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QUANTITATIVE LIPIDOMICS AND METABOLOMICS IN FERMENTED RAW CONILON COFFEE BEANS FROM ESPIRITO SANTO

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Brazil is the second largest producer of *Coffea canephora* Pierre, with cultivation concentrated in Espírito Santo and Rondônia. Espírito Santo alone accounts for about 30% of global conilon coffee production, employing more than 250,000 people. Coffee beans contain around 10% oil, mainly triacylglycerols (TGs), and a notable unsaponifiable fraction rich in kaurane-type diterpenes such as cafestol, kahweol, and 16-*O*-methylcafestol. Minor constituents include phospholipids, sterols, tocopherols, and $^{\beta}$*N*-alkanoyl-5-hydroxytryptamides (C_n-5HTs). While cafestol and C_n-5HTs show biological activities, they are also linked to hypercholesterolemia and gastric discomfort. Post-harvest processing reduces bean moisture, removes pulp and mucilage, and stabilizes beans for storage and roasting. Because cherries are rich in sugar and water, fermentation occurs naturally; however, induced fermentation provides controlled conditions that promote biochemical reactions and microbial development, generating aroma and flavor precursors that may migrate into the seed. Considering the role of lipids in seed development and bean quality, this study aimed to characterize the lipid fraction of conilon coffee beans from Espírito Santo processed by different post-harvest methods. This study applied quantitative lipidomics by liquid chromatography–high-resolution mass spectrometry (LC-HRMS) to profile lipid classes and developed a validated high-performance liquid chromatography–diode array detector (HPLC-DAD) method to quantify diterpenes. Coffees were processed by the dry method (control) and four fermentation protocols. Fermented coffees exhibited significantly lower TGs, cafestol, and C_n-5HTs contents compared to control beans. PLS-DA analysis confirmed a clear separation between fermented and dry-processed samples, mainly influenced by TGs and C_n-5HTs. These results demonstrate that lipidomics is an effective tool to evaluate processing, and controlled fermentation modifies the lipid profile of conilon beans, potentially reducing compounds linked to negative health effects while preserving or enhancing sensory properties.

Keywords: *Lipidomics; Robusta coffee; Fermentation, Quantification; LC-MS*

References: *(1)Brand, et al., Food Biosci., 2024, 57, 103472. (2)Tinoco et al., Food Res. Int., 2019, 115, 487–492.*