

Program and Abstract Book

# BICFH 2019



26-28 September 2019  
Institut Teknologi Bandung  
Bandung, Indonesia



crbb  
CENTRE FOR RESEARCH AND  
DEVELOPMENT IN BIOMEDICAL  
SCIENCE



100  
YEARS  
OF  
INDEPENDENCE



## Antibacterial potential of coffee pulp fractions against some foodborne pathogens

Baiq Rien Handayani<sup>1\*</sup>, Stanley E. Gilliland<sup>2</sup>

<sup>1</sup>Faculty of Food Technology and Agroindustry-University of Mataram, Indonesia

<sup>2</sup>Food Science Department-Oklahoma State University, USA

\*Corresponding author: [baiqrienhs@unram.ac.id](mailto:baiqrienhs@unram.ac.id)

Foodborne disease infections and intoxications due to pathogenic bacteria are much more of a concern to government, the food industries and consumer today than a few decades ago. This study was aimed to determine the antibacterial activity of Arabica coffee berry pulp fraction against some foodborne pathogens. Experimental method was conducted through fractionation of phenolic content to water soluble, ethyl acetate and chloroform fraction and pH adjustment to 6.5 and followed by antibacterial test against Gram negative bacteria (*Escherichia coli* O157:H7 ATCC (35150, 43890, 43894 and 933), *Pseudomonas Fluorescences*, *P. aerogenosa*, *Salmonella thypimurium*, *S. thypimurium* ATCC 29631) and Gram positive bacteria (*Listeria monocytogenes scott A*, *L.monocytogenes* ATCC 39-2, *Staphylococcus aureus* ATCC 13565 and *Bacillus cereus*). The result showed that all fractions have inhibition activity against bacteria tested. Increasing acidity of water-soluble fraction is able to decrease its inhibition activity. On the other hand, inhibition activity of ethyl acetate and chloroform fraction tends to be more stable.

Keywords: antibacterial, coffee pulp, foodborne, pathogenic bacteria

# Certificate

this is to certify that

**Baiq Rien Handayani, SP. MSI. PhD**  
as *Poster Presenter*

in recognition of valuable contributions to

**Bandung International Conference on Food and Health EXPO 2019**

26-28 September 2019

Institut Teknologi Bandung

West Java, Indonesia



**Prof. Dr. Ir. Benedictus Kombaitan**

Chairman of a Centennial Commemoration  
of Indonesian Higher Education  
Institut Teknologi Bandung



**Dr. Elfahmi M.Si., Apt.**

Organizing Committee Chairperson  
of BICFH EXPO 2019  
Institut Teknologi Bandung



# ANTIBACTERIAL POTENTIAL OF COFFEE PULP FRACTIONS AGAINST SOME FOODBORNE PATHOGENS

Baiq Rien Handayani<sup>1\*</sup> and Stanley E. Gilliland<sup>2</sup>

<sup>1</sup>Faculty of Food Technology and Agroindustry-University of Mataram, Indonesia  
<sup>2</sup>Animal Science Department-Oklahoma State University, USA

\*E-mail : baiqrienhs@unram.ac.id

## Abstract

The objective of this study was to determine the antibacterial activity of Arabica coffee berry pulp fraction against some foodborne pathogens. Experimental method was conducted through fractionation of phenolic content to water soluble, ethyl acetate and chloroform fraction and pH adjustment to 6.5 and followed by antibacterial test against Gram negative bacteria (*Escherichia coli* O157:H7 ATCC (35150, 43890, 43894 and 933), *Pseudomonas Fluorescences*, *P. aerogenosa*, *Salmonella typhimurium*, *S. typhimurium* ATCC 29631) and Gram positive bacteria (*Listeria monocytogenes* scott A, *L. monocytogenes* ATCC 39-2, *Staphylococcus aureus* ATCC 13565 and *Bacillus cereus*). The result showed that all fractions have inhibition activity against bacteria tested. Increasing acidity of water-soluble fraction is able to decrease its inhibition activity. On the other hand, inhibition activity of ethyl acetate and chloroform fraction tends to be more stable.

