

# Study Effect Type of Extraction Method And Type of Solvent To Cinnamaldehyde and Trans-Cinnamic Acid Dry Extract Cinnamon (*Cinnamomum burmanii* [Nees & T, Nees]Blume)

Sri Wardatun, Erni Rustiani, Nella Alfiani, Desta Rissani\*

Department of Pharmacy, University of Pakuan, Bogor, 16610, INDONESIA.

## ABSTRACT

**Introduction:** We report the effects of extraction methods and the type of solvent to cinnamaldehyde and trans-cinnamic acid content of dry extract of cinnamon (*Cinnamomum burmanii* [Nees & T, Nees] Blume). **Methods:** The extraction method used maceration, soxhletation and infundation. We used 50%, 70% and 96% ethanol as solvent, while for methods infundation used aquadest. Liquid extract dried to obtain dry extract. Cinnamaldehyde and trans-cinnamic acid measured by spectrophotometric UV-Visibel. **Results:** The results of the assays showed that method of maceration with 96% ethanol had cinnamaldehyde content on  $124.14 \pm 1.17$  mg/g dry extract and trans-cinnamic acid content on  $151.35 \pm 1.24$  mg/g dry extract. Statistical test showed that method of extraction and type of solvent had a significant effect of cinnamaldehyde and trans-cinnamic acid contents. **Conclusion:** 96% Ethanol and 70% ethanol solvent had a significant effect of cinnamaldehyde and trans-cinnamic

acid contents, while 50% ethanol and aquadest hadn't a significant effect of cinnamaldehyde and trans-cinnamic acid contents.

**Key words:** Dry extract cinnamon, Cinnamaldehyde, Trans-cinnamic acid.

**Correspondence:**

**Desta Rissani**

Laboratory Department of Pharmacy, University of Pakuan, Bogor, 16610, INDONESIA.

Phone: +62-251-8375547

Email: sri.wardatun@unpak.ac.id

DOI: 10.5530/jyp.2017.1s.13

## INTRODUCTION

Cinnamaldehyde and trans-cinnamic acid were active metabolites of cinnamon bark. These compounds are markers on cinnamon extract because it's was naturally inhibitor enzyme PTP1B (protein tyrosine phosphatase 1B). Inhibitor enzyme activates a compound in prancreas by activating the  $\beta$  cell function to produces insulin, so insulin to be normal.<sup>1,2</sup> Cinnamaldehyde have antibacterial activity.<sup>3,4</sup> The odourant molecule trans-cinnamaldehyde is the mayor of component of cinnamon oil and it responsible for its characteristic smell.<sup>5</sup> Cinnamic acid is a significantly important fuctional group as an effective insuling releasing agent.<sup>6</sup> Cinnamaldehyde extraction have been done with sonication and soxhletation.<sup>7</sup> The highest levels of cinnamaldehyde obtained from sonication extraction using ethanol as solvent amount of 3.37%, while the levels of cinnamaldehyde obtained from soxhletation amount of 3.12%. Other cinnamaldehyde extraction experiments have been conducted using soxhletation method with aquadest and ethanol as solvent.<sup>8</sup> Solvent extraction using water gave cinnamaldehyde amount of 0.51%, and 2.07% using ethanol. It shows that the type of solvent effect on the levels of extractable cinnamaldehyde. Determinationa of cinnamaldehyde and trans-cinnamic acid has been reported in literature do with spectroforometry<sup>9</sup> or with high performance liquid chromatography.<sup>10,11</sup> This research for study the effects of the extraction method by maceration and soxhletation with 50%, 70% and 96% ethanol and infundation with aquadest to levels cinnamaldehyde and trans-cinnamic acid in the dry extract of cinnamon to help for choose the best method extraction and get the higher content of cinnamaldehyde and cinamic acid.

## MATERIALS AND METHODS

All chemicals and reagents were analytical grade. Reference standard Cinnamaldehyde and trans-cinnamic acid with 99% purity obtained from Sigma Aldrich. Evaporation was conducted with evaporator system (IKA<sup>®</sup>) and dried with vaccum dryer (OGAWA<sup>®</sup>), moisture balance (AND MX-50<sup>®</sup>), UV-VIS spectrophotometer (GENESYS<sup>®</sup>). Cinnamon bark was obtained from the main market area of Bogor, Indonesia. Determination of Cinnamon bark at The Indonesian Institute of Sciences (LIPI), Bogor Botanical Gardens, Indonesia.

