

## **Comparison of curcumin level in fresh and decoction of dried *Curcuma xanthorrhiza***

### **Roxb. rhizome**

Ramdan Panigoro, Samsudin Surialaga, Diah Dhianawaty D.

Biochemistry Department Faculty of Medicine of Universitas Padjadjaran, Bandung,

Indonesia

#### **ABSTRACT**

*Curcuma xanthorrhiza* Roxb, is an original medicinal plant from Indonesia. Almost of Indonesian Jamu consist of it, and the people made it in the various methods such as decoction, home made jamu. Nowadays, it is used in the formal therapy, such as in vitamins. It contains curcuminoid which one is curcumin that has various activities. The objective of the research is to evaluate the curcumin concentrations in two different preparation methods, fresh and decoction of dried rhizome. The rhizome was screened of the phytochemical constituents. Fresh rhizome was scraped and was kneaded with 50 ml of boiled water, dried rhizome was boiled in 50 ml water at 90<sup>0</sup>C in 30 minutes, volume to be kept at constant. Both were filtered and the supernatants were evaporated on the water bath. Curcumin were isolated with 50 ml methanol. Concentrations of curcumin were measured with spectrophotometer at wavelength 418 nm. Phytochemicals screening showed of positive results for the presence of alkaloid, saponin, quinon, and steroid/triterfenoid. From 20 g fresh of *Curcuma xanthorrhiza* rhizome and 5.87 g decoction of dried *Curcuma xanthorrhiza* rhizome could be isolated 37.9 mg and 12.95 mg curcumin respectively. In conclusion curcumin concentration that could be isolated from fresh *Curcuma xanthorrhiza* rhizome is higher than decoction of dried *Curcuma xanthorrhiza* rhizome, those are 37.9 mg and 12.95 mg curcumin respectively.

Key words: Curcumin, *Curcuma xanthorrhiza* Roxb., decoction, traditional medicine.

Corresponding author

Email : [ramdan.panigoro@unpad.ac.id](mailto:ramdan.panigoro@unpad.ac.id)

Contact: +62818210259

## INTRODUCTION

Almost of Indonesian Jamu consist of *Curcuma xanthorrhiza* Roxb. (commonly known as temulawak in Indonesia), is an original medicinal plant from Indonesia. Traditionally it used for fever, chronic cholecystitis, hypercholesterolemia, anorexia, acne, cholelithiasis (gallstones), cholagogue (promotes bile secretion), healthy promoters as well as to increase the production of breast-milk (Hutapea et al., 2001, Dalimartha, 2008). Nowadays, *Curcuma xanthorrhiza* Roxb are used in the formal therapy, e.g. in vitamins as appetite stimulant which have been named as Curvit, Curcuma Plus, Vitacur; for digestion upset have been named as Curliv; as acolereticum, colagogum and liver protector called as Curcil, Gramuno, Heparviton, Hepasil, Hepatoflak Planta, Hepa Q, and other names (IPA, 2013, Medica Asia, 2010).

The effects of *Curcuma xanthorrhiza* have been published, the main bioactive substances in the rhizomes of *Curcuma xanthorrhiza* is curcuminoids had efficacy as antioxidant and anti-inflammatory activities. Curcuminoid content was 31.27 mg/g, IC50 values for 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging activity was 81.99 µg/ mL, and antiinflammatory activities were evaluated by cyclooxygenase 2 (COX2) method was 67.96µg/ mL (Nurcholis et al., 2012). The secondary metabolites in the *C. xanthorrhiza* ethanol and aqueous extracts were further studied for the determination of phenol, flavonoid, saponin and alkaloid content. The result showed total phenol content (TPC) from the calibration curves of gallic acid, ethanol extract was  $199.00 \pm 1.31$ , and aqueous extract was  $19.99 \pm 0.16$  mg GAE/g. Total flavonoid content (TFC) using the calibration curve generated from catechin from ethanol

and aqueous extracts were  $101.66 \pm 0.8$  and  $10.58 \pm 0.83$  respectively. The total saponin and total alkaloid contents present in the rhizomes of *C. xanthorrhiza* were 80.90 mg/g and 14.06 mg/g, respectively (Halim et al., 2012).

