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Extraction and purification of lipase enzymes from rice bran and identification of potent natural inhibitors of rice lipases

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A significant byproduct of milling of rice is rice bran. Global production of rice bran is approximately 29.3 million tons per year. While rice bran is used as animal feed, a considerably low amount of rice bran is utilized efficiently due to its short shelf life due to rancidity resulting from high levels of lipids, lipases, and lipoxygenases. Triglycerides (lipids) have ester bonds hydrolyzed by lipase enzymes, releasing free fatty acids. Therefore, inhibiting the lipases in rice bran is a potential method for limiting lipid oxidation to prevent rancidity. In this study, three lipases found in rice bran were isolated and separated using differential protein precipitation, followed by size exclusion chromatography and ion exchange chromatography. The 45% saturation pellet was used further to separate three lipases, indicating the highest lipase activity (1.954 ± 0.025). Then, the efficiency of natural plant extracts in inhibiting the activity of isolated lipases was assessed using the Folin Ciocaltue assay. Natural plant extracts such as ethanolic extracts of leaves of *Moringa stenopetala* (drumstick), *Punica granatum* (pomegranate) and *Psidium guineense* Swartz (guava) and methanolic extracts of leaf and bark of *Cinnamomum zeylanicum* (cinnamon) on each lipase were assessed. The activity of the rice bran lipases was significantly reduced by leaf extracts of *Moringa stenopetala,* leaf and inner bark extracts of *Cinnamomum zeylanicum*, and *Psidium guineense Swartz* (P value<0.05). Among those, the highest inhibition was observed in leaf extract from *Moringa stenopetala.* Concentration as Galic Acid Equivalent (mg/mL) for Lipase 1, Lipase 2 and Thermostable lipase were 0.79 ± 0.05, 0.55 ± 0.01, 0.39 ± 0.06, respectively. The highest percentage inhibition for three lipases was obtained by leaf extract of *Moringa stenopetala.* Percentage inhibition for lipase 1, lipase 2 and thermostable lipase were 33.33%, 26.09% and 19.05%, respectively.

Keywords: Lipase inhibitors, Rice bran, Rice bran lipases.

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