

CHARACTERIZATION AND OPTIMIZATION OF CHEMICAL ISOLATION TECHNIQUES OF PIPERINE FROM *Piper nigrum* L. OLEORESIN

H.A.U. Subasinghe¹, I.V.A.D.C.S. Induruwa² and H.R.M.G.C. Thialakarathna¹

¹*Department of Animal and Food Sciences, Faculty of Agriculture, Rajarata University of Sri Lanka, Anuradhapura, Sri Lanka.*

²*Central Research Station, Department of Export Agriculture, Matale, Sri Lanka.*

Piperine is an alkaloid that is primarily responsible for the pungency of black pepper and has gained significant attention for its potential health benefits and pharmacological properties. This study aimed to select and optimize the best method for piperine isolation using black pepper oleoresins using three techniques: ethanol extraction (E1), methanol precipitation (E2) and chloroform precipitation (E3), utilizing analytical grade solvents (ethanol, methanol, and chloroform respectively). In each method, oleoresin was dissolved in ethanol (E1), methanol (E2) or chloroform (E3). Each solution was treated with 10% KOH, while E3 was additionally treated with 10% NaOH and 1% HCl. All solutions were then filtered and refrigerated at 4°C for 72 hours. The efficiency of piperine isolation was evaluated in terms of yield and purity, while the physicochemical properties of piperine were also characterized. According to the results, the piperine yield was greater ($p < 0.05$) in the E2 [24.11±0.03% (w/w)] than in the E3 [12.02±0.03% (w/w)] or E1 [15.22±0.04% (w/w)]. The purity of piperine was higher ($p < 0.05$) in the E1 [97.58±0.39% (w/w)] in comparison to the E2 [95.72±0.34% (w/w)] and E3 [92.53±0.41% (w/w)]. In this study, E2, recognized as the best method, was further optimized to improve the piperine yield by changing the factors such as oleoresin: solvent ratio [1:10, 1:15, and 1:20 (v/v)] and KOH concentration [8%, 10%, and 12% (v/v)] while maintaining constant extraction time (72 hours) and temperature (4°C). The optimal conditions for the isolation of piperine were identified as oleoresin: solvent ratio of 1:20 (v/v) and a KOH concentration of 12% (v/v). Optimizing the chemical isolation of piperine from oleoresin can enhance its yield, purity, and commercial availability, thereby increasing its applications in the food, medical, and cosmetic industries.

Keywords: Chloroform precipitation, Ethanol extraction, Methanol precipitation, Purity analysis, Yield optimization