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Transmittance and Absorbance Analysis of Beetroot (Job's Method)

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Abstract

Spectrometry refers to the quantitative measurement of the reflection or transmission properties of a substance material. In this experiment, the device is used to measure the optical density of the solution. the amount of pigment present in the solution influence the reading of optical density of the solution so that a solution with more pigments will bring higher reading of optical density and lower reading of transmittance. In spectroscopic techniques, the atom or molecule absorbs a certain quantum of energy which causes the atom or molecule to move to a higher energy level. Present Paper is the study of transmittance and absorbance analysis of Beetroot helps to the researchers to explore more about betanin pigment of beet root mixed with rosewater.

Keywords: Betanin, Electromagnetic Radiation

Introduction

Spectroscopy techniques can tell us, the type of atom or molecule present. How much of an atom or molecule is present, the structure and bonding of a molecule. Spectroscopy techniques utilise the fact that atoms/molecules absorb and emit electromagnetic radiation of certain energies. Atoms/molecules undergo change when they absorb electromagnetic radiation. Different parts of the electromagnetic spectrum affect different parts of the atom/molecule. Atoms- movement of electrons to higher level. Molecules- movement of electrons to higher level, movement of molecules to a higher vibrational, rotational and nuclear spin energy levels. It is to be noted that all forms of spectroscopy use part of the electromagnetic spectrum. Ultraviolet light is very short wave radiation with high energy, while radio waves have long wavelengths and low energy. With the help of this technique present studies of beetroot and rosewater concentration variation absorbance have been determined and result so obtained has been shown in the form of optical density in the table given.

Materials and Methods

Stock solution of the purified pigment obtained from Beetroot juice is prepared by transferring 10 mg. of the finely powdered dry material, accurately but rapidly weighed, to a small mortar in which it is thoroughly ground with 8 to 10 drops of water; 10 ml. of. The solution is then made to 100 ml. with water; it is stable for at least 1 hour. THE SETS OF Rose water and Beetroot solutions were made in increasing proportions.

This represents a concentration of rose water with beetroot solution in increasing and decreasing order. An approximate light transmission curve was obtained by observation of the standard solution with the colour filters of a Colorimeter. Table I shows that maximum absorption is obtained at the effective wave-length 570-700 cm^{-1} and the filter 7 was accordingly chosen for subsequent measurements. It is not ideal and can be employed with ease only with fairly dilute solutions. Satisfactory reproducibility is, however, obtained with concentrations between 0.001 and 0.01 mg. per ml. of each of the coloured pigment (Rose water and Beetroot).

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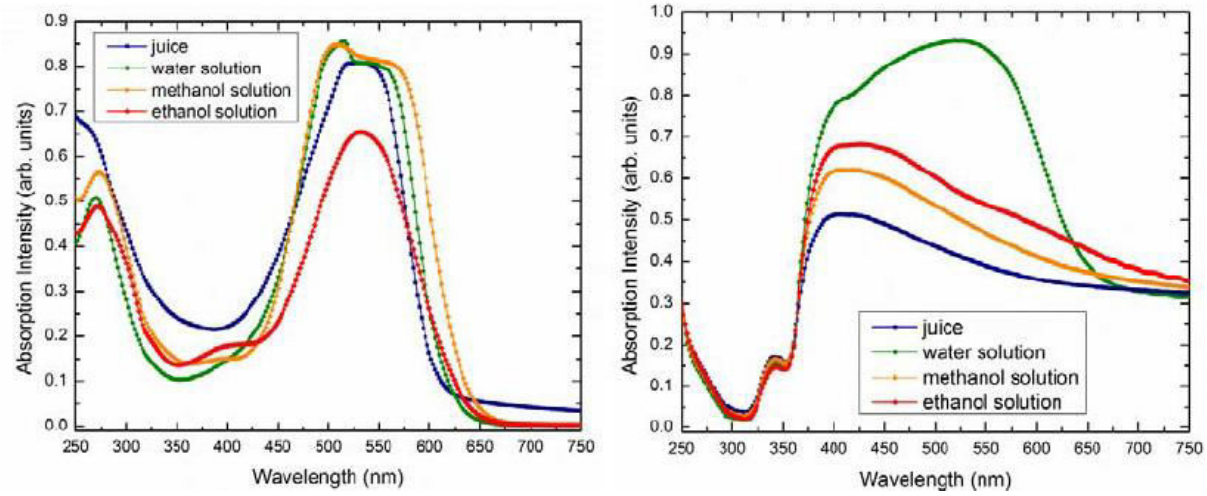
Result and Discussion

