



Antimicrobial Activities of Curcumin

**Extracted from Selected *Zingiberaceae* Species
as Potential Halal Active Pharmaceutical
Ingredient**



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CURCUMIN

- Curcumin [1,7-Bis (4-hydroxy-3-methoxyphenyl)-1,6-heptadiene 3,5-dione]- strong immunomodulator in both humans and animals, produced an **orange-yellow polyphenolic and hydrophobic phytochemical component.**

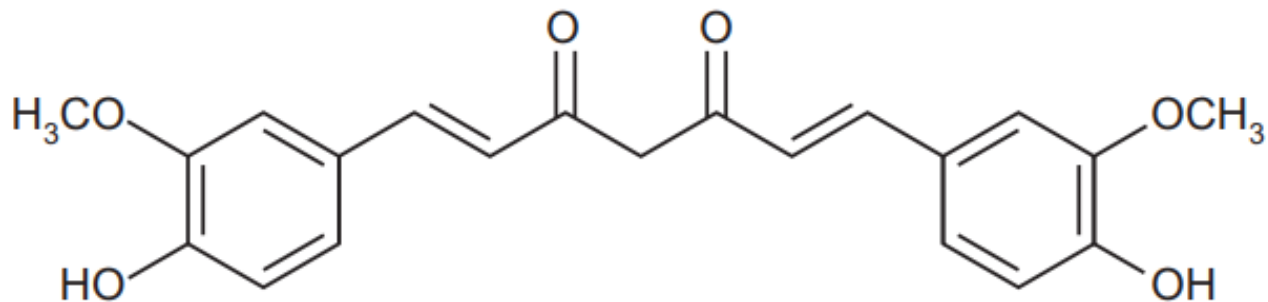


Figure 1: Chemical structure of Curcumin (Maria L.A.D. Lestari, Gunawan Indrayanto, 2014)



CURCUMIN

- Powerful **natural antioxidant** in traditional Chinese medicine and Indian ayurvedic treatments. (Aggarwal *et al.*, 2007; Zheng *et al.*, 2018).
- Properties of curcumin: **anti-inflammatory, antimicrobial, antioxidant, immunomodulatory, appetite-increasing, and gastro-protective** effects on animal health. (Johannah *et al.*, 2018)
- Carotenoid that can be extracted from the rhizomes of the plant *Curcuma longa* that changes colour in alkaline conditions or high pH solution (Oglah *et al.*, 2020).



RESEARCH AIMS

To quantify curcumin content and to analyse the antibacterial activities of curcumin extracts from 5 selected species of Zingiberaceae



ZINGIBERACEAE FAMILY

- The Zingiberaceae family is known as ginger plants with characteristics: **rhizome**, **pseudo-stems**, and **single leaves**.
- The **rhizome** is used for medication because it contains **aromatic compounds** as a characteristic of each species in its use for local societies.



ZINGIBERACEAE FAMILY

- Zingiberaceae family: used to treat **digestive, respiratory, and skin diseases** caused by a **bacterial infection**.
- Various species of Curcuma: used for **healing wounds, liver disorders, jaundice** and also as a **blood purifier**.



ZINGIBERACEAE FAMILY

- Bacteriostatic antibacterial is an **antibacterial** that in which able to **inhibit bacterial growth** and **bactericidal** is an **antibacterial that able to kill bacteria.** (Trisia *et al.*, 2018).
- Curcumin acts as an **antibacterial** by **inhibiting the proliferation of bacterial cells.** (Yuliati, 2016).