Key Words: antibacterial, coffee pulp, foodborne, pathogenic bacteria

## Introduction

Foodborne disease infections and intoxications are much more of a concern to government, the food industries and consumer today than a few decades ago. The infections and intoxication lead to the large number of outbreaks that were not only related to vegetable products but also to the meat products from fresh to frozen food. The outbreaks were caused by some common pathogenic and spoilage microorganism such as *Escherichia coli* O157:H7, *Salmonella typhimurium*, *Pseudomonas aeruginosa* and *Staphylococcus aureus* (Yosai and others, 1985; Davies and others, 1996 and Tood, 1997). Consumer also concerned about the safety of food containing synthetic preservative. Therefore, there has been increasing interest in the development of natural antimicrobial as an alternative for food preservative. Specific study by Toda, Okubo, Hiyoshi, and Shimamura, (1989) found that extracts of coffee inhibited the growth of various bacteria known to cause diarrhoeal such as *Staphylococcus aureus* and *Vibrio parahaemolyticus*. Shetty and others (1994) reported that coffee (Coffea arabica) showed bactericidal activity against *Vibrio cholerae*, *Salmonella typhimurium* and *Salmonella typhi*. Michels (2000) also studied that coffee has antibacterial activity against a range of pathogens including *S. aureus*, *Vibrio parahaemolyticus*, *V. cholerae* and *Salmonella* due to the attributing of tannins and caffeine. Furthermore, Daglia and others (2007) reported that roasted coffee has antibacterial activity against wide range of microorganisms including *S. aureus* and *Streptococcus mutans*.

## Objective

The objective of this study was to determine the antibacterial activity of Arabica coffee berry pulp fraction against some foodborne pathogens.

## Materials and Methods

### Materials

Materials used were coffee pulp fraction from Kona Coffee plantation Hawaii, 80% methanol, chloroform, ethyl acetate and water

### Methods

#### Fractionation

Fractionation is illustrated in Figure 1, and was done by modify procedure of Zhang and others (2008). Fraction was collected and a half portion was adjusted to pH 6.5. The water solution from the EtOAc fractionation was further absorbed on an XAD-2 (Amberlite Resin, Supelco Bellefonte, PA) column and rinsed with sterile water to get water soluble fraction. The fraction was collected and a half portion was adjusted to pH 6.5. Water soluble fractions were evaporated to dryness using Labconco Freeze drier system for 72 hours. Whereas, CHCl<sub>3</sub> and EtOAc fractions were evaporated using rotary evaporator at 40 °C, speed 40 and pressure about 560-585 mmHg for CHCl<sub>3</sub> and 615-620 mmHg for EtOAc. The dried fractions were resuspended with their solvent (Water soluble fraction with water; CHCl<sub>3</sub> fraction with CHCl<sub>3</sub>, and EtOAc fraction with EtOAc).

#### Antibacterial Test

All pathogenic bacteria were subcultured at least three (3) times prior to the test. Bacteria used were *L. monocytogenes* ATCC 39-2, *Pseudomonas Fluorescences*, *P. aerogenosa*, *Salmonella typhimurium*, *Escherichia coli* O157:H7 ATCC (35150, 43890, 43894 and 933), *Listeria monocytogenes* scott A, *S. typhimurium* ATCC 29631, *Staphylococcus aureus* ATCC 13565 and *Bacillus cereus*. Antimicrobial activity was determined by measuring diameter inhibition zone.

