

Title : Effect of extraction method on biological characteristic of cold brew coffee

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## ABSTRACT

Cold brew coffee is a preferred choice among health-conscious consumers due to its cold extraction process. By utilizing cold water with longer extraction time, thereby the coffee is preserving bioactive compounds more effectively than hot extraction. However, there are several protocols of cold brew extraction that yield the different biological activities. In this study, we aimed to analyze the effects of the extraction method on antioxidant activity, total phenolic content (TPC), and antibacterial properties in cold brew coffee and spent coffee grounds after extraction. Three arabica coffee that fermented with *Lactiplantibacillus plantarum* JT-PN39 (LP), *L. plantarum* JT-PN39 combined with *Pichia kluyveri* (LPi), and *L. plantarum* JT-PN39 combined with *Yarrowia lipolytica* (LYar) were extracted using cold drip and immersion method. Antioxidant activity and TPC of cold brew coffee were assessed by ABTS<sup>+</sup> and Folin-Ciocalteu assay, respectively. The results indicated that cold drip extraction exhibited significantly higher antioxidant activity and TPC than immersion with a statistically significant difference values of LP, LPi, and LYar. The radical scavenging values for cold drip extraction were 48.39 ± 6.60%, 75.88 ± 5.04%, and 65.44 ± 2.52%, respectively, while those from immersion were 15.84 ± 1.58%, 40.12 ± 4.84%, and 24.81 ± 1.58%, respectively. Similarly, TPC values for cold drip extraction were 35.50 ± 0.11, 58.72 ± 0.69, and 52.68 ± 0.18 mg GAE/g, respectively, while those from immersion were 10.34 ± 0.37, 18.66 ± 0.76, and 12.39 ± 0.09 mg GAE/g, respectively. Antibacterial property was tested against foodborne pathogens, including *Bacillus cereus*, *Escherichia coli*, *Listeria monocytogenes*, *Pseudomonas aeruginosa* and *Staphylococcus aureus*, using agar well diffusion. Cold drip extraction inhibited *B. cereus* and *S. aureus*, whereas none of the bacteria were inhibited by immersion. Consequently, determination of the relationship between cold drip extraction and storage effect on biological property changes were observed at 0, 30, 60, and 90 days. Both antioxidant activity and TPC significantly decreased from fresh extraction with 2 times and 3 times lower at day 90. The antibacterial property against *B. cereus* initially showed MIC of 62.5 mg/mL but declined throughout the storage period. In contrast, the inhibition of *S. aureus* remained stable at MIC 62.5 mg/mL throughout the storage period. Biological properties of three spent coffee grounds after cold drip extraction were evaluated by water and 75% ethanol extraction. Water extraction demonstrated significantly higher antioxidant activity with values of 38.01 ± 6.90%, 12.67 ± 5.71%, and 21.12 ± 5.09%. Similarly, TPC exhibited values of 17.85 ± 0.87, 5.85 ± 0.53, and 10.51 ± 0.90 mg GAE/g, whereas none of the bacteria were inhibited. However, 75% ethanol extraction exhibited the activity against *B. cereus*, *L. monocytogenes*, and *S. aureus* at MIC 25 mg/mL. These findings indicated that the extraction method for cold brew coffee preparation significantly influenced the solubility of bioactive compounds and will be applied for industrial extraction scale. Moreover, the spent coffee grounds after cold drip extraction have the potency for further extraction of high value compounds which are able to supply in food or cosmetic industries.

Keywords: Cold brew coffee, Antioxidant activity, Total phenolic content, Antibacterial property, Spent coffee grounds

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