Feasibility of Food Analysis with an inexpensive and mobile Photometer

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Abstract

The feasibility of food analysis with an inexpensive and mobile photometer was studied using apple juice as an example. Therefore different brands were tested regarding their fruit content concentration and the aging of the apple juice. The measurement results were showing that food analysis with a photometer is possible but has limitations.

Introduction

The people's awareness of food ingredients has increased over time. Because of the versatility of photometry it is often used in food analysis. An inexpensive and mobile photometer would make it possible for everyone to analyse the content and the quality of food.

To examine the fruit content in different sorts of apple juice the measurements of the self-built photometer are compared to the measurements of a spectrometer.

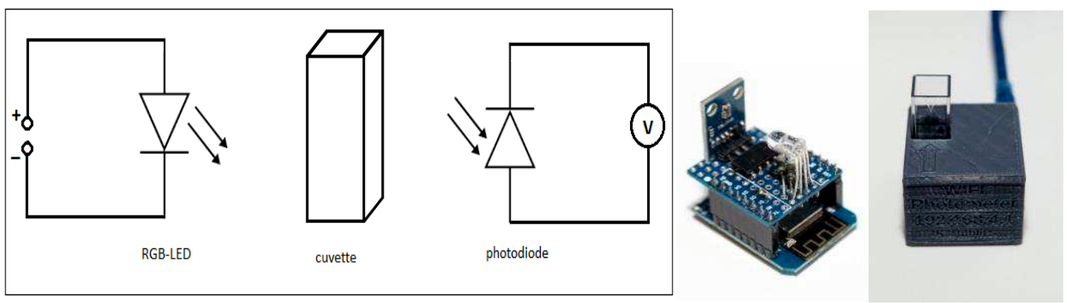
Methods and Material

In the experiment apple juices of different brands and with different concentrations of fruit content are examined. The photometer measures the relation between the original amount of light and the remaining amount of light after passing the sample of apple juice.

To verify that the absorption spectrum is proportional to the fruit content, gravimetric dilution series are made. Furthermore experiments on the dependence on the aging of the apple juice are performed.

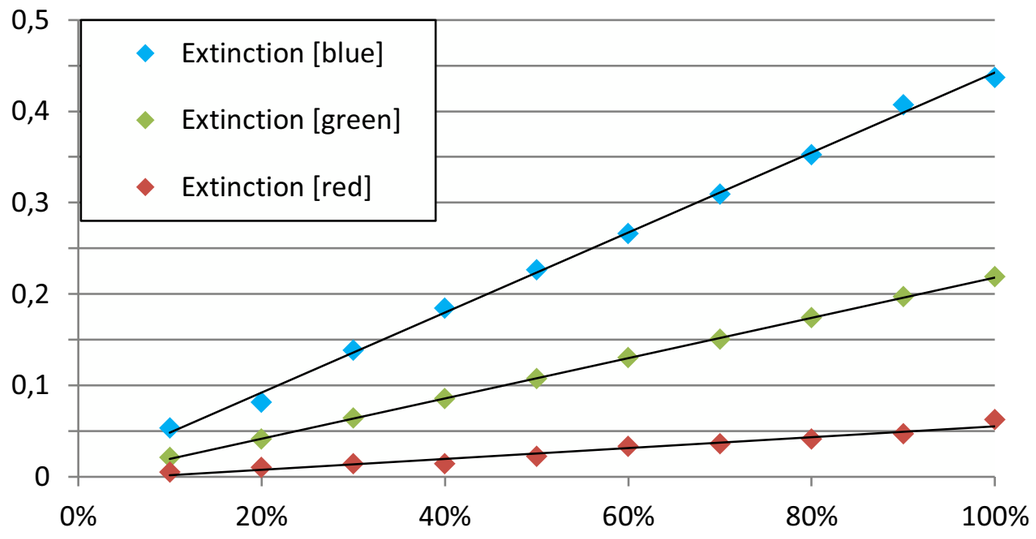
A spectrometer is used to determine the significant absorption wavelengths of apple juice. The data is evaluated with a spectroscopy software.