EXPERIMENTAL DESIGN



1. Sample Preparation



2. Drying and Grinding



Cekur – letak saintifik name sekali



Temu Emas



Lempoyang



Temu Kunci



Temu Pauh

3. Extraction of Pigments
▪ Chemical



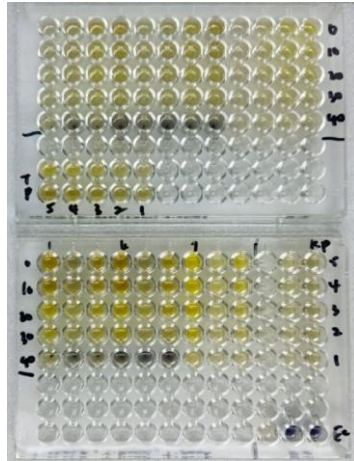
4. Curcumin



EXPERIMENTAL DESIGN



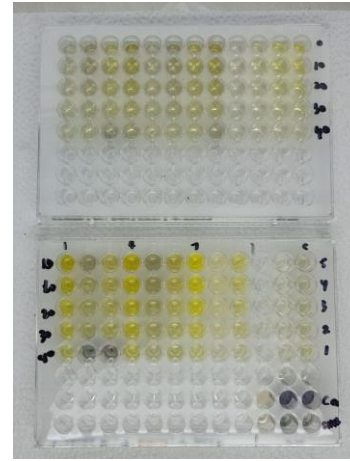
S. aureus



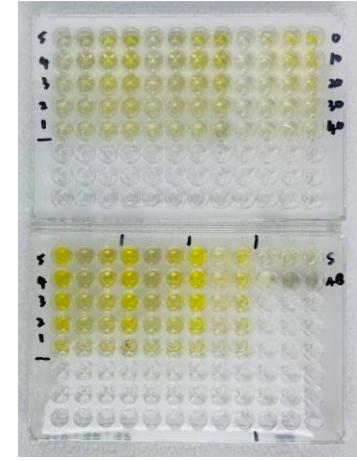
E. coli



S. typhimurium



C. albicans



A. brasiliensis

CURCUMIN CONTENT OF... - BUAT JADUAL COMPARE CURCUMIN CONTENT UG/G DW)

