxymethyl cellulose, arabic gum, xanthan gum, propylene glycol alginate and pectin) with three emulsifiers (arabic gum, polysorbate 80 and propylene glycol alginate) were analysed. Ultrasonic treatments using 12 kHz and 24 kHz frequencies with pulse and continuous conditions on the homogenisation of PGJ were studied. In the second phase, sensory evaluation of the PGJ fortified with different concentrations of vitamin E (0, 70, 150, 225 and 300 mg/L) was conducted to determine consumer acceptability of the fortified juice. The most preferred vitamin E fortified PGJ was subjected to storage stability study (Phase 3) at different storage temperature (5, 15 and 25 °C) for 6 months. Emulsion stability, colour changes and loss of vitamin E were monitored during the storage. Results obtained in Phase 1 showed that fresh PGJ contain $0.67\pm 0.15\%$ protein, $0.27\pm 0.05\%$ fat, $0.74\pm 0.10\%$ crude fibre, $0.64\pm 0.10\%$ ash, $92.72\pm 0.91\%$ moisture and $4.96\pm 0.59\%$ carbohydrate by difference. Total acidity obtained was $0.41\pm 0.10\%$, pH 3.65 ± 0.12 , total soluble solids 10.56 ± 0.43 , a_w 0.99 ± 0.01 , viscosity 15.33 ± 1.15 mPa.s and colour parameters of lightness (L) value 31.95 ± 0.02 , chroma (C*) 34.65 ± 0.01 and hue angle (H°) 25.42 ± 0.02 . For the combinations of stabilisers and emulsifier, results obtained showed that xanthan gum and carboxymethyl cellulose with 70:30 ratio together with 0.8% w/v of polysorbate 80 gave the best emulsifying action. For the ultrasonic treatment, continuous application of 24 kHz frequencies was found to be the most effective in reducing the particle size distribution (3.87 ± 1.11 µm) of PGJ. The results obtained in Phase 2 showed that PGJ fortified with 225 mg vitamin E was the most preferred among the panelists. Based on the emulsion stability, colour stability and vitamin E content results obtained in Phase 3 indicates that the vitamin E fortified PGJ was most stable at 5 °C for 6 months compared to at 15 and 25 °C storage temperature.

5.3 Introduction

5.3.1 Background of study

Pink guavas (*Psidium guajava* L.) are tropical, climateric fruits that are commonly grown in Malaysia for juice and puree production. These fruit are highly aromatic and rich in potassium, vitamin A and C. It is well known that guava fruit contains significantly more vitamin C than most citruses. Vitamin C is a powerful antioxidant and anti-inflammatory agent. Pink guavas also have a high level of lycopene, a carotenoid which is considered good for fighting free radicals. Currently, Sime Darby Golden Hope Foods and Beverages company is the single largest pink guava plantation in the world with over 500 hectares of the fruit grown in Sitiawan, Perak. It is the only pink guava plantation in Malaysia and the largest integrated facility in Asia. The fruit are hand-picked and processed into puree and hygienically packed into aseptic bags and sealed in steel drums for overseas export market or process into ready-to-drink juice in tetrapak packaging for local market.

Normally, fruit juices are cloudy in appearance, have a lot of colloidal suspensions that are either preferred by some consumers or considered as unattractive to the others. The juice cloudiness is contributed by the presence of different components (cell wall fragments, cellular organelles, oil droplets, hesperidin crystals, pectin etc.) together with polydisperse distribution of particles sizes (Sentandrau et al., 2011). The colloidal particles in the juices also carry flavour substances and natural antioxidants such as carotenoids, lycopene etc. Sedimentation of juice due to the presence of pulp particles caused the separation problem in most fruit juices. Addition of stabilising agent and homogenisation process are conducted to reduce the particle size of the sediments hence preventing separation from occurring. The choice of stabilisers used is also important depending on the properties of the juices. Starch, pectin, arabic gum, carrageenan gum, guar gum and xanthan gum are commonly used as stabilising agents in beverages. Homogenisation technique using ultrasonic vibrations and high-pressure homogenisers are nowadays used to disintegrate large fat globules into a more stable, small and uniform fat globules size. Sonication process is more preferred in food industries because of reduced processing time, higher throughput and lower energy consumption (Cheng et al., 2007).

Vitamin E is an essential micronutrient with biological antioxidant properties. A daily intake of 10 mg of vitamin E (alpha-tocopherol equivalent) or 15 IU/day is