# A comparative study and identification of various nutrients present in Indian apple (Shimla) and goose berry (Nelli) by FTIR spectroscopic analysis and their estimation by chemical tests

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**Abstract**

Now a day, FTIR spectroscopy is not only used to find the composition of various nutrients present in vegetables and fruits, but also used as a tool to identify them precisely from their absorption spectra. In the present work, a sample of Indian apple (Simla) and gooseberry (Nelli) (Tamilnadu) are taken.

**Key words:** Apples, gooseberry air dry film technique, FTIR Spectra, absorption levels, proteins, carbohydrates, lipids and glucose.

## Introduction

We know that the vegetables, fruits and grains used for the preparation of our food stuff contain mainly proteins, carbohydrates. Lipids and some metal ions. The presence of nutrient constituents is essential for the growth of our body and the restoration of energy. Since the amount of nutrient present vary from one sample to another it is very important to know the exact amount of nutrient present in each sample. FTIR Technique is used have as a tool to identify the important nutrient constituents like proteins & carbohydrates and the amount of nutrients present is verified by Chemical tests.

## Experimental

**Apple (Simla) and gooseberry (South India are taken for our present research work.** The samples are analysed in dried powder form by air dry technique to remove moisture using KBr as matrix and KSCN as solution. Samples are dried over for 30 minutes in order to eliminate the absorption spectra of water and then FTIR Spectra of samples are recorded over the region 4000-400cm using BRUKER MODEL IFS 66V Double beam FTIR Spectrometer, IIT, Chennai.

All spectra have been base line corrected and are normalized in the absorbance mode to acquire identical data.

TABLE 1
IR vibrational band frequency assignment

| SI.NO | Vibrational band $cm^{-1}$(region) | Assignment |
|---|---|---|
| 1. | 3388-3400(A)<br>3435(G) | N-H stretching of secondary amide of protein amide A(strong absorption band) |
| 2. | 2932-2936 | $CH_3$ asymmetric stretching of protein & lipids |
| 3. | 1636-1640(A)<br>1637(G) | C=O stretching (80%) weakly (coupled with C=N stretching (10%)N-H deformation (10%) |
| 4. | 1414-1419(A)<br>1353(G) | $CH_3$, symmetric deformation $100^{-1}$stretching of amino acids |
| 5. | 1234-1239(A)<br>1217(G) | Asymmetric $PO_2$ stretching of lipid phosphate |
| 6. | 1038-1060(A)<br>1042(G) | C=O stretching in glucose (carbohydrates strong absorption bard) |
| 7. | 625-629(A)<br>679(G) | O=C=N deformation (40%) coupled with other ring deformation(60%) of amide B |

Represents apple G- represents Goose berry

SI.1 in table 1 clearly predicts the presence of protein in apple and goose berry since it gives a strong absorption band in the IR region (3388-3400 $cm^{-1}$)for apples 3435$cm^{-1}$ for goose berry,allied protein compounds and lipids are indicated by absorption bands by SI.NO2,3,4,5,and 7 (N-H stretching and deformations etc ).SI.No 6 in table 1 clearly shows the presence of glucose (carbohydrates) since it gives strong absorption band in the region (1038-1060 $cm^{-1}$)for apple and 1042 $cm^{-1}$ for goose berry.

TABLE 2
Amount of protein (Bradford method)and carbohydrate (Anthrone method)present by chemical tests

| SI.NO | Name of the fruit | Protein content (per gram of sample) | Carbohydrate content (per gram of sample) |
|---|---|---|---|
| 1. | Indian apple | 48.8 mg | 9.9mg |
| 2. | Goose berry | 22.5µg | 72µg |

RESULTS AND DISCUSSION

The FTIR spectra of apple and goose berry are distinct from one another but are dominated mainly by the absorption of protein constituents and glucose (carbohydrates)which are having selectively absorption band in IR region Fig1,2,represents the FTIR spectra of apples and goose berry respectively. A satisfactory vibrational band assignment of the absorption bands of spectra is done with the idea of group frequency of various constituents present in the samples.

Conclusion:

By comparison between FTIR spectra and chemical tests, the presence of nutrients like protein and carbohydrates (glucose) are identified (by frequency band assignment)and their relative amounts are estimated by chemical tests.