## Results and Discussions

Table 1. Fractionation of methanolic coffee pulp extracts

Fraction	pH	Yield (g)	% (Yield/fresh pulp)
CHCl <sub>3</sub>	6.53	0.0855	0.11
	4.28	0.0762	0.09
EtOAc	6.50	0.0637	0.08
	3.88	0.0471	0.06
Water soluble fraction	6.50	2.5455	3.18
	3.97	2.2771	2.85
Methanolic acidic fraction	6.59	0.2522	0.32
	5.06	0.2688	0.34

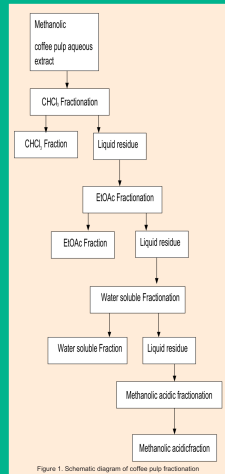
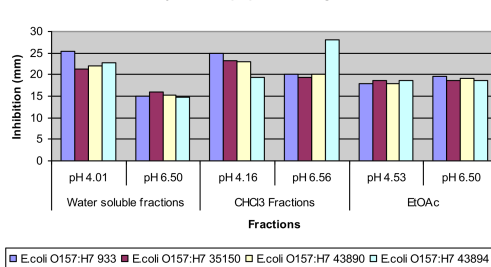


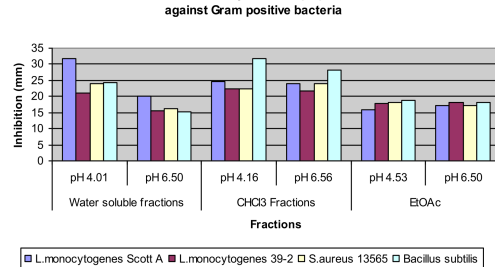
Figure 1. Schematic diagram of coffee pulp fractionation



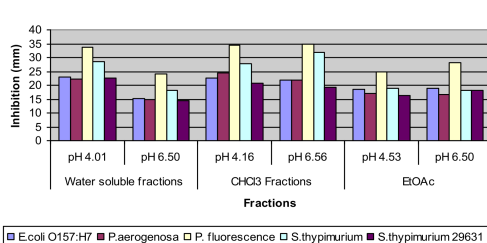
### Antibacterial activity of coffee pulp fractions against *E. coli* O157:H7



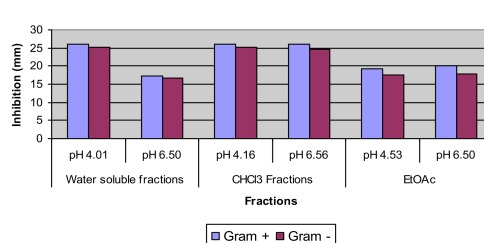
### Antibacterial activity of coffee pulp fractions against Gram positive bacteria



### Antibacterial activity of coffee pulp fractions against Gram negative bacteria



### Antibacterial activity of coffee pulp fractions against Gram positive and Gram negative bacteria



## Conclusions

All fractions have inhibition activity against bacteria tested. Increasing acidity of water-soluble fraction is able to decrease its inhibition activity. On the other hand, inhibition activity of ethyl acetate and chloroform fraction tends to be more stable.

Coffee pulp has potential as antibacterial against some food borne pathogens, therefore it can be used as food preservative and has potential as medicine.

## References

- Daglia M, Cuzzoni MT, Daccaro C. 1994. Antibacterial activity of coffee, J of Agric Food Chem 42 (10): 2270-2.
- Michels MJM. 2000. Tea, herbal Teas, and Coffee. Microbiological safety and quality of food. In Barbara L, Baird-Parker M, Gould TC, Grahamew. Spinger-Verlag:960-71.

- Shetty M, Subbannayya K, and Shivananda PG 1994. Antibacterial activity of tea (*Camellia sinensis*) and coffee (*Coffea arabica*) with special reference to *Salmonella typhimurium*. J of Comm disease 26(3):147-50.
- Toda M, Okubo S, Hiyoshi R, Shimamura T. 1989. The bactericidal activity of tea and coffee. Lett in App Microbiol 8(4):123-125.
- Zhang Y, Seram NV, Lee R, Feng L and Heber D.2008. Isolation and identification of strawberry phenolics with antioxidant and human cancer cell antiproliferative properties. J Agric Food Chem 56:670-5.