### Preparation of cinnamon extract

Each 100 g cinnamon bark was remaceration and soxhletation each with 50% ethanol, 70% ethanol, and 96% ethanol 1000 mL. While for infundation used aquadest 2500 mL at 90°C in 15 min. Liquid extract is dried with a vacuum dryer to obtain dry extract. The yield of dry extract determined as well as the analysis of the levels of cininamaldehyde and cinnamic acid.

### Preparation curve calibration of cinnamaldehyde

Cinnamaldehyde was weighed and dissolved in ethanol to obtain a stock standard (1.0 mg/mL). Cinnamaldehyde solutions were prepared in concentration 0.5-2.5  $\mu$ g/mL for the calibration curve. The absorbance was measured at 287 nm.<sup>12</sup>

### Preparation curve calibration of trans-cinnamic acid

Cinnamic acid were weighed and transferred to 50 mL stoppered volumetric flasks and volume adjusted with ethanol. Curve calibration prepared from standar solution of trans-cinnamic acid containing 0.5-2.5  $\mu$ g/mL. The absorbance was measured at 270 nm.<sup>12</sup>

This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

## Preparation and Determination of cinnamaldehyde and trans-cinnamic acid from extract

Dried extract (50 mg) of cinnamon was accurately weighed and added to stoppered tube and diluted with 10 mL ethanol. The contents of the tube was put in a glass beaker and stirred with an electric mixer at a temperature of 25°C for 15 min. The solution was filtered, and the filtrate solution was measured absorbance at the maximum wavelength.<sup>13</sup> Cinnamaldehyde and trans-cinnamic acid levels were determined using a calibration curve.

### Statistical Analysis

The data were analyzed by Multi Analysis of Variance (MANOVA) method followed by Turkey's multiple comparison. The result were considered to be statistically significant when the  $P < 0.05$ .

## RESULTS

### Determination Cinnamon bark

The result of determination shows that cinnamon bark used in this study is *Cinnamomum burmanni* (Nees & T, Nees) Blume.

### The Yield of extract

The yield of the extract obtained from this research can be seen in the Table 1 below

Based on the above table it can be seen that the yield of extract most of the largest cinnamon extract macerated results with 96% ethanol. The yield extract of 96% ethanol from maceration were found to be 20.860%

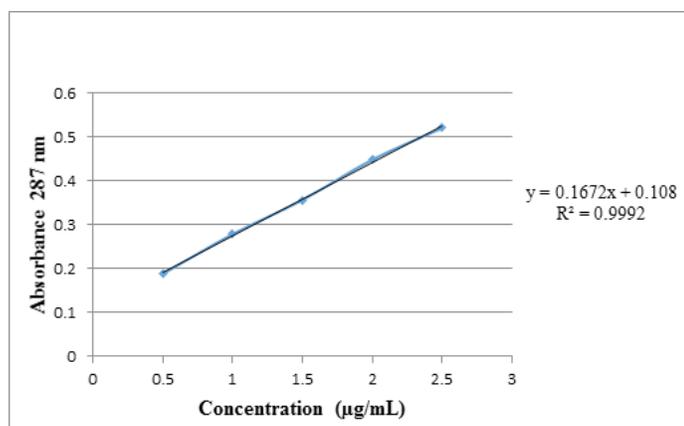


Figure 1: Calibration curve of cinnamaldehyde.

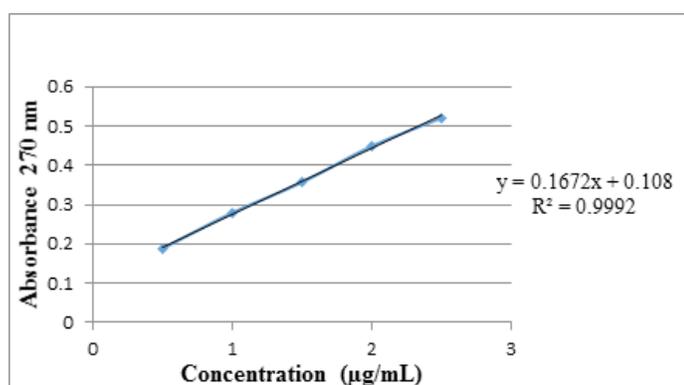


Figure 2: Calibration curve of trans cinnamic acid.

