



**PHYSICAL, CHEMICAL PROPERTIES, AND  
EFFECT OF STORAGE CONDITION ON  
ANTIOXIDANT ACTIVITY OF AN INSTANT  
BLUE DRINK FROM BUTTERFLY PEA  
FLOWERS (*CLITORIA TERNATEA*)**

by

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A dissertation submitted in partial fulfilment of the requirement for the degree of Bachelor of  
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## LIST OF SYMBOLS AND ABBREVIATIONS

<b>Abbreviation</b>	<b>Caption</b>
°C	Degree Celsius
ANOVA	Analysis of Variance
AOAC	Association of Analytical Communities
Ca	Calcium
DPPH	2,2-diphenyl-1-picrylhydrazyl
FRAP	Ferric reducing antioxidant power
HCl	Hydrochloric acid
H <sub>2</sub> SO <sub>4</sub>	Sulphuric acid
H <sub>2</sub> O <sub>2</sub>	Hydrogen peroxide
K	Potassium
KCl	Potassium chloride
La <sub>2</sub> O <sub>3</sub>	Lanthanum oxide
Mg	Magnesium
NaOH	Sodium hydroxide
TAC	Total anthocyanin content
TPTZ	2,4,6-tris(2-pyridyl)-1,3,5-triazine

**SIFAT FIZIKAL, KIMIA, DAN PENGARUH KEADAAN PENYIMPANAN  
TERHADAP AKTIVITI ANTIOKSIDAN MINUMAN BIRU SEGERA DARI BUNGA  
TELANG (*CLITORIA TERNATEA*)**

**ABSTRAK**

Bunga telang (*Clitoria ternatea*) kaya dengan nutrien dan antosianin, yang menyumbang kepada sifat antioksidannya. Penggunaan warna biru semula jadi dari bunga telang sebagai pengganti agen pewarna sintetik yang berbahaya terhadap kesihatan manusia, dapat menambahkan nilai fungsian pada sesuatu produk makanan. Oleh itu, kajian ini dijalankan untuk menghasilkan dan menganalisis sifat fizikal, kimia, dan pengaruh keadaan penyimpanan terhadap aktiviti antioksidan minuman biru segera dari bunga telang. Pengekstrakan bunga telang dilakukan pada suhu 60 °C selama 37 min, diformulasikan dengan xylitol dan asid sitrik (masing-masing 12.3 % dan 0.03 %), dan dikering-bekukan pada suhu -50 °C / 0.090 mBar selama 48 jam. Sifat fizikal dan kimia minuman biru segera termasuk ketumpatan pukal, warna, pH, komposisi umum, dan kandungan mineral telah dianalisa. Warna minuman biru segera terutamanya dipengaruhi oleh pencairan ekstrak bunga telang dan penambahan asid sitrik yang kemudiannya mengubah pH-nya. Nilai L\* minuman biru segera menunjukkan kenaikan lebih dari 50 % berbanding dengan bunga telang, sementara nilai b\* menurun dengan ketara. Komposisi kelembapan, abu, lemak, protein, dan serat mentah minuman biru segera adalah  $1.46 \pm 0.04$  %,  $0.13 \pm 0.02$  %,  $1.94 \pm 1.32$  %,  $0.89 \pm 0.02$  %, dan  $0.43 \pm 0.08$  %, masing-masing. Pada masa yang sama, kandungan kalsium, magnesium, dan kalium minuman biru segera adalah  $-0.007 \pm 0.002$ ,  $0.061 \pm 0.002$ , dan  $0.195 \pm 0.118$  mg / g, masing-masing. Aktiviti antioksidan minuman biru segera dinilai setelah 30 hari pada empat keadaan yang berbeza yang merangkumi dua factor iaitu suhu (4 °C dan 23 °C), dan cahaya (kehadiran dan ketiadaan cahaya). Keadaan penyimpanan optimum minuman biru segera adalah pada suhu 4 °C dengan ketiadaan cahaya. Oleh itu, aktiviti fizikal, kimia, dan antioksidan minuman biru segera dari bunga telang (*Clitoria ternatea*) berjaya dianalisa.

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**ABSTRACT**

Butterfly pea flowers (*Clitoria ternatea*) are rich in nutrients and anthocyanin, which contributes to its antioxidant properties. The utilization of butterfly pea flowers' natural blue colour as a substitute to synthetic colouring agents which is harmful to human health, could add functional value to food products. Accordingly, this study was conducted to develop and analyse the physical, chemical properties, and effect of storage condition on antioxidant activity of an instant blue drink from butterfly pea flowers. The extraction of butterfly pea flowers was done at 60 °C for 37 min, formulated with xylitol and citric acid (12.3 % and 0.03 % respectively), and freeze-dried at -50 °C / 0.090 mBar for 48 hr. Physical and chemical properties of the instant blue drink including bulk density, colour, pH, proximate composition, and mineral content were analysed. The colour of the instant blue drink was mainly affected by dilution of extract and the addition of citric acid which also subsequently changed its pH. The L\* value of instant blue drink showed more than 50 % increment as compared to butterfly pea flowers, while the b\* value decrease significantly. The moisture, ash, fat, protein, and crude fibre percentage composition of the instant blue drink is  $1.46 \pm 0.04$  %,  $0.13 \pm 0.02$  %,  $1.94 \pm 1.32$  %,  $0.89 \pm 0.02$  %, and  $0.43 \pm 0.08$  %, respectively. Concurrently, the content of calcium, magnesium, and potassium of the instant blue drink is  $-0.007 \pm 0.002$ ,  $0.061 \pm 0.002$ , and  $0.195 \pm 0.118$  mg/g, respectively. The antioxidant activity of the instant blue drink was evaluated after 30 days at four different condition which include two factors, temperature, and light. The optimal storage condition of instant blue drink is at 4 °C with the absence of light. Hence, the physical, chemical, and antioxidant activity of an instant blue drink from butterfly pea flowers (*Clitoria ternatea*) were successfully analyzed.