

Potassium Analysis in Various Roasted Coffees using Atomic Absorption Spectroscopy

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Abstract

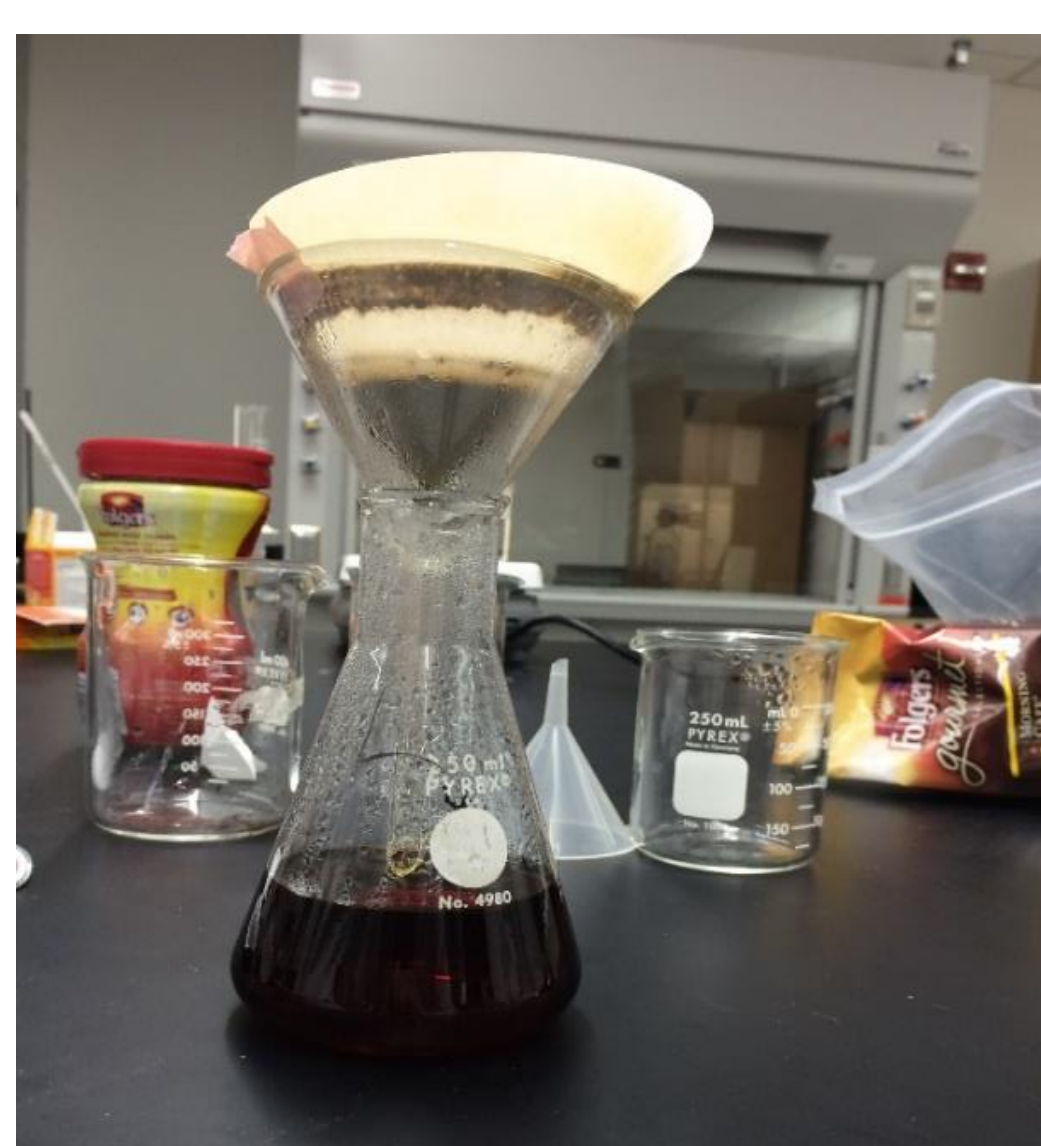
Potassium is an important molecule needed for many bodily functions. Potassium is needed for muscle contraction, cardiovascular activity, digestive regulation and lowering blood pressure (Ehrlich). Low potassium levels can lead to fatigue and muscle cramps. On the contrary to this, people with chronic kidney disease (CKD) need to limit their potassium intake. Therefore, the measuring of potassium content in processed foods is important. Coffee is a source of potassium in the diet, but it is also known as a source to cause hypokalemia, an increased loss of potassium due to the diuretic action of caffeine. The purpose of the experiment was to determine the potassium contents of different roasted coffee. Three different coffees, light roasted, dark roasted, and instant coffees (Folger's Coffee) were used as samples. Our test was done in triplicate using atomic absorption (AA) spectroscopy and a potassium standard curve (R^2 value=0.9952) was used to convert the potassium contents of the coffee sample. ANOVA single-factor test showed that the results were not significant, with p-value of 0.444. Literature shows that Folger's does not have to include nutrition facts on their coffee as the nutrient values are less than 1.0mg (USDA). Daily value needs of potassium are 3,500mg, and so for those with CKD, this is a low-potassium food that they can consume (FDA). In conclusion, there was no significant difference between the three different roasting types of coffee for potassium concentration. Even though the roasting and processing are different, all of the coffees had similar amounts of potassium, so these processes did not have an effect on potassium concentration. Because coffee has a low amount of potassium, those with CKD can consume any coffee of their choosing. Further analysis would be comparing other brands of coffee to see their potassium concentrations.

