A green and cost-effective approach for detection of cyanide ions by the reaction of butterfly pea anthocyanin extract

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Abstract: A green approach for spectrophotometric determination of CN\(^{-}\) ions by using an anthocyanin-rich extract from butterfly pea has been proposed. Aqueous extract of butterfly pea anthocyanin (pH 6) and cyanide solution was added into the test tube and adjusted the volume with water to achieve exactly concentration. The reaction was done at room temperature for 1 min with constant pH. As the amount of CN\(^{-}\) ions increased, the reaction mixture exhibited slightly different colors from blue to green, corresponding to a red shift in the visible region on their absorption spectra. The peak intensity at \(\sim 570 \text{ nm}\) decreased while the peak intensity at \(\sim 630 \text{ nm}\) further increased as the CN\(^{-}\) concentration increased. These color and spectral responses could be indicated that CN\(^{-}\) ions reacts butterfly pea anthocyanin through nucleophilic addition reaction. This method enables detection of CN\(^{-}\) ions with a detection level of 0.5 mg/dm\(^3\). Because the proton in an aqueous medium was found to affect both color shade and stability. The effect of aprotic solvent, dimethylformamide, in extending the reaction mixture stability was examined. This method could be a rapid detection, cost-effective, toxic solvent reduction and has the potential to be a natural probe to detect total cyanide in engineering industrial waste.

Keywords: Cyanide ions; Butterfly pea; Anthocyanins; Spectrophotometric analysis; Green analytical method