ASCORBIC ACID DETERMINATION IN NATURAL AND COMMERCIAL FRUIT JUICES BY DIFFERENTIAL PULSE ANODIC STRIPPING VOLTAMMETRIC TECHNIQUE AT A GLASSY CARBON ELECTRODE

ZAIHASRA BINTI RAZIS

Final Year Project Report Submitted in

Partial Fulfilment of the Requirement for the

Degree of Bachelor of Science (Hons.) Chemistry

In the Faculty of Applied Science

Universiti Teknologi MARA

JANUARY 2017

ABSTRACT

ASCORBIC ACID DETERMINATION IN NATURAL AND COMMERCIAL FRUIT JUICES BY DIFFERENTIAL PULSE ANODIC STRIPPING VOLTAMMETRIC TECHNIQUE AT A GLASSY CARBON ELECTRODE

Vitamins are important in human diet because they will give sufficient amount of nutrient that needed by human body. Humans cannot synthesize the ascorbic acid, but this vitamin is commonly found in the varieties of vegetables and fruits. Hence, these vegetables and fruits become their main sources of ascorbic acid to meet requirement of dietary intake. The contents of ascorbic acid in the natural and commercial fruit juices must be analyzed. The differential pulse anodic stripping voltammetry (DPASV) technique using glassy carbon electrode (GCE) as a working electrode and phosphate buffer at pH 4.2 as a supporting electrolyte has been proposed to be developed. The experimental voltammetric parameters were optimized in order to obtain a maximum response with analytical validation of the technique. The optimum instrumental conditions for electroanalytical determination of ascorbic acid in phosphate buffer solution at pH 4.2 by the proposed DPASV technique were initial parameter E_i = 0 V, end parameter E_f = 0.7 V, accumulation time t_{acc} = 60 s, scan rate ν = 0.125 V/s, accumulation potential E_{acc} = 0 V and pulse amplitude = 0.150 V. The anodic peak was appeared at 0.3598 V. The curve was linear from 0.028 to 1.703 mM (R^2=0.999) with detection limit of 0.0114 mM. The precisions in terms of relative standard deviation (RSD) were 1.3%, 0.5% and 0.06%, respectively on the same day precision. The recoveries for the spiked 0.0852 mM (in commercial fruit juice samples) and 0.039 mM (in natural fruit juice samples) concentration of the ascorbic acid standard were 101.93 ± 1.65 % for pineapple sample by squeezing method while in commercial fruits sample; blackcurrent was 80.00 ± 6.25 %, orange was 73.65 ± 1.70 % and mango sample was 97.48 ± 16.90 %. The concentration of ascorbic acid in the commercial fruit juice samples; blackcurrent was 2.0213 mM, orange was 1.8286 mM and mango was 2.9798 mM. Meanwhile, there was no content of ascorbic acid detected for the lychee and guava commercial juice sample. For the natural fruit juice samples, the content of ascorbic acid in the orange was 0.800 mM and pineapple was 0.698 mM. It can be concluded that the developed technique is precise, accurate, rugged, low cost, fast and has potential to be an alternative method for routine analysis of ascorbic acid in the natural and commercial fruit juices.

TABLE OF CONTENT

CHAPTER 3 MATERIALS AND METHOD