Introduction

- ❖ Potassium is an important molecule needed for many bodily functions.
- ❖ Potassium is needed for muscle contraction, cardiovascular activity, digestive regulation and lowering blood pressure (Ehrlich).
- ❖ Low potassium levels can lead to fatigue and muscle cramps.
- ❖ On the contrary to this, people with chronic kidney disease (CKD) need to limit their potassium intake.
- ❖ Therefore, the measuring of potassium content in processed foods is important.
- ❖ Coffee is a source of potassium in the diet, but it is also known as a source to cause hypokalemia, an increased loss of potassium due to the diuretic action of caffeine.
- ❖ The **objective** of the experiment was to determine the potassium contents of different roasted coffee.

Materials and Methods

- ❖ Three different coffees, light roasted, dark roasted, and instant coffees (Folger's Coffee) were used as samples.
- ❖ Our test was done in triplicate using atomic absorption (AA) spectroscopy and a potassium standard curve (R^2 value=0.9952) with potassium chloride (KCl) was used to convert the potassium contents of coffee sample.
- ❖ Standards were prepared from 1000ppm stock to serial dilutions into 100mL volumetric flasks with 10mL HCl
- ❖ Each coffee was brewed 5 minutes at 98°C: 4g coffee to 180mL water and 1.95g of the instant to 180mL water (all 1 cup coffee), all were filtered into Erlenmeyer flasks using Whatman paper
- ❖ Samples were prepared in 100mL volumetric flasks with 0.2mL sample, 10mL HCl, and filled with deionized water.
- ❖ Shake well. (If there is any particulate matter present, the sample will need to be filtered through ashless filter paper.)
- ❖ Make appropriate dilution and analyze (to sample for AAS, add LaCl_3 to final conc. of 0.1%).
- ❖ Liquid Blank: Prepare a liquid blank sample to be assayed, following the sample preparation procedure but excluding the sample.
- ❖ AAS was set-up, and all standards and samples were tested