$\pm 2.340$ . It shows that 96% ethanol can extraction higher compounds in cinnamon than others.

### Calibration curve of cinnamaldehyde solution

The effect of variation in the concentration of cinnamaldehyde solution was studied. A linear calibration curve of cinnamaldehyde solution ethanolic was obtained on range concentration 0.5-2.5 µg/mL with coefficient of regression  $R^2 = 0.9991$ . The linear regression was  $y = 0.299x + 0.0077$  as Figure 1. The content of cinnamaldehyde was obtained as Table 2.

### Calibration curve cinnamic acid solution

The effect of variation in the concentration of trans-cinnamic acid solution was studied. A linear calibration curve of cinnamaldehyde solution ethanolic was obtained on range concentration 0.5-2.5 µg/mL with coefficient of regression  $R^2 = 0.9992$ . The linear regression was  $y = 0.1672x + 0.108$  as Figure 2. The content of trans-cinnamic acid was obtained as Table 2.

## DISCUSSION

Type of method extraction gave different cinnamaldehyde and trans-cinnamic acid contents. The maceration gave the higher concentration of cinnamaldehyde and trans cinnamic acid. The maceration method more effective for extraction cinnamaldehyde and trans-cinnamic acid. The 96% Ethanol was extracted cinnamaldehyde and trans-cinnamic acid in higher levels than the other because cinnamaldehyde and trans cinnamic acid easily soluble in 96% ethanol. Cinnamaldehyde and trans-trans-cinnamic acid slightly soluble in water.<sup>13</sup> The 70% ethanol and 50% ethanol

Table 1: Yield extract of various type of method extraction and type of solvent of Cinnamon bark

Type of Method Extraction	Type of solvent	Yield (%)
Maceration	50% Ethanol	3.695 ± 0.345
	70% Ethanol	20.545 ± 2.725
	96% Ethanol	20.860 ± 2.340
Soxhletation	50% Ethanol	7.832 ± 0.367
	70% Ethanol	8.807 ± 0.412
	96% Ethanol	9.290 ± 0.185
Infundation	Aquadest	14.945 ± 1.034

Data are mean ±SD for duplicate measurement

Table 2: Content Cinnamaldehyde and Trans-Cinnamic Acid in various type of method extraction and type of solvent of Cinnamon bark

Type of Method Extraction	Type of Solvent	Content of Cinnamaldehyde (mg/g dry extract)	Content of Trans-Cinnamic Acid (mg/g dry extract)
Maceration	50% Ethanol	69.081 ± 3.52	74.258 ± 4.86
	70% Ethanol	95.512 ± 2.24	110.788 ± 2.82
	96% Ethanol	124.143 ± 1.17	151.362 ± 2.47
soxhletation	50% Ethanol	62.273 ± 0.90	62.221 ± 0.95
	70% Ethanol	66.532 ± 0.23	68.125 ± 0.62
	96% Ethanol	120.816 ± 0.87	146.694 ± 0.31
infundation	Aquadest	59.285 ± 4.22	64.590 ± 3.99

Data are mean ± SD for duplicate measurement

contains a lot of water and was influence for soluble of cinnamaldehyde and trans-cinnamic acid. Statistical test showed that type of method extraction had a significant effect on content of cinnamaldehyde and trans-cinnamic acid ( $p < 0.05$ ). The 96% Ethanol and 70% ethanol solvent had a significant effect on content of cinnamaldehyde and trans-cinnamic acid ( $p < 0.05$ ), while 50% ethanol and aquedest hadn't a significant effect on content of cinnamaldehyde and trans-cinnamic acid ( $p > 0.05$ ).

## CONCLUSION

Type of method extraction have an effect on cinnamaldehyde and trans-cinnamic acid content, 96% ethanol and 70% ethanol as solvent have an effect on cinnamaldehyde and trans-cinnamic acid content. The 96% Ethanol give higher cinnamaldehyde and trans-cinnamic acid content.