*C. xanthorrhiza* had cytotoxic activities, LC50 values for BSLT was 210.3  $\mu\text{g/ml}$  (Nurcholis et al., 2012). Xanthorrhizol is a natural sesquiterpenoid compound isolated from the rhizome of *Curcuma xanthorrhiza* Roxb. (Zingiberaceae) was suggested has antiproliferative effects on MCF-7 cells (the human breast cancer cell line) by inducing apoptosis through the modulation of bcl-2, p53 and PARP-1 protein levels (Cheah et al., 2006).

The ethanol 70% extract of *Curcuma xanthorrhiza* Roxb contained xanthorrhizol (m/z 218), in a concentration of 1.0-5.0% (w/v) inhibited the growth of Gram positive bacteria *S. aureus* and *S. mutans*, while *B. cereus* in a concentration of 2.0-5.0% (w/v). The Minimum Inhibitory Concentration (MIC) of ethanol 70% extract toward *S. aureus* and *S. mutans* were 0.1% (w/v), while against *B. cereus* it showed 2.0% (w/v). Phytochemistry analysis showed it consists of alkaloid, quinone, and terpenoids (Mangunwardoyo et al., 2012). Xanthorrhizol, isolated from the methanol extract of *Curcuma xanthorrhiza* Roxb., has the potent anticandidal activity, the tests showed susceptibility to xanthorrhizol in the MIC range 1.0–15.0 mg/L for *Candida albicans*, 1.0–10 mg/L for *Candida glabrata*, 2.0–8.0 mg/L for *Candida guilliermondii*, 2.5–7.5 mg/L for *Candida krusei*, 2.5–25 mg/L for *Candida parapsilosis* and 2.0–8.0 mg/L for *Candida tropicalis*. Time–kill curves demonstrated that xanthorrhizol was able to kill the *Candida* strains with MFCs of 20 mg/mL, 15 mg/mL, 12.5 mg/mL, 10 mg/L, 30 mg/mL and 10 mg/L for *C. albicans*, *C. glabrata*, *C. guilliermondii*, *C. krusei*, *C. parapsilosis* and *C. tropicalis*, respectively (Rukayadi et al., 2006).

The decoct of *Curcuma xanthorrhiza* at the dose 160 mg/kg BW of rat in the 100 ml of mixture 30 mM glucose in 0,9 % sodium chloride solution had effect to decrease the glucose absorption level on intestine (Dhianawaty et al., 2010).

Oral curcumin at 400 mg/rats (2 g/KgBW) single dose once a week significantly reduces atrophy of soleus muscle in rats immobilized for 2 weeks (Soebadi et al., 2008).

Curcumin is more effective in decreasing total cholesterol level, LDL-cholesterol, number of F2-isoprostan and the formation of foam cell at a dose of 400 mg/kg bw daily (Fikriah et al., 2007).

The research to human body, the antioxidant activity of the curcuminoids of *Curcuma domestica* L. and *C. xanthorrhiza* Roxb., and eight compounds which are prevalent constituents of their rhizome oils was examined using thiobarbituric acid reactive substances (TBARSs) assay with human low-density lipoprotein LDL as the oxidation substrate. IC50 value ( $\mu\text{g/mL}$ ) of the methanol extracts and curcuminoids of *Curcuma domestica* and *C. xanthorrhiza* on human LDL peroxidation were  $0.31 \pm 0.01$  and  $0.78 \pm 0.03 \mu\text{g/mL}$  respectively. IC50 value ( $\mu\text{g/mL}$ ) of the essential oils of *Curcuma domestica* and *C. xanthorrhiza* and the essential oil standards on human LDL peroxidation were  $7.8 \pm 0.2$  and  $2.2 \pm 0.1 \mu\text{g/mL}$  respectively (Jantan et al, 2012). The effects of curcumin ingestion and aerobic exercise training on flow-mediated dilation as an indicator endothelial function in postmenopausal women was investigated by Akazawa. The curcumin used in the study was described as a highly absorptive curcumin dispersed with colloidal nanoparticle. The study lasted for eight weeks with a daily dose of 25 mg. The results indicated that curcumin ingestion and aerobic exercise training can increase flow-mediated dilation in postmenopausal women, suggesting that both can potentially improve the age-related decline in endothelial function (Akazawa et al., 20012). The previous study demonstrated that curcumin, an active compound of *Curcuma xanthorrhiza* and *C. domestica*, produces a positive cholekinetic effect. A 20 mg amount of curcumin is capable of contracting the gall bladder by up to 29% within an observation time of 2 h. A 40 mg amount of curcumin is capable of producing a 50% contraction of the gall bladder (Rasyid et al, 2002).