Results

Figure 1. Potassium Standard Curve

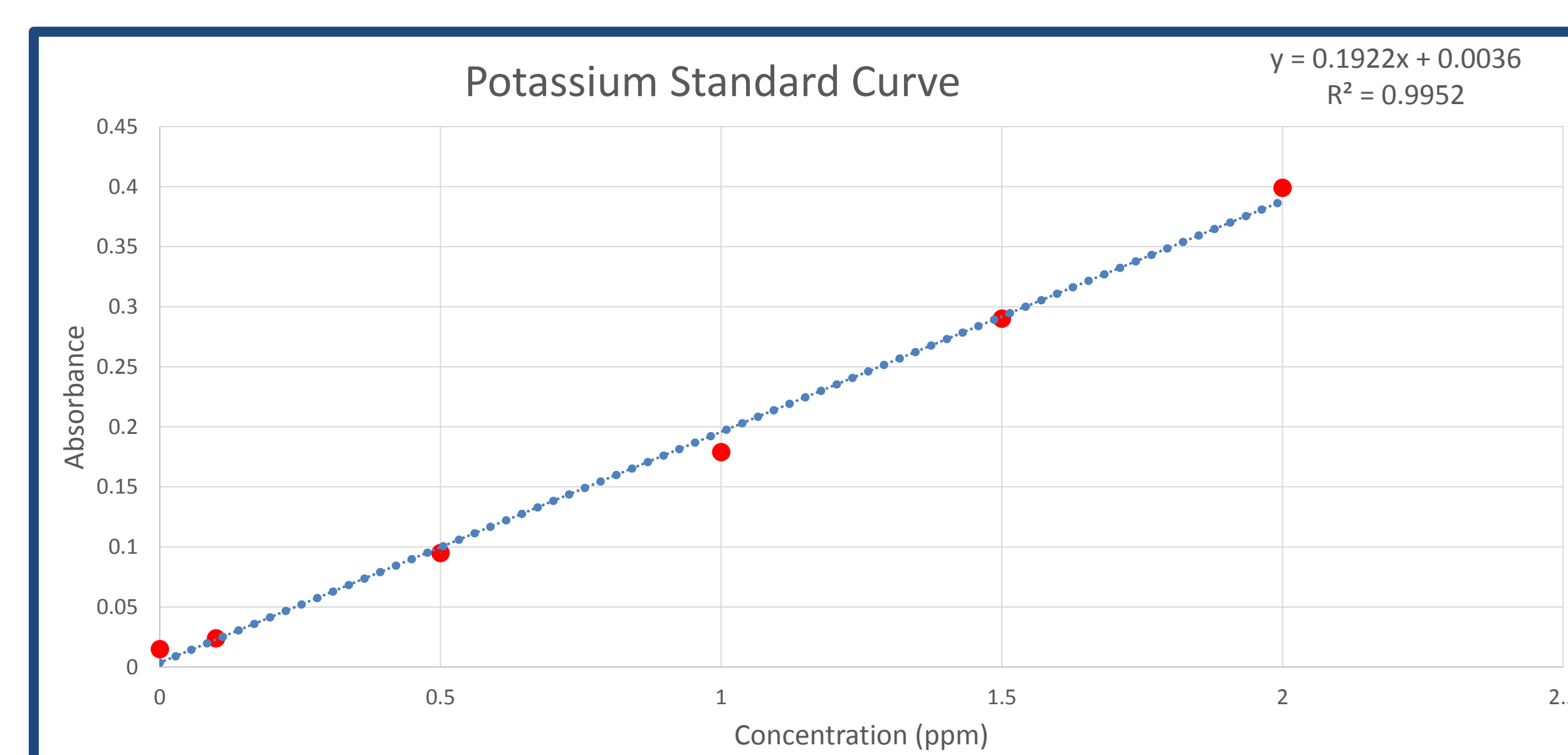


Table 1. Absorbance and concentration of potassium in different roasted coffee samples.

Sample	Absorbance	Dilution	Concentration (ppm)	Diluted (mg/mL)	Original (mg/mL)
Blank	0.0150	500	0.0593	0.000059	0.0297
Instant	0.2060	500	1.0531	0.001053	0.5265
Light	0.1893	500	0.9662	0.000966	0.4831
Dark	0.1997	500	1.0200	0.001020	0.5100

Discussion

- ❖ Figure 1 shows the standard curve achieved, and the R^2 value is 0.9952.
- ❖ This standard curve allowed for accurate results when finding potassium concentration in the coffee samples.
- ❖ Analysis of concentration data in Table 1 using an ANOVA single-factor test showed that the results were not significant, with p-value of 0.444.
- ❖ Literature shows that Folger's does not have to include nutrition facts on their coffee as the nutrient values are less than 1.0mg (USDA).
- ❖ Daily value needs of potassium are 3,500mg, and so for those with CKD, this is a low-potassium food that they can consume (FDA).



Conclusion

- ❖ In conclusion, there was no significant difference between the three types of coffee for potassium concentration.
- ❖ Even though the roasting and processing are different, all of the coffees had similar amounts of potassium, so these processes did not have an effect on potassium concentration.
- ❖ Because coffee has a low amount of potassium, those with CKD can consume any coffee of their choosing.
- ❖ Further analysis would be comparing other brands of coffee to see their potassium concentrations.

References

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