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Characterization of coffee flavor profiling through controlled symbiotic fermentation using *Saccharomyces cerevisiae* and lactic acid bacteria

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Introduction

Fermented coffee consumption has increased due to its unique aromas and rich flavors. However, a conventional process for coffee fermentation has limitations for consistent quality. To overcome these limitations, we conducted a controlled anaerobic fermentation process by inoculating the fermentation starter of plant origin. Then we performed a flavor profiling analysis to compare the characteristics of fermented coffee with traditionally produced coffee.

Materials/Methods

Coffee cherries (El Paraiso, Columbia) were sorted according to ripening degree, sterilized with ozonated water and pulping. Fermentation of coffee bean was performed with *Saccharomyces cerevisiae* and a mixture of three lactic acid bacteria (LAB) species (*Lactobacillus brevis*, *L. curvatus*, and *L. plantarum)* isolated from Korean traditional fermented foods including *Nuruk* and *Kimchi*. Starter cultures were inoculated to initiate the anaerobic fermentation at 20°C for 24, 72 and 168 hours in anaerobically controlled fermentation tanks. After the fermentation process, flavor compounds for both green beans and roasted beans were analyzed using solid phase micro extraction- gas chromatography/mass spectrometry (SPME-GC/MS) (Agilent, Santa Clara, CA, USA).

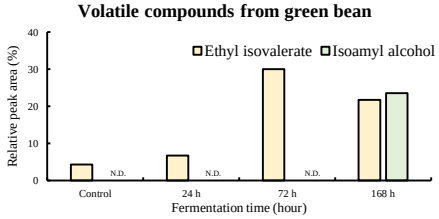

Figure 1: Effects of yeast/lactic acid bacteria fermentation tim e on the volatile compounds from green bean

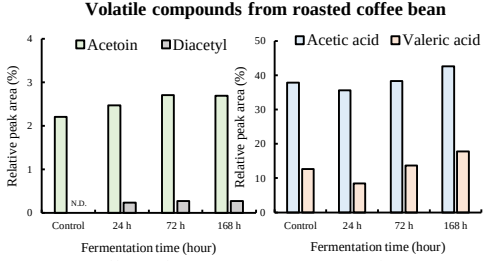

Figure 2: Effects of yeast/lactic acid bacteria fermentation tim e on the volatile compounds from roasted coffee bean

Sample Name	Final score
Non Fermented Coffee [reference]	82.5
Fermented Coffee [24hr mark]	83.5
Fermented Coffee [72hr mark]	85.75
Fermented Coffee [168hr mark]	84.25

Table 1 : Final score of coffee samples

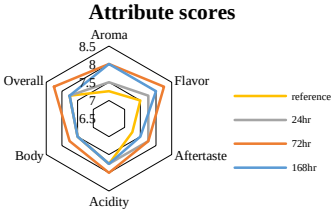

Figure 3 : Individual attributes scores for each sample

Results/Discussion

The flavor analysis revealed that the ester compounds were only produced i n fermentation process.

Particularly, ethyl isovalerate, known as 'fruity and sweet odor' characteristic, was dramatically increased at the 72 hr fermentation mark. Whereas, isoamyl alcohol, the major end product of the fermentation process that gives its acrid odor, was detected only at the 168 hr mark (Figure 1). In roasted samples, acetoin and diacetyl (buttery odor) were produced at the highest amount in the 72 hr fermented coffee. Acetic acid and valeric acid (unpleasant odor) were produced solely in the 168 hr mark sample (Figure 2).

All fermented coffee samples, including the 72 hr mark with the highest cup quality, improved the cup score compared with the reference. Coffee samples were evaluated according to the SCA protocol (Table 1, Figure 3).

Conclusion/Perspectives

The flavor analysis and SCA cupping standard method for the fermented coffee revealed that the 72 hr fermentation process is (most) optimal for generating pleasant aromas and tastes.

By optimizing the anaerobic fermentation process, it is possible to acquire various coffee flavors and to produce high quality coffee from coffee beans of the same origin. Since coffee fermentation has yet to be well characterized at an industrial level, microbial culture studies of coffee fermentation will be needed for production of high quality coffee in a consistent and reliable manner.

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