

Literature Review : Chlorogenic Acid Content Analysis With Uv-Vis Spectrophotometry In Coffee Seeds, Balegede Village, Naringgul District, Cianjur Regency

Sri Wahyuni

Universitas Wanita Internasional, Bandung, Indonesia

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Abstract

Coffee in Indonesia has an important role as a source of foreign exchange for the country because it has high economic value. One of the regions in Indonesia as a producer of robusta coffee is Cianjur district. Naringgul village is one part of the Cianjur district which produces coffee as a commodity. Geographically, the location of Naringgul Village is very suitable for the development of coffee plants. Many Naringgul people become coffee farmers as a livelihood without knowing the advantages of the content in the coffee they produce. The question in this study is what are the components of active chemical compounds contained in the coffee beans of Naringgul village as the mainstay of coffee production. The method used is a literature review journal by looking for several journals related to the research title. Search journals through google scholarships from national, international journals, textbooks and scientific articles. The analytical method to determine the components of the active chemical compounds in coffee beans is the UV-Vis spectrophotometry method. The results of the review obtained are the components of active chemical compounds in coffee beans in general are chlorogenic acid, aromatic compounds, pyrolles, mercaptans, phenols, Thiophenes, Furans, and Pyrazines. Based on the results of the analysis, it was found that the highest levels of chlorogenic acid were found in coffee beans that had gone through a certain roasting process.

Keywords: Coffee Beans, UV-Vis Spectrophotometry, Chlorogenic Acid, Naringgul Village

(*) Corresponding Author: sriwahyuni@iwu.ac.id

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INTRODUCTION

Coffee in Indonesia is one of the drinks that are widely enjoyed and consumed by Indonesian people from various ages and even considered as a lifestyle. This is because in Indonesia there are many coffee plants because Indonesia is the world's largest coffee producer, occupying the fourth position with 11.95 million kg sacks per year. Indonesia which makes an important contribution to the country's foreign exchange. Besides being an export, coffee is also in great demand by the public. This situation makes many farmers choose to grow coffee. This is proven by the

large area of coffee plantations in Indonesia, one of which is the Cianjur area, Naringgul sub-district, Balegede village.

Naringgul is one of the sub-districts in Cianjur district. Naringgul means up and down which is taken from the hilly geographical conditions of the land. Naringgul has an area of about 4038.250 Ha and is located at an altitude of 500-600 M above sea level. Geographically, Naringgul has suitable conditions for the growth of coffee plants. The people of Naringgul village generally have a livelihood as coffee farmers. One of the many coffee-producing villages in Naringgul is Balegede Village. Balegede is the boundary between Cianjur and Bandung because it is the farthest village. Balegede is one of 11 villages in Naringgul sub-district. Balegede village has an altitude of 700 meters above sea level and is the entrance to Jayanti Beach. The coffee produced by the village of Balegede is marketed in the form of cherries, green beans, coffee beans and coffee grounds. Balegede village is not as well known as a coffee producer compared to other villages in the Cianjur area. This is because there has been no research conducted to determine the superiority of the content of coffee produced. So this research needs to be done by analyzing the content of active chemical compounds in coffee beans in the village of Balegede through a literature review first before conducting a direct analysis to determine the content of active chemical compounds commonly found in coffee beans.

According to Ruth (2010) the content of coffee beans consists of various types of secondary metabolites such as caffeine, chlorogenic acid, carbohydrates, fats, amino acids, proteins, volatile compounds, organic acids and minerals. The quality of coffee is influenced by the acid group which will affect the quality and give it a distinctive aroma and taste. Based on Yusianto's research (2014), the dominant acid in coffee beans is chlorogenic acid, which is about 8% in coffee beans or 4.5% in roasted coffee. During roasting most of the chlorogenic acid becomes caffeic acid and quinic acid. Chlorogenic acid in coffee serves to protect the growth of coffee from microorganisms, insects and UV radiation (Farah, 2012). Meanwhile, in the study of Farah and Carmen (2006), the benefits of chlorogenic acid for human health are as an antioxidant, antiviral, hepatoprotective, and play a role in antispasmodic activities. Determination of the levels of active compounds in coffee beans has been carried out by various methods. These include UV-Vis spectroscopy methods, high performance Liquid Chromatography (HPLC) or commonly called high performance liquid chromatography (HPLC), and Infrared. Research on the analysis of chlorogenic compounds in coffee beans has been carried out using HPLC. However, many researchers prefer to use the spectroscopic method. This is due to several advantages possessed by this method. One of them is a lower cost (Dewa, 2016).

Based on the literature review above, the authors want to conduct research on the determination of chlorogenic acid levels using the UV-Vis method as a literature review.

