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## Alkaline-based curcumin extraction from selected zingiberaceae for antimicrobial and antioxidant activities

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### Abstract

**Purpose** The purpose of this paper is to extract, characterise and quantify curcumin from selected Zingiberaceae of kunyit or turmeric (*Curcuma longa*), temu lawak or Javanese turmeric (*Curcuma xanthorrhiza*), temu pauh (*Curcuma mangga*), lempoyang (*Zingiber zerumbet*) and bonglai (*Zingiber cassumunar*) using alkaline and chemical-based extraction method for antimicrobial and antioxidant activities.

**Design/methodology/approach** Through the alkaline-based extraction method, all parts of rhizome samples were freeze-dried for 72h before grounded into a fine powder and kept at -20 degrees C. The powdered sample (0.1g) was weighed and placed in a 50mL tube. About 20mL of 2M NaOH solution was added into the tube. The solution was allowed to stand for 30min. Then, 20mL of ethyl acetate was added into the tube. The solution was mixed well then centrifuged at 13,500rpm for 3min. The upper layer was collected using a pipette. The process was repeated until the upper layer became almost colourless. The collected ethyl acetate solution was concentrated using a rotary evaporator to remove the ethyl acetate from the extracted compound. The concentrated curcumin was placed in a universal bottle, which was then dried from the remaining ethyl acetate using nitrogen drying process. The dried curcumin was then stored inside the freezer at -20°C. The antimicrobial activities were using agar diffusion method against bacterial and fungi, while the antioxidant activity was evaluated using 2,2-diphenyl-1-picrylhydrazyl (DPPH) scavenging assay.

**Findings** All the samples successfully showed a single peak (curcumin) that gained from the high-performance liquid chromatography (HPLC) chromatogram analysis (at 425nm) using the alkaline-based extraction method and the highest curcumin content was in turmeric (12.951.07mg/g DW). At 10.0mg/mL curcumin concentration, the best antibacterial activity was against methicillin-resistant staphylococcus aureus (MRSA) with 7.50 +/- 0.71mm inhibition zone, while the best antifungal activity was against *Aspergillus niger* with 8.00 +/- 0.41mm inhibition zone. The DPPH antioxidant test resulted in the highest inhibition (110.41 per cent) was at 0.25mg/mL curcumin concentration.

**Originality/value** Through HPLC analysis, all samples successfully showed a single peak of curcumin at 425nm. The total carotenoid determination from turmeric revealed that the samples content was substantially higher using alkaline-based extraction (18.40 +/- 0.07mg/g DW) compared to chemical-based extraction (9.42 +/- 0.20mg/g +/- SD).

### Keywords

**Author Keywords:** Antioxidants; Colorant; Pigments; Pharmaceuticals industry; Antimicrobial; HPLC; Alkaline-based extraction; Turmeric; Zingiberaceae

**KeyWords Plus:** STABILITY

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