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Influence of Fermentation and Roasting on the Volatile and Sensory Profiles of Coffee

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Sensory quality is one of the main attributes that contribute to coffee value, influencing consumer acceptance and market differentiation. This quality is determined by genetic, environmental, and processing factors that affect the chemical composition of coffee beans and the beverage's sensory attributes. Among the processing stages, fermentation and roasting stand out for inducing transformations that can modify the profile of volatile compounds associated with coffee aroma. During fermentation, microbial and enzymatic activities may alter fruit composition and the availability of aroma precursors, depending on processing conditions. In this context, carbonic maceration has been investigated as a strategy to modulate sensory quality in a study involving *Coffea canephora* var. Conilon, different fermentation temperatures (18, 28, and 38 °C) and durations 24–120 h changed the volatile composition and sensory characteristics of the beverage. The highest sensory score 83.25 points was obtained at 38 °C after 120 h, and 92 volatile compounds were identified; associations were observed between certain alcohols, pyrazines, and phenolic compounds and the evaluated sensory attributes. Roasting, in turn, is a critical stage in developing coffee's characteristic aroma, as heating triggers chemical reactions such as the Maillard reaction and Strecker degradation, which are responsible for forming various volatile compounds. The extent of these transformations depends on roasting time and temperature, which influence the formation, transformation, and degradation of aroma compounds and, consequently, the beverage's sensory profile. In a study involving *Coffea arabica* and *Coffea canephora*, 111 volatile compounds were identified, with their abundance varying throughout roasting and sensory attributes. Accordingly, the highest mean sensory scores were observed at 10 min for Conilon and 11 min for Arabica, with descriptors such as chocolate, caramel, and almond prominent at intermediate roasting stages. Positive correlations were also observed between aldehydes, ketones, and furans and sensory quality. Overall, these studies demonstrate that fermentation and roasting conditions influence the volatile composition and sensory characteristics of coffee, highlighting the importance of controlling these processes to develop beverages with distinctive sensory profiles.

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