Impact on Sensory Quality and Physicochemical Changes in Coffee during Re-roasting

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Abstract

The impact of re-roasting and the physical changes occurring during the roasting process were investigated in this study. Coffee samples were roasted using a laboratory-scale roaster, and samples were collected every minute throughout the roasting process for subsequent physiochemical analysis. Additionally, the roasted coffee underwent a re-roasting process using same roasting profile.

The results indicated that coffee roasted for 5 minutes with 5% moisture content during re-roasting exhibited superior sensory attributes. Further research will be conducted to analyze the aromatic and non-aromatic compounds in the re-roasted coffee.

Introduction

- The aroma and flavor of coffee that are desired for consumption are created during roasting.
- During roasting the coffee beans go through chemical and physical changes.
- The composition depends on the roasting degree which identified through outside color of roasted beans.
- Roasting causes the beans to expand, lose moisture, and develop their characteristic flavor.
- Re-roasting coffee beans gives flavor complexity, deeper flavor, uniformity, and increases its shelf life.

Objective: To evaluate the impact of re-roasting and different moisture contents on the physiochemical and sensory properties of roasted coffee.

Results and Discussion

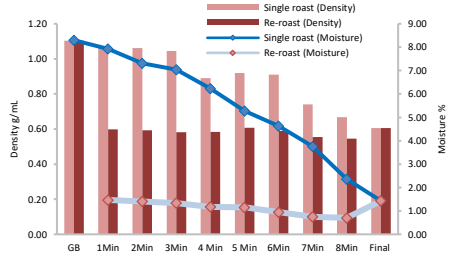


Figure 1. Density and moisture changes during roasting

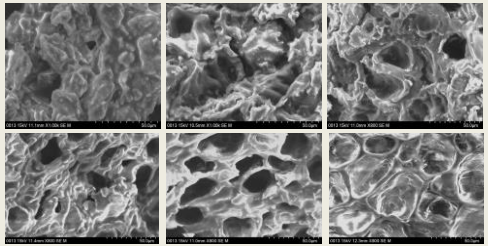


Figure 2. SEM images of coffee beans during the different stages of roasting from (GB) to the final roast

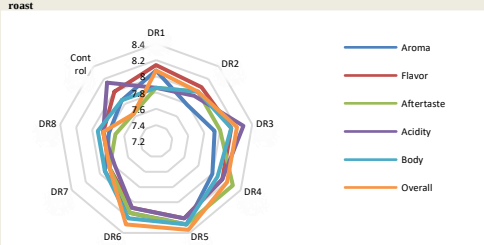
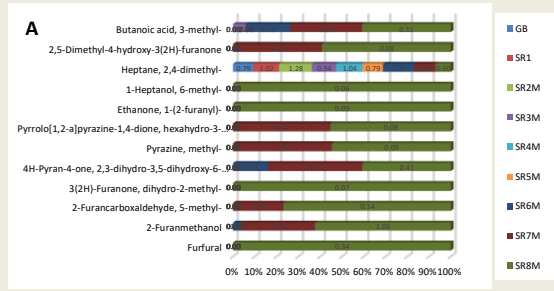


Figure 3. Sensory profile of Re-roasted coffee



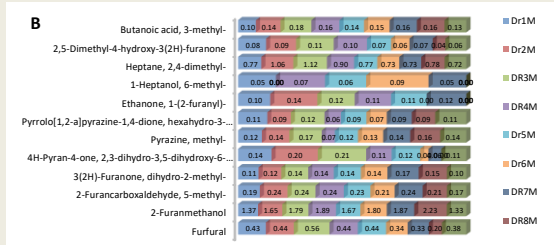


Figure 4. Aroma compounds relative concentration in roasted coffee (A) Initial roasting, (B) Re-roasting

- During the roasting process, coffee beans gradually lose moisture content which reduces its density (fig.1).
- SEM images showed that the dense structure of green beans changed porous, with the pore size increasing from 32 µm in green beans to 1236 µm after 9 minutes of roasting (fig.2).
- GCMS analysis revealed that most of the aromatic compounds in coffee are produced during roasting, and the number of aromatic compounds increases with roasting time (fig.4).
- The intensity of some aromatic compounds increased during re-roasting, probably due to the decrease in water content, which accelerated the Maillard reaction and caramelization.

Analysis

- Color- As Lab values (Color meter)
- Moisture- (Oven drying 105 ±1 °C)
- Density-(Freely settled density g/mL)
- HPLC- (LC-20A Prominence, Shimadzu) using C18 VP-ODS (250 × 4.6 mm) column.
- GCMS-Gas Chromatograph-Mass Spectrometer GCMS-QP2010 Plus
- SEM- Scanning Electron Microscopy (TM4000)
- Sensory- Specialty Coffee Association standardized method

Conclusion

- The moisture content of the coffee beans gradually decreased during the first roasting. This had an impact on the second roast, with beans with a moisture content of 4.6-6.2% showed satisfactory results.
- GCMS analysis revealed that the concentration of aroma compounds increased along with roasting time.
- Sensory data showed that the re-roasted coffee samples with reduced moisture were more aromatic and flavorful.
- Overall, coffee re-roasted at 5 minute roasts had superior sensory attributes.

Acknowledgment

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