RESEARCH METHOD

This study uses a literature review method with literature searches in the form of national journals and international journals using Google Scholar, Science Direct, Elsevier, and PubMed with the keywords Coffee, Chlorogenic Acid, and UV-Vis Spectrophotometry by prioritizing the latest. Journal publications are taken

from the last 10 years. The topic inclusion criteria were studies in coffee that showed chlorogenic acid levels in the results and the exceptions were studies that only described coffee antioxidants. First of all, the articles collected were listed and the journal category used was research on chlorogenic acid levels in coffee. Then the selection was carried out, only articles that provided data on the levels of chlorogenic acid in the selected coffee. After getting research data from articles, they are combined and studied to get a combination of data that can describe the levels of chlorogenic acid in coffee and the factors that will affect the levels of chlorogenic acid produced.

RESEARCH RESULTS AND DISCUSSION

Based on the results of research conducted by Indrayani (2022) it was found that chlorogenic acid compounds are the main phenolic components in coffee. The amount of chlorogenic acid in green coffee beans ranges from 7-14.4% while in Robusta and Arabica coffees it contains about 4-8.4% chlorogenic acid. The amount of chlorogenic acid in green beans will be different from that of roasted coffee beans. This is because the heating process affects the amount of chlorogenic acid produced. The continuous heating process can reduce the total amount of polyphenols in coffee beans. So that it will have an impact on the degradation of polyphenols which causes the formation of products that are less stable and volatile. The maximum content of chlorogenic acid and very useful as an antioxidant and free radical scavenger is found in unroasted green coffee. But according to Farah et al (2005), stating that coffee processing by roasting will increase levels of chlorogenic lactone acid. This is because the number of precursors contained in coffee is increasing. The heating and roasting process will increase the bitterness of the coffee. Because this process causes the Millard reaction to occur (Husniati, 2021). The quality, taste and distinctive aroma of coffee beans can be influenced by the chemical components contained, one of which is chlorogenic acid (Mangiwa et al., 2016). The structure of chlorogenic acid can be seen in Figure 1.

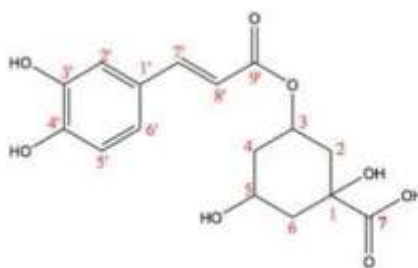


Figure 1. Chlorogenic Acid Structure (Sukohar et al., 2011)

Phenolic compounds commonly found in coffee beans or coffee is chlorogenic acid. Chlorogenic acid is formed from trans-cinnamic acid esters and plays an important role in influencing the taste and aroma of the coffee beans or coffee produced (Ardiansyah et al., 2018). Chlorogenic acid is also often known as 5 - caffeoylquinic acid (Santana-Gálvez et al., 2017).

In the research of Mangiwa & Yabansabra (2016), coffee beans were roasted using the appropriate temperature. After that, it was mashed and sieved to obtain a size of 100 mesh. It aims to homogenize and expand the surface of the coffee

powder so that the compounds contained in the coffee powder can be extracted optimally.

Chlorogenic acid can be obtained maximally by extracting coffee beans using the soxhletation method using methanol as a solvent (Mangiwa et al., 2016). The choice of methanol as a solvent because methanol is able to extract secondary metabolites maximally. This is indicated by a change in the color of methanol to blackish brown. The color change is caused by the distribution of chemical compounds in roasted coffee beans into methanol (solvent). The more chemical compounds that are distributed into methanol, the more maximal the extraction process will be (Mangiwa & Maryuni, 2019).

Several literatures explain that chlorogenic acid is mostly detected by high performance liquid chromatography (HPLC) method combined with UV-Vis spectrophotometry, electrochemical detection or mass spectrometry, gas chromatography, spectrophotometry, and electrochemical methods. According to research by Daglia (2000) levels of chlorogenic acid in roasted coffee and green coffee can be measured using a UV-VIS spectrophotometer at a wavelength of 720 nm. Meanwhile, Wulandari (2005) conducted research on the levels of chlorogenic acid in Arabica and Robusta coffee based on roasting time, which was carried out using UV-Vis spectrophotometry. In both studies, the reagents used to determine the levels of chlorogenic acid were FeCl_3 , $\text{K}_3\text{Fe}(\text{CN})_6$ and HCl . Based on the literature review above, the researcher thinks that the UV-Vis spectrophotometric method can be used to analyze the content of chlorogenic acid compounds contained in coffee beans in the village of Balonggede, Naringgul sub-district, Cianjur district.

The work procedures to be carried out consist of: making a working solution of chlorogenic acid, making a solution of Potassium Hexacyanoferrat (III), making a solution of FeCl_3 , making HCl solution as a reagent. After that, determine the maximum wavelength and determine the calibration curve. After the work procedure is carried out, the result data will be obtained in the form of a graph of the levels of chlorogenic acid in the analyzed coffee beans. With the data obtained, it is hoped that it can become a further research study to determine the advantages of coffee bean production in the village of Balonggede, Naringgul District, Cianjur Regency.

CONCLUSION

Based on the literature review, it can be concluded that the analysis of active compounds, especially the content of chlorogenic acid in coffee beans can be analyzed using a UV-Vis spectrophotometer.

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