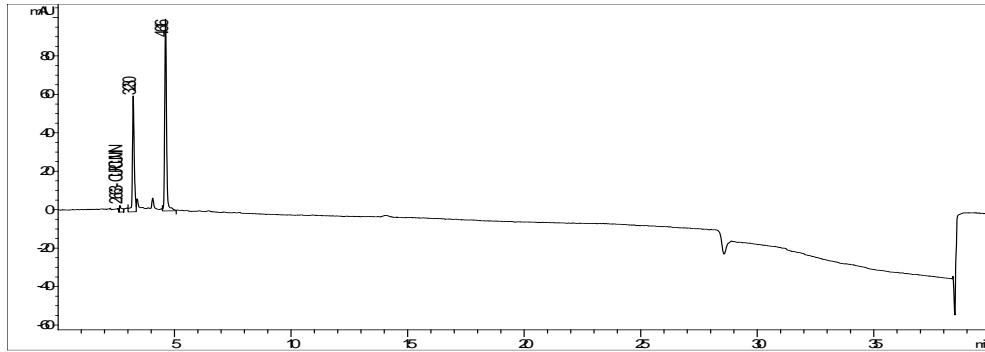


Figure 1 HPLC Chromatogram for Curcumin Extraction on Cekur

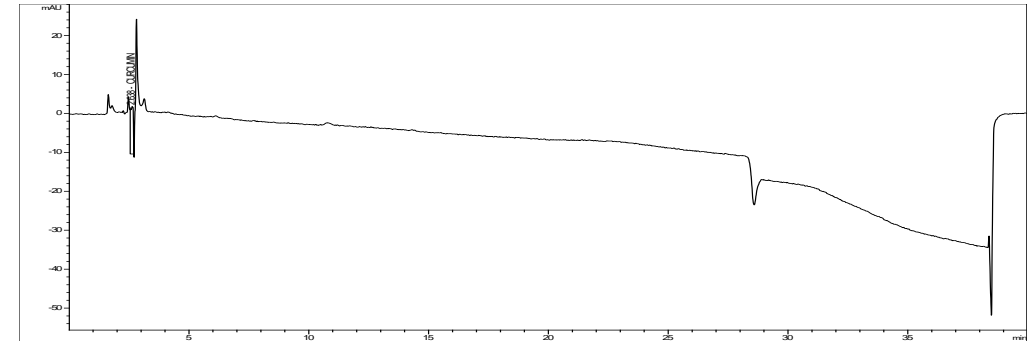


Figure 4 HPLC chromatogram for curcumin extraction on temu kunci

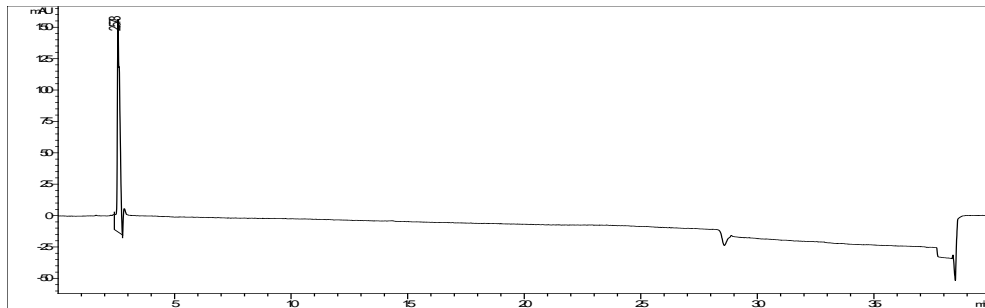


Figure 2 HPLC chromatogram for curcumin extraction on lempoyang

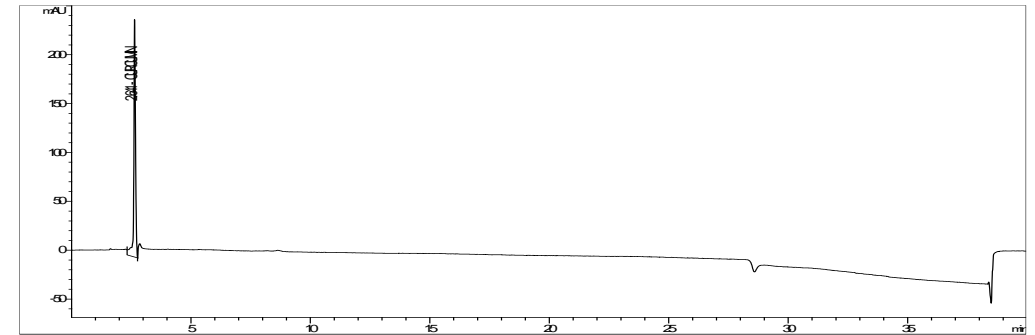


Figure 5 HPLC chromatogram for curcumin extraction on temu pauh

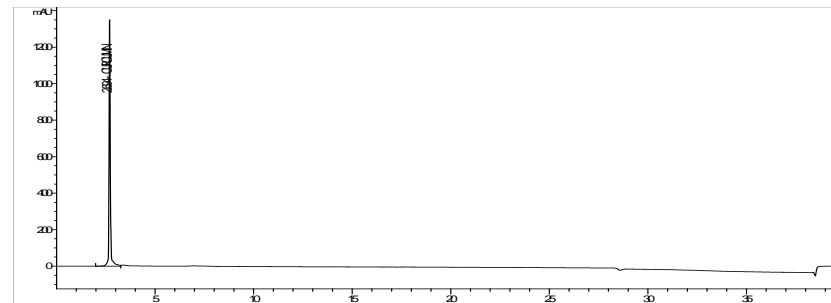


Figure 3 HPLC chromatogram for curcumin extraction on temu emas

- The peaks of the elution were also detected at a wavelength of **425 nm**, which was consistent with the results (Nabati et al., 2014).
- Each of the chromatograms detected the presence of the curcumin peak by comparing the peaks' retention times to the curcumin standard.
- The type and amount of specific carotenoids, like curcumin, will depend on the **activity of functional enzymes** and **candidate enzymes** that control **carotenoid biosynthesis**. (Othman et al., 2017).



ANTIMICROBIAL ACTIVITIES OF...

Sample	Minimum Bacteriocidal/Yeastocidal/ Fungicidal Concentration (μg / μL)				
	<i>S. aureus</i> (ATCC 25923)	<i>E. coli</i> (ATCC 35218)	<i>S. typhimurium</i> (ATCC 14028)	<i>C. albicans</i> (ATCC 10231)	<i>A. brasiliensis</i> (ATCC 16404)
Cekur (20mg/mL)	9	6	6	3	3
Lempoyang (20mg/mL)	9	6	6	6	3
Temu emas (5mg/mL)	3	2	2	2	2
Temu kunci (20mg/mL)	9	6	6	6	3
Temu pauh (20mg/mL)	9	6	6	6	3

Table 1 MIC minimum inhibitory concentrations; minimum bacteriocidal/yeastocidal/fungicidal concentration (μg / μL)

- Every bacterial strain, inhibition was seen. The creation of novel and **potent medications** to **combat** current pathogens that are **antibiotic-resistant** is urgently required (Otieno *et al.*, 2015).
- **Temu emas** extracts have demonstrated **excellent antibacterial activities**. The extract from Temu emas was most effective against these bacteria.
- The *S. aureus* ATCC 25923 was only moderately inhibited by the extracts of cekur (20 mg/ml), temuk kunci (20 mg/ml), and temu pauh (20 mg/ml).



- Temu emas extracts were found to be more effective when diluted to a concentration of 2 (g/L), which inhibited the growth of the bacteria *E. coli* ATCC 35218, *S. typhimurium* ATCC 14028, *C. albicans* ATCC 10231, and *A. brasiliensis* ATCC 16404.
- The **antifungal, antibacterial, and anti-inflammatory activity** has been reported for species like *Curcuma longa*, *Curcuma zedoaria*, *Curcuma aromatica*, and *Curcuma amada*.
(Apisariyakul et al., 1995; Yoshioka et al., 1998; Negi et al., 1999; and Mujumdar et al., 2000.)



- Highest curcumin content was detected in ...
letak kat slide berkaitan
- *A. brasiliensis* ATCC 16404 are the most
resistant to all the extracts.
- 5 species of Zingiberaceae extracts with the
highest MIC values ranged from 3 to 9 (g /
L).



CONCLUSIONS

- By using chemical extraction method, HPLC analysis of five selected Zingiberaceae species revealed that **temu??** contained the highest levels of curcumin.
- Temu emas with a concentration of 5 mg/ml demonstrated greater activity than the other extracts and generated inhibition zones that ranged from 3 to 9 (g/L).
- Temu emas inhibited *S. aureus* ATCC 25923 at a concentration of 5 mg/ml. All four species, Cekur, Lempoyang, Temu kunci, and Temu Pauh, produced inhibition only at concentrations of 20 mg/ml, which showed inhibitory activity concentrations as high as 9 g/L for *S. aureus* ATCC 25923.