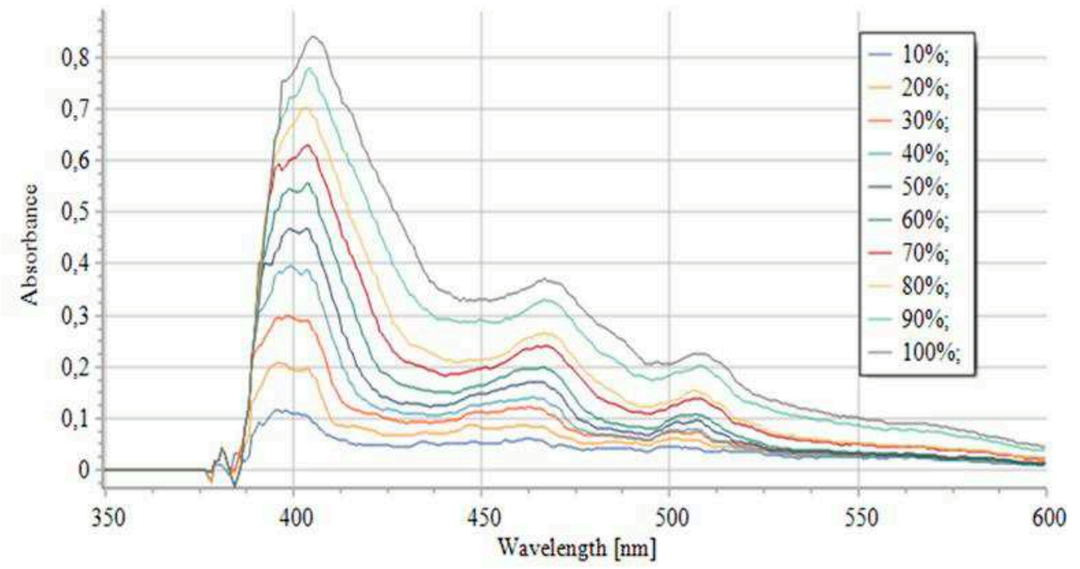
The photometer is using a red (631nm), green (518nm) and blue (471nm) LED. The following schematic shows the principal of the self-built photometer:



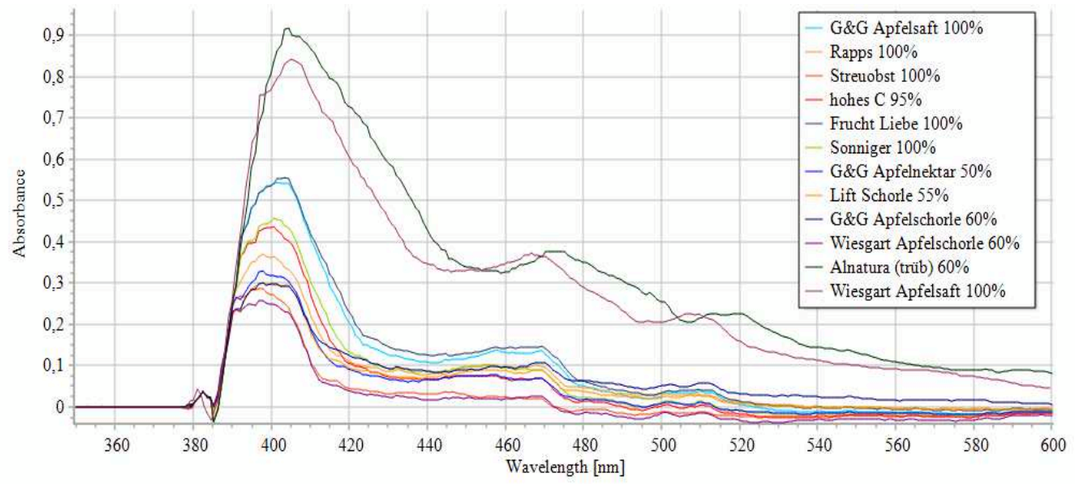
Results

The results of the dilution series show a linear dependence of the absorbance to the concentration of the fruit content.





The comparison of the various sorts of apple juice show major differences between the different brands.



To examine the aging of the apple juice the absorbance was measured after 24 and 48 hours. The spectra show only minor differences.

Discussion

The results show that it is possible to determine the concentration of fruit content in a diluted sample if the absorbance of the sample with 100% fruit content is known. The difference between apple juices of different brands prohibits the quantitative analysis of an unknown sample.

The absorption spectrum of the apple juice is not only depending on the fruit content. Deviations in the absorption spectra can be caused by different dyestuffs in the apples, different apple varieties or the degree of ripeness. Furthermore the absorbance of cloudy apple juice is higher because the light is scattered by the fine particles. For example some apple juices with 100% fruit content are less absorbing than diluted apple juices.

The small differences after 24 and 48 hours can be explained by dyestuffs like melanin developing with the aging of apple juice. To examine dyestuffs in greater detail measurements in the ultraviolet wavelength rage would have to be performed.

In conclusion photometry with an inexpensive and mobile photometer as a method of food analysis is only possible with some restrictions.

References

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