OD of Beetroot λ max-7 **570-700cm^{-1} Beetroot: Rose water**	**Beetroot : Rose Water OD**	**Transmittance %**
1:9	0.27	94
2:8	0.37	69
3:7	0.38	44
4:6	0.60	28
5:5	0.59	26
6:4	0.71	20
5:3	0.75	18
1:2	0.78	17
1:1	0.79	17



There are two main techniques for taking observation of Absorbance are mainly-

COLORIMETRY

Colorimetry or is used to determine the concentration of coloured compounds in solution.

The absorption is compared to a Calibration Graph- a graph of the different absorptions of standard solutions with known concentrations – to determine the concentration of the solution.

UV-VISIBLE SPECTROSCOPY

This method is similar to colorimetric in that it uses a light beam to measure light absorption.

UV – Visible is more effective in that it uses a monochromatic to select specific wavelengths to best detect the presence of specific ions.

A light detector identifies which wavelength the sample absorbs and this is compared with the wavelength absorbed by reference samples.

UVVS is particularly useful for detecting metal ions in uncoloured solutions.

Some uses include detecting substances in blood and urine, and determining the amount of coloured dye in plastics.

Although UV-Spec is mainly used for finding the concentration of certain elements within a solution, it can also be helpful in qualitative analysis.

When a substance absorbs light it appears coloured.

The colour observed is the complement of the absorbed colour because this is what remains to reach our eyes.

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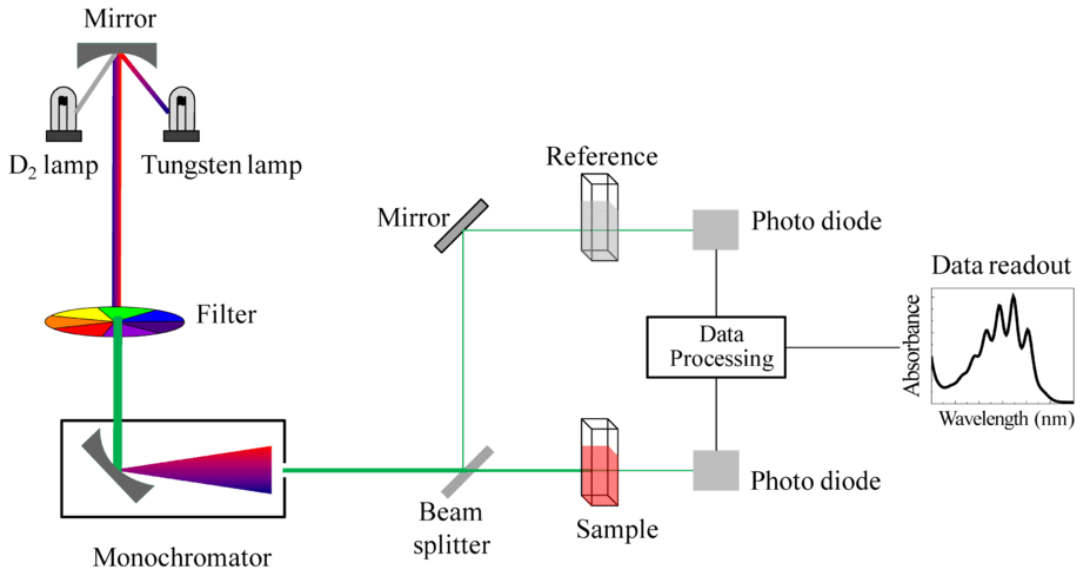
Basic UV Spectrometer



Conclusion

The stability of the standard solution with respect to reaction and time was studied by means of observations on solutions obtained by dilution of 1 ml. of the stock solution to 20 ml. with appropriate buffer solutions, the observations in Table are expressed as percentages of this value. It is clear that at highest concentration of beetroot transmittance decreases which proves the minimum quantity of Pigment,Betanin.