## **METHOD**

### **Material**

*Curcuma xanthorrhiza* Roxb., it was identified at School of Life Sciences and Technology of Institute Technology of Bandung, cultivated at Wonogiri (Central Java), was harvested in October, 2012. Its rhizome has length 13–17 cm; diameter 7–11 cm; fresh (wet) weight = 2,907.4 g; dried weight = 303.02 g.

Curcumin for synthesis: 8203540010 (E.Merck)

Equipment: Spectrophotometer Jenway 6305 UV-Vis single beam (United Kingdom).

### **Experimental Details**

#### **Phytochemical screening of dried of *Curcuma longa* L. and *Curcuma xanthorrhiza* Roxb.**

Both of rhizomes analyzed for the presence of phytochemical constituents such as flavonoid, alkaloid, saponin, quinon, tannin, and steroid/terpenoid using standard procedure (Harbone, 1973).

#### **Standard curve**

The absorbance of curcumin for synthesis in methanol at concentrations: 0.500; 0.250; 0.200; 0.125; 0.100; 0.050 mg/50ml were measured at wavelength 418 nm, and were used to make standard curve.

#### **Dosage in traditional medicine (Dalimartha, 2008).**

Fresh *C. xanthorrhiza* rhizome was used at dosage: 20 – 23 g /day.

This experiment was used 20 g fresh rhizome which is equivalent with 5,87 g dried rhizome .

#### **Preparation of *C. xanthorrhiza* rhizome fresh and decoct, and isolation of curcumin**

(Panigoro, 2013)

10 g of fresh rhizome was scraped and was kneaded with 50 ml of boiled water. Then was pressed and was filtered, supernatant was evaporated on the water bath. After dried, curcumin was isolated with 50 ml methanol.

Preparation of the decoction: 5.87 g of dried rhizome was boiled in 50 ml water at 90<sup>0</sup>C during 30 minutes, volume to be kept at constant, then was filtered and supernatant was evaporated on the water bath. After dried, curcumin was isolated with 50 ml methanol.

### **The calculation of curcumin sample concentrations**

1 ml of curcumin from fresh and dried solutions were taken and were diluted until 50 ml solutions. Curcumin concentrations were measured at wavelength 418 nm by Spectrophotometer Jenway 6305 UV-Vis single beam, and then the results were calculated by linier regression from standard curve.

