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Kashif A. Shaikh
University of Northern Iowa, shaikhk@uni.edu

Jaspreet K. Rishi
University of Northern Iowa, rishij@uni.edu

See next page for additional authors

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Quantification of Trigonelline From Coffee Beans and its Correlation with the pH

Kashif A. Shaikh, Jaspreet K. Rishi, Joshua Sebree

Background

- Trigonelline is found in coffee in almost as much quantity as caffeine (about 1%)
- Trigonelline is known to give "earthy" taste to the coffee.
- Trigonelline has also been shown to help inhibit tumor cell growth by suppressing a transcription factor.
- About 70% of the trigonelline in coffee is decomposed to different alkaloids during the roasting process.
- At high temperatures, trigonelline is known to decompose to nicotinic acid also known as Niacin (Vitamin B3 supplement)
- Because of the low pKa of trigonelline, we suspect that it affects the pH of the beverage.

Sample Prep

- 14 samples of coffee beans were collected at different roast levels.
- “French press” was made from ground coffee beans by soaking ground beans in hot water for approximately 10 minutes.

Results

- Overall decrease in trigonelline content is observed.
- Increase in trigonelline content is observed in the mid-process. This could be due to prolonged soaking of ground beans in water during sample prep. It could also be due to decomposition of trigonelline to nicotinic acid, that might have better absorption at this wavelength.

Discussion

- Trigonelline content obtained is consistent with the literature.
- Data suggests that Capillary Electrophoresis is a reliable way of quantifying alkaloids in coffee.
- Although trigonelline concentration seems to rapidly fall in the last few minutes, there is no obvious correlation with the pH found.
- The beverage gets acidic but there is no significant difference in the pH of the “drinkable” roast stages.
- Data suggests that the difference in the coffee pH could be influenced by other alkaloids.

Future Work

- Trigonelline content and pH could be analyzed from various coffee beans.
- Other alkaloids like theobromine and how it changes could be investigated.

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References

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