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A simple method to measure effective catalase activities: Optimization, validation and application in green coffee

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Abstract:

Oxidative metabolism in coffee cherries during maturation appears to be regulated by the timely expression of redox enzymes such as catalase (CAT), peroxidase (POD), and polyphenoloxidase (PPO). Among these enzymes, CAT is suspected to contribute significantly in setting the redox status of the healthy cherry and the processed bean. The initial redox status of the green bean might further control the nature and dynamics of reactions induced by roasting and eventually quality aspects of the end product. In this respect, Arabica (*Coffea arabica*) and Robusta (*Coffea canephora*) typically differ by their cup coffee flavor profiles. We developed an assay that allowed us to screen numerous green coffee samples for effective CAT activities. The proposed assay, which monitors CAT activities by online oxygen sensing in green coffee crude suspensions incubated with H₂O₂, seeks to integrate potential effects of endogenous inhibitors and activators. After optimization and validation of the assay, 23 Arabicas, 23 Robustas, and 8 Arabustas were analyzed. Nearly all Arabicas (22 of 23) harbored high CAT activity levels, whereas all Robustas harbored low ones. Arabustas performed like Arabicas of the lower CAT activity range. The traditional spectrophotometric assay did not reveal these specificities. Because of its simplicity, our assay might be valuable for assessing effective CAT activities in various plant tissues.

Key-words: Catalase, enzymatic assay, effective activity, green coffee, redox status, quality marker