## **RESULT AND DISCUSSION**

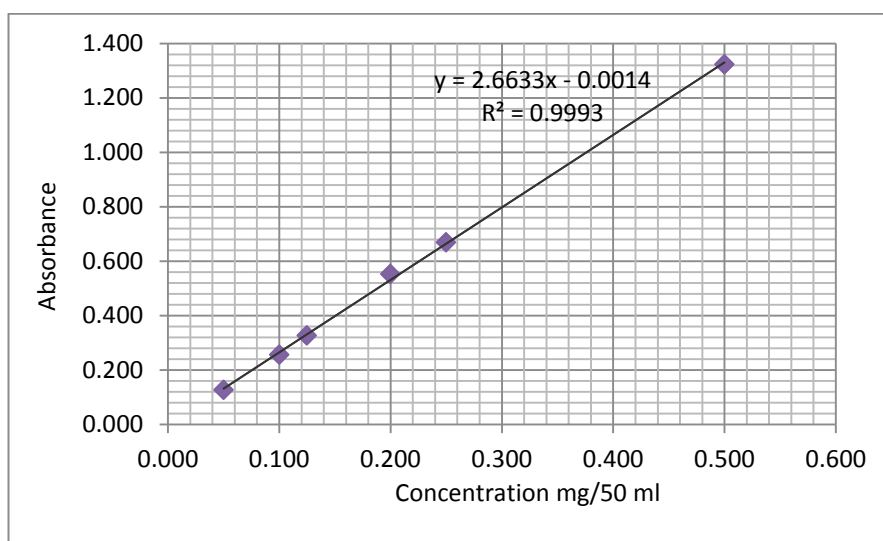
The result of phytochemical screening *Curcuma xanthorrhiza* Roxb. rhizome contains alkaloid, saponin, quinon, and steroid/triterfenoid.

**Table 1: Phytochemical constituents of *Curcuma xanthorrhiza* Roxb.**

No.	Constituents	Results
1.	Alkaloid	+
2.	Flavonoid	-
3.	Saponin	+
4.	Quinon	+
5.	Tannin	-
6.	Steroid/Triterfenoid	+

+ = Present; - = Absent

Standard curve of the curcumin concentration were: 0.500; 0.250; 0.200; 0.125; 0.100; 0.050 mg in 50ml ethanol gave the absorbance: 1.323; 0.669; 0.552; 0.327; 0.256; 0.127, respectively.



**Figure 1: Standard curve of curcumin at wavelength 418 nm**

The linear regression is  $y = 2.663 x - 0.001$

Note : y is absorbance and X is sample concentration

**Table 2: Curcumin concentration from fresh and decoction of dried *C. xanthorrhiza* rhizome were measured at wavelength 418 nm**

No. samples	Absorbance of <i>C. xanthorrhiza</i>	
	Fresh	Dried
1	0,999	0,690
2	0,995	0,693
3	0,995	0,690
Average	0,996	0,691
Concentration of curcumin	18,95 mg	12.95 mg

Concentration of curcumin in 20 g fresh rhizome =  $2 \times 18.95 = 37.9$  g

Concentration of curcumin was calculated with the linier regression,  $y = 2.663 x - 0.001$

From 20 g fresh *C.xanthorrhiza* rhizome and 5.87 g decoction of dried *C.xanthorrhiza* rhizome could be isolated 37.9 mg and 12.95 mg curcumin respectively.

## CONCLUSION

In 20 g fresh *C.xanthorrhiza* rhizome and 5.87 g decoction of dried *C.xanthorrhiza* rhizome contained 37.9 mg and 12.95 mg curcumin respectively. Curcumin concentration from fresh *Curcuma xanthorrhiza* rhizome is higher than decoction of dried *Curcuma xanthorrhiza* rhizome, those are 37.9 mg and 12.95 mg curcumin respectively.

## ACKNOWLEDGEMENTS

The authors would like to thank to the Authorities of Chemistry Department of Faculty of Mathematics and Natural Sciences of Universitas Padjadjaran for supporting this research project.

## REFERENCES

Akazawa N, Choi Y, Miyaki A, Tanabe Y, Sugawara J, Ajisaka R, Maeda S.

‘Curcumin ingestion and exercise training improve vascular endothelial function in postmenopausal women’, *J. Nutres*, vol. 32, no. 10, October, 2012 pp. 795-9.

Cheah YH, Azimahtol HL, Abdullah NR. ‘Xanthorrhizol exhibits antiproliferative activity on MCF-7 breast cancer cells via apoptosis induction’, *Anticancer Research*, vol. 26, no. 6B, December, 2006 pp. 4527-4534.

Dalimartha S., Atlas of Indonesian medicinal plants: *Curcuma xanthorrhiza* Roxb. 2<sup>nd</sup> edition, Depok: Trubus Agriwidya, 2008.



