

Kinetics of Coffee Infusion: Determination of the Geographical Origin of Medium Roasted Coffees using Extraction Kinetics

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SUMMARY

Arabica and Robusta are the most important commercial varieties of coffee. Arabicas are considered to be of higher quality and therefore more expensive. Several papers have been published on how to differentiate the two varieties, and the origin of Arabica coffee beans. In search of a reliable method to determine the geographical origin of coffee beans, the present paper evaluates kinetic data on the extraction of caffeine, P as $(\text{H}_2\text{PO}_4^-)$ K, Mg and Mn. The determination of equilibrium concentrations and rate constants of extraction of these species from Medium roasted coffees of particle size range 1.70-2.00 mm from six different geographical regions (Kenya, Brazil, Sumatra-Dutch East Indies, Ethiopia, Zimbabwe and South African) have been examined.

High performance liquid chromatography was used for the analyses of caffeine and inductively coupled plasma atomic emission spectrometry for the chosen elements. The equilibrium concentrations of all the species and the trend were found to be independent of the various coffee beans. The order of the rate of infusion was found to be $\text{K}^+ > \text{Caffeine} > \text{P as } (\text{H}_2\text{PO}_4^-) > \text{Mg}^{2+} > \text{Mn}^{2+}$. Statistical analysis (One-way Analysis of Variance) was performed on the equilibrium concentrations as well as the rate constants, so as to determine which of the results were similar or significantly different. The results clearly indicated that the kinetic data for P as $(\text{H}_2\text{PO}_4^-)$, Mg^{2+} and Mn^{2+} couldn't be used for the identification of the coffee origin. But the values for caffeine and K^+ can be used for the identification.

Key words: coffee, caffeine, mineral ions, extraction kinetics.