From the study we came to know that apple and gooseberry contains identical nutrients like proteins, lipids phosphate and carbohydrates. But the amount of nutrient present in goose berry is relative small due to its size. But if we consider a few number of goose berry the amount of nutrients present is equivalent that of an apple. Also goose berry is relatively cheaper and hence it is called as poor man's apple which is verified by our research work.

Hence the study fo identification and estimation of different nutrients (constituents) in different samples gives a clue to select a good fruit from different samples, which are essential for our diet .Also the study indirectly gives a clue about the fertility and compositionof soil on which the plant grow.

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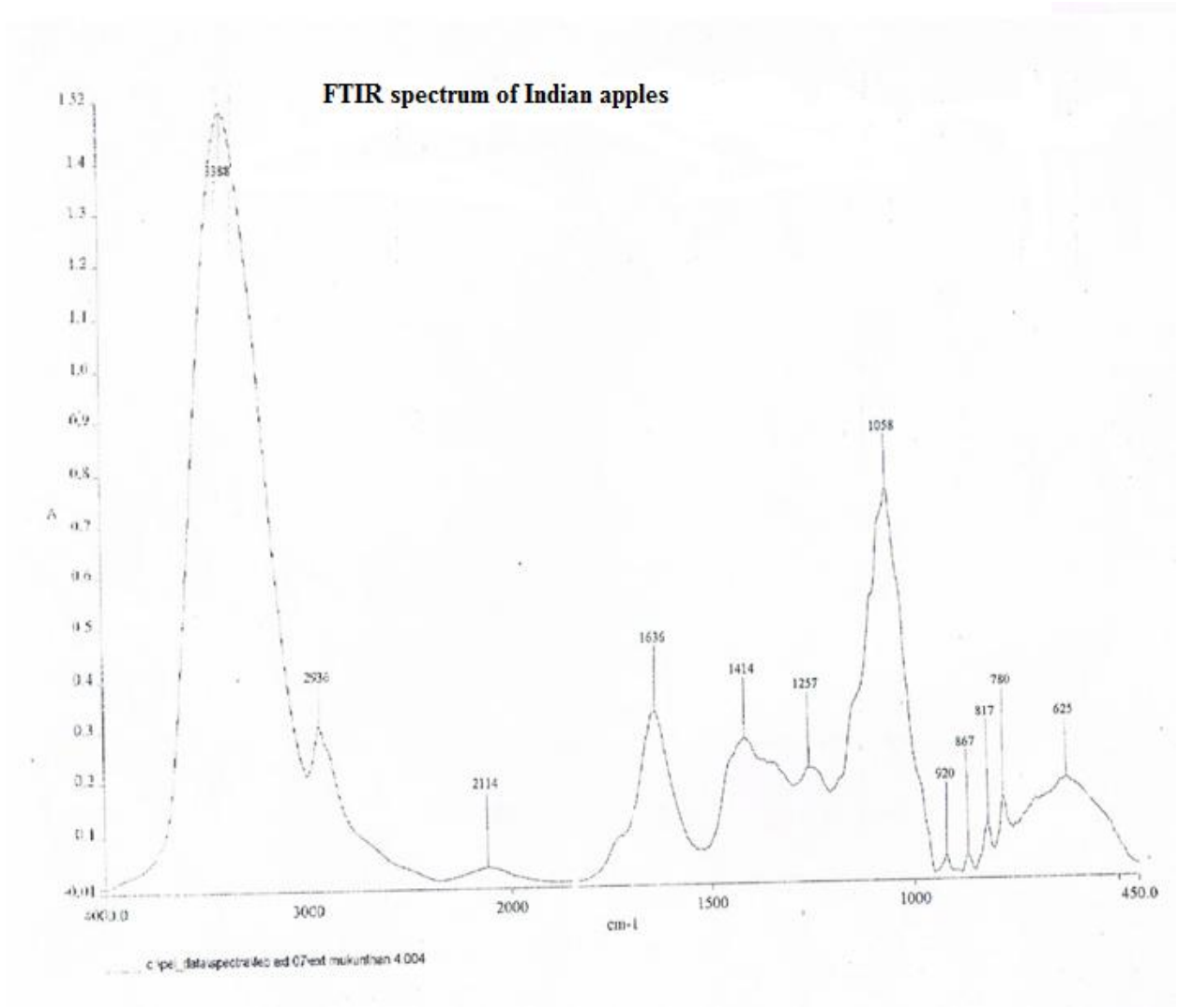