- Dhianawaty DD, Andreanus AS, Surialaga S, Martiana AS, Ruslin. 'Effect of *Curcuma xanthorrhiza* Roxb. decoct on glucose absorption level in intestine of male rat of Wistar strain', Bogor Agricultural University The 2nd International Symposium on Temulawak and The 40th Meeting of National Working Group on Indonesian Medicinal Plant, Bogor, 2011 pp. 121-123.
- Fikriah I. 'Effect of curcumin on the levels of total cholesterol, LDL cholesterol, the amount of F2-isoprostan and foam cell in aortic wall of rats with atherogenic diet', *Folia Medica Indonesiana*, vol. 43, no. 3, July-September, 2007 pp. 136-140.
- Halim MRAB, Zabri TMSM, Ismail S, Mahmud R. 'Standardization and phytochemical studies of *Curcuma xanthorrhiza* Roxb', *Int J. Pharm Pharm Sci.*, vol. 4, no. 3, September, 2012 pp. 606-610.
- Harborne JB. *Phytochemical methods: A guide to Modern Technique of Plant Analysis*. London: Chapman and Hall Ltd., 1973.
- Hutapea JR, Djumidi, Sutjipto, Indonesia medicinal plants inventory: *Curcuma xanthorrhiza* Roxb. 1<sup>st</sup> edition, Jakarta: Ministry of Health Republic of Indonesia, 2001.
- Indonesian pharmacist association (IPA), Indonesia drug specialist information: drug for gastrointestinal tract, vol.47, Jakarta, 2013.
- Jantan I, Saputri FC, Qaisar MN, Buang F. 'Correlation between chemical composition of *Curcuma domestica* and *Curcuma xanthorrhiza* and their antioxidant effect on human low-density lipoprotein oxidation', *Evidence-Based Complementary and Alternative Medicine*, vol. 2012, October, 2012 pp. 1-10.
- Mangunwardoyo W, Deasywaty, Usia T. 'Antimicrobial and identification of active compound *Curcuma xanthorrhiza* Roxb.', *Int J. Basic Appl Sci.*, vol. 12, no. 01, February, 2012 pp. 69-78.
- Medica Asia, Indonesia Index of Medical Specialities: supplement, vol.12, Jakarta, 2010.

- Nurcholis W, Ambarsari L, Sari NLPEK, Darusman LK . ‘Curcuminoid contents, antioxidant and anti-Inflammatory activities of *Curcuma xanthorrhiza* RoxB. and *Curcuma domestica* Val. promising lines from Sukabumi of Indonesia’, Unesa – Seminar Proceedings , Chemistry National Proceeding, Surabaya, 2012 pp. C284 – C 292.
- Nurcholis W, Priosoeryanto BP, Purwakusumah ED, Katayama T, Suzuki T. ‘Antioxidant, cytotoxic activities and total phenolic content of four Indonesian medicinal plants’, Valensi, vol. 2, no. 4, Mei, 2012 pp. 501-510.
- Panigoro R, Dhianawaty DD. ‘Curcumin concentration in fresh and decoction of dried *Curcuma longa* L. (Turmeric) rhizome as homemade jamu’, Int J Res Phytochem Pharmacol, vol. 3, no. 1, April, 2013 pp. 5-8.
- Rasyid A, Rahman AAR, Jaalam K, Lelo A, ‘Effect of different curcumin dosages on human gall bladder’, Asia Pacific J Clin Nutr, vol. 11, no. 4, December, 2002 pp. 314-318.
- Rukayadi Y, Yong D, Hwang JK. ‘In vitro anticandidal activity of xanthorrhizol isolated from *Curcuma xanthorrhiza* Roxb’, J Antimicrob Chemo., 57, April, 2006 pp.1231-1234 .
- Soebadi RDH, Pawana IPA. ‘Effect of oral curcumin and immobilization on the diameter of skeletal muscle fiber in *Rattus Norvegicus*’, Folia Medica Indonesiana, vol. 44, no. 1, Januari-Maret, 2008 pp. 30-34.