Determination of Potassium via Atomic Absorption Spectroscopy

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Abstract

The production of gourmet salts has been on the rise in recent years. Alongside this, health proponents have put forth many claims regarding gourmet salts. With this increase in demand and consumption, there is a rising concern for individuals unaware of the levels of nutrients and harmful metals they might be ingesting.

As a result, detection methods such as atomic absorption spectrometry (AAS) have been employed to detect harmful and beneficial elements in salts. In this study, the target element potassium was determined in milligrams K^+ per gram of salt for 5 different brands of Himalayan pink salts using AAS compared to a standard sample of KNO_3.The results help demonstrate that the pink Himalayan salt brands vary in terms of total potassium content. This investigation also demonstrates the reproducibility of AAS for this determination and therefore makes this a viable method to include in the undergraduate curriculum.

Background

From its commercial use in cooking to add more of a taste to a more practical use biologically in the human body, the role that salts serve within society remains essential. Common table salt is composed of sodium chloride while gourmet salts such as pink Himalayan salt can have traces of different elements. In sufficient quantities, these elements can be harmful or beneficial. Despite both types of salt being consumed at high rates, individuals do not have information about the quantities of these trace elements in the salts. Thus, they are left unaware and unable to judge the risks or benefits of these harmful and beneficial elements. For example, health proponents have put forth certain claims such as that pink Himalayan salts promotes healthy bones, aids in metabolism, and is a healthier alternative to that of regular table salt.

In order to provide essential information and reduce the risks coming with the consumption of gourmet salts research is needed to quantify trace amounts of both harmful and beneficial elements. Key to this process would be detection methods such as atomic absorption spectroscopy which provides a quantitative analysis of solution contents. Not only would this be key in providing a better public understanding of products on the market, but a closer examination on variation levels within different brands of Himalayan pink salts would also provide beneficial consumer information.

Experimental

Each analysis was performed in triplicate on different days to simulate a group of students doing single analyses. The procedure was followed in accordance with da Silva Campos Almeida and colleagues' study.

1. Glassware, sample Himalayan pink gourmet salts of different brands, and standard KNO_3 were all dried overnight and transferred to a desiccator.
2. 2000 mL of 1% v/v HNO_3 solution and 1000 mL KNO_3 standard stock solution were created.
3. 0.5 grams of each Himalayan pink salt was used to create 100 mL solutions dissolved in 1% v/v HNO_3.
4. A flame Atomic Absorption Spectrometer with an oxygen-acetylene flame was used to measure absorbances of gourmet sample solutions and standard KNO_3 solutions at 766.5 nm.
6. Milligrams potassium per gram of salt was then calculated using Beer's Law using known concentrations of KNO_3 .

Results

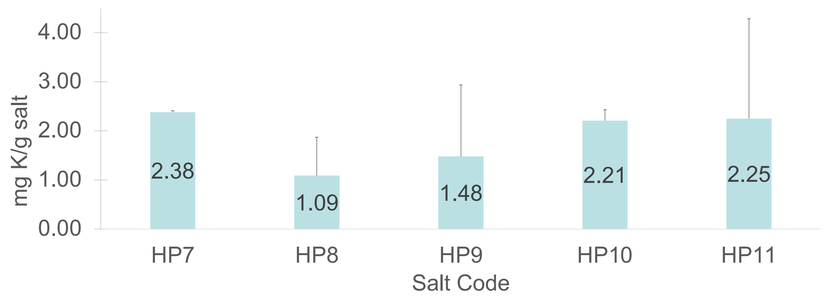

Figure 1 & Table 1: Potassium content in milligrams per gram of Himalayan pink gourmet salt tested by brand code from three trials and then averaged.

Salt Code	Brand Name
HP7	Kirkland
HP8	Olde Thompson
HP9	Sea Salt Shack
HP10	Sherpa Pink
HP11	The Spice Lab

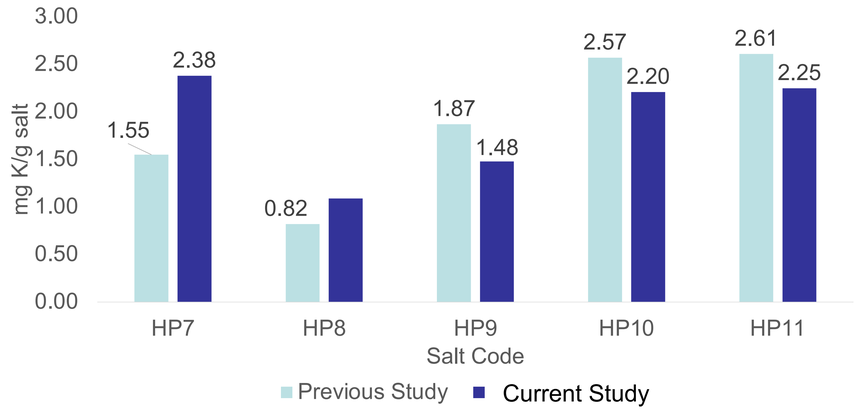

Figure 2: Milligrams of potassium per gram of salt averages of Himalayan pink gourmet salt from the three trials compared to that of the previous study by (Rajput & Robles, 2019).

Discussion

Utilizing atomic absorption spectroscopy, traces of potassium were found within all 5 salt samples. Mean results for each brand are shown in **Figure 1**. As can be seen, there is significant variability among brands (specified by code in **Table 1**) for potassium content, measured in mg K/g salt. With this variability present among brands, this demonstrates the importance of regulating the disclosure of additional substances in gourmet salts. This also paves the way for utilizing gourmet salt analysis by atomic absorption spectroscopy within the undergraduate curriculum. In addition to simply analyzing the content of gourmet salts, using AAS, individuals can look at reproducibility, precision, and accuracy of this method. **Figure 2** shows mean results of the present analysis compared to a previous analysis conducted on the same salts. Creating a comparison, this figure shows how reliable the method of AAS can be when analyzing samples as reproducibility and precision is seen between studies.

With these ideas in mind, future research in this area could investigate harmful elements such as lead or even looking at other brands of Himalayan salts and seeing the variation among elements present. Future steps also include integrating the technique further into the curriculum and approved chemistry labs and allowing students to explore making personal decisions about gourmet salts.

References & Thanks

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