

## Link between volatile composition of cocoa beans and the use of yeast starter culture during fermentation

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## ABSTRACT

Cocoa quality derives strongly from its flavor and its flavor precursor composition. Cocoa flavor may be seen as the result of the chemical and biochemical reactions that take place during the cultivation, harvest and post-harvest processing of the cocoa beans, which are all at the same time heavily dependent on the cocoa variety and origin. Subject to all these conditions is the final chemical composition of the cocoa beans, which is highly complex. Both, volatile and non-volatile compounds contribute to the final flavor perception of cocoa. Around 600 volatile compounds have been reportedly found present in cocoa beans. Among post-harvest processes, fermentation has arguably the most significant impact on the formation of volatiles (mainly alcohols, esters, and carboxylic acids), as well as their precursors. Some of these precursors and intermediates will then be further transformed during roasting by means of Maillard reactions and Strecker degradation (producing pyrazines, aldehydes and ketones, among others). Fermentation of cocoa beans involves an initial anaerobic phase (driven by yeasts and lactic acid bacteria), followed by an aerobic phase (where acetic acid bacteria are predominant). Varied factors influence cocoa fermentation and the products resulting thereof. This work focused on the study of the impact of fermentation time and of the use of yeast starter cultures on the final volatile composition of the cocoa beans, which would translate into differences in their consequent perceived flavor profiles. Large-scale fermentation trials of Trinitario beans were carried out in wooden boxes (600kg) in Dominican Republic in April 2020. Three different fermentation techniques were carried out: one spontaneous, and two inoculated with different Saccharomyces cerevisiae strains. Beans were collected and dried after 4, 5, and 6 fermentation days, for them to be later roasted under the same conditions. A SPME-HS extraction (using a DVB/CAR/PDMS fiber) and GC/MS analysis of volatiles compounds was performed on dried raw beans and on their roasted counterparts, which ultimately allowed to showcase the impact of time and of



the addition of yeasts during fermentation on cocoa bean composition and on its flavor potential.

Keywords: cocoa fermentation, flavor formation, volatiles