## ACKNOWLEDGEMENT

This research was supported by Ministry of Research and Technology by the Directorate-General for Research and Higher Education, Indonesia.

## CONFLICT OF INTEREST

The authors have no conflict of interest.

## ABBREVIATION USED

**PTP1B:** Protein Tyrosine Phosphatase 1B.

## REFERENCES

1. Allen RW, Schwartzman E, Baker WL, Coleman CI, Phung OJ. Cinnamon use in type 2 diabetes: an updated systematic review and meta-analysis. *Ann Fam Med*. 2013;11(5):452-9.
2. Cao H, Polansky MM, Anderson RA. Cinnamon extract and polyphenols affect the expression of tristetrapirolin, insulin receptor, and glucose transporter 4 in mouse 3T3-L1 adipocytes. *Arch Biochem Biophys*. 2007;459(2):214-22.
3. Utchariyakiat I, Surassmo S, Jaturanpinyo M, Khurtayaporn P, Chomnawang

MT. Efficacy of Cinnamon bark oil and cinnamaldehyde on anti multidrug resistant *Pseudomonas aeruginosa* and the synergistic effect in combination with other antimicrobial agent. *BMC Complementary and Alternative Medicine*. 2016;16(158):2-7

4. Rana IS, Singh A, Gwal R. *In vitro* study of antibacterial activity of aromatic and medicinal plant. essential oil with spesial reference of cinnamol oil. *International Journal of Pharmacy and Pharmaceutical Sciences*. 2011;3(4):376-80.
5. Zinn S, Betz T, Medcraft C, Schnell M. Structure determination on trans cinnamaldehyde by broadband microwave spectroscopy. *Phys Chem Chem Phys*. 2015;17:16080-5
6. Sharma P. Cinnamic acid derivatives: a new chapter of various pharmacological activities. *J Chem Pharm Res*. 2011;3(2):403-23
7. Aprianto. Ekstraksi cinnamaldehyde dan oleoresin dari kayu manis berbantu ultrasonik. Master Thesis, Faculty of Chemistry Engineering, University of Diponegoro Semarang, Central of Java, Indonesia. 2011.
8. Araar H. Cinnamon plant extracts: a comprehensive physico-chemical and biological study for its potential use as a biopesticide. Master of Science. MSc. Thesis, Mediterranean Organic Agriculture. Instituto Agronomico Mediterraneo, Bari. 2009
9. Rind FMA, Memon AH, Almani F, Laghari MGH, Mughal UR, Maheshwari ML, *et al.* Spectrophotometric determination of cinnamaldehyde from crude drugs and herbal preparations. *Asian Journal of Chemistry*. 2011;23(2):631-5.
10. Gursale A, Dighe V, Parekh G. Simultaneous quantitative determination of cinnamaldehyde and methyl eugenol from stem bark of *Cinnamomum zeylicum* Blume using RP-HPLC. *Journal of Chromatographic Science*. 2010;48(1):59-62
11. Lee J, Lee DG, Park JY, Chae SW, Lee S. Analysis of the trans cinnamic acid content in cinnamomum spp and commercial of cinnamon powder using HPLC. *Journal of Agricultural Chemistry and Environment*. 2015;4(4):102-108.
12. Truong VT. Effect of cinnamic acid-cyclodextrin inclusion complexes on populations of *Escherichia coli* O157:H7 and *Salmonella entericain* Fruit Juices. M.Sc. Thesis, Faculty of the Virginia Polytechnic Institute and State University, Virginia. 2007.
13. Clark GS. An Aroma Chemical Profile, CinnamicAldehyde,CommoditySevices International Inc., Maryland. 1991.

**Article History:** Submission Date: 20-01-17; Revision Date: 03-02-17; Accepted Date:22-02-17.

**Cite this article:** Wardatun S, Rustiani E, Alfiani N, Rissani D. Study Effect Type of Extraction Method And Type of Solvent To Cinnamaldehyde and Trans-Cinnamic Acid Dry Extract Cinnamon (*Cinnamomum burmanii* (Nees & T, Nees)Blume. *J Young Pharm*. 2017;9(1)Suppl:s49-s51.