EFFECTS OF pH AND SUCROSE CONCENTRATION ON BUTTERFLY PEA (*Clitoria ternatea*) FLOWER EXTRACT

SITI HAJAR BINTI MOHD NOOR

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Siti Hajar Binti Mohd Noor

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ABSTRACT

EFFECTS OF pH AND SUCROSE CONCENTRATION ON THE ANTHOCYANIN AND ANTIOXIDANT STABILITY OF BUTTERFLY PEA (*Clitoria ternatea*) EXTRACT

There are many factors influencing the stability of natural colourant anthocyanin in which sucrose concentration and pH is among the most significant factor. This study aims to determine the effects of pH, sucrose concentration and heat treatment on the total anthocyanin content, DPPH scavenging activity, ferric reducing antioxidant power, total phenolic content, and colour of *Clitoria ternatea* aqueous extract. The fresh *Clitoria ternatea* extract was found to have total anthocyanin content of 8.68±0.10 mg/L, DPPH scavenging effects 49.9±0.26%, ferric reducing antioxidant power 429.5±0.97 mg/100 g, total phenolic content 220.8±1.89 mg GAE/100 g, total colour difference 8.04±0.46 and the initial pH of 5.26±0.42. The extracts were then adjusted and evaluated at pH 2, 3 and 4; sucrose concentration of 10%, 20% and 30%; also after pasteurisation at 90 ºC for 60 minutes. The result shows that the highest value of total anthocyanin content (6.77±0.01 mg/L) was obtained at pH 3 with 30% sucrose concentration. The highest value of DPPH scavenging effects (63.52±0.57%) was obtained at pH 4 with 30% sucrose concentration. The highest value of ferric reducing antioxidant power (403.3±0.73 mg/100 g) was obtained at pH 4 with 10% sucrose concentration. The highest value of total phenolic content (160.9±0.95 mg GAE/100 g) was obtained at pH 3 with 10% sucrose concentration. The colour of the extract was found to shift from light red at pH 2 to light purple at pH 3 and light dark blue at pH 4; and the colour observed was intensified by the increase in sucrose concentration. In general, heat treatment caused reduction in total anthocyanin, antioxidant properties, total phenolic content and colour of the extract. Total anthocyanin content was found to decrease by 35.66% to 90.02%with the increase in pH and 35.66% to 90.23% with the decrease in sucrose concentration after heat treatment. DPPH scavenging effects was found to reduce 26.19% to 46.81% with the decrease in pH and 26.19% to 46.81% with the decrease in sucrose concentration. Ferric reducing antioxidant power was decrease by 10.50% to 28.38% with the increase in pH and 10.50% to 28.38% with the decrease in sucrose concentration. Total phenolic content was found to reduce by 6.47% to 31.70% with the increase in pH and 17.34% to 27.10% with the increase in sucrose concentration. The total colour difference was also found to decrease between 0.23% to 11.55% with the decrease in pH and 0.23% to 10.86% with the increase in sucrose concentration after heat treatment. Overall, the results obtained in this study can be use by the food and beverages industry in manipulating the natural colourant obtained from *Clitoria ternatea* to suits to their products properties.

CHAPTER 1

INTRODUCTION

1.1. Background

Butterfly pea (*Clitoria ternatea*) or commonly known as 'bunga telang' or 'bunga seri pagi' is a blue coloured flower due to the presence of anthocyanins pigment. Anthocyanins extracted from butterfly pea are stable in weakly acidic or neutral aqueous solution, hence its wide application as a food colourant in Southeast Asia (Terahara *et al*., 1996). In Thailand, butterfly pea flower are commonly used as food colourants in dessert or herbal drinks, while in Malaysia it's been used in the preparation of 'nasi kerabu'.

Butterfly pea is one of the most interesting sources of natural colour used in food and cosmetics. The colouring pigments found in its petals could be extracted easily with water (Tantituvanont *et al*., 2008). It was the largest water soluble pigments group that responsible for the orange, red, and blue colours in fruit, vegetables, and flowers. However, the use of butterfly pea as food colorants is still limited because of their relatively low stability during processing, formulation and storage. It is known that colour intensity of anthocyanin is pH dependent, which is the greatest, is at pH 1 and decreasing rapidly as pH rises (Hendry and Houghton, 1996). This characteristic limits the application of anthocyanins as a food colourant.

Consumption of butterfly pea provides excellent health benefits because they are a rich source of phytochemicals that are good for disease risk reduction. It has been reported to be associated with a lower incidence of chronic diseases such as cardiovascular disease and cancer (Ikram *et al*., 2009). These health benefits are attributed to the antioxidant capacity derived from the phenolic compounds present in Butterfly pea (Salta *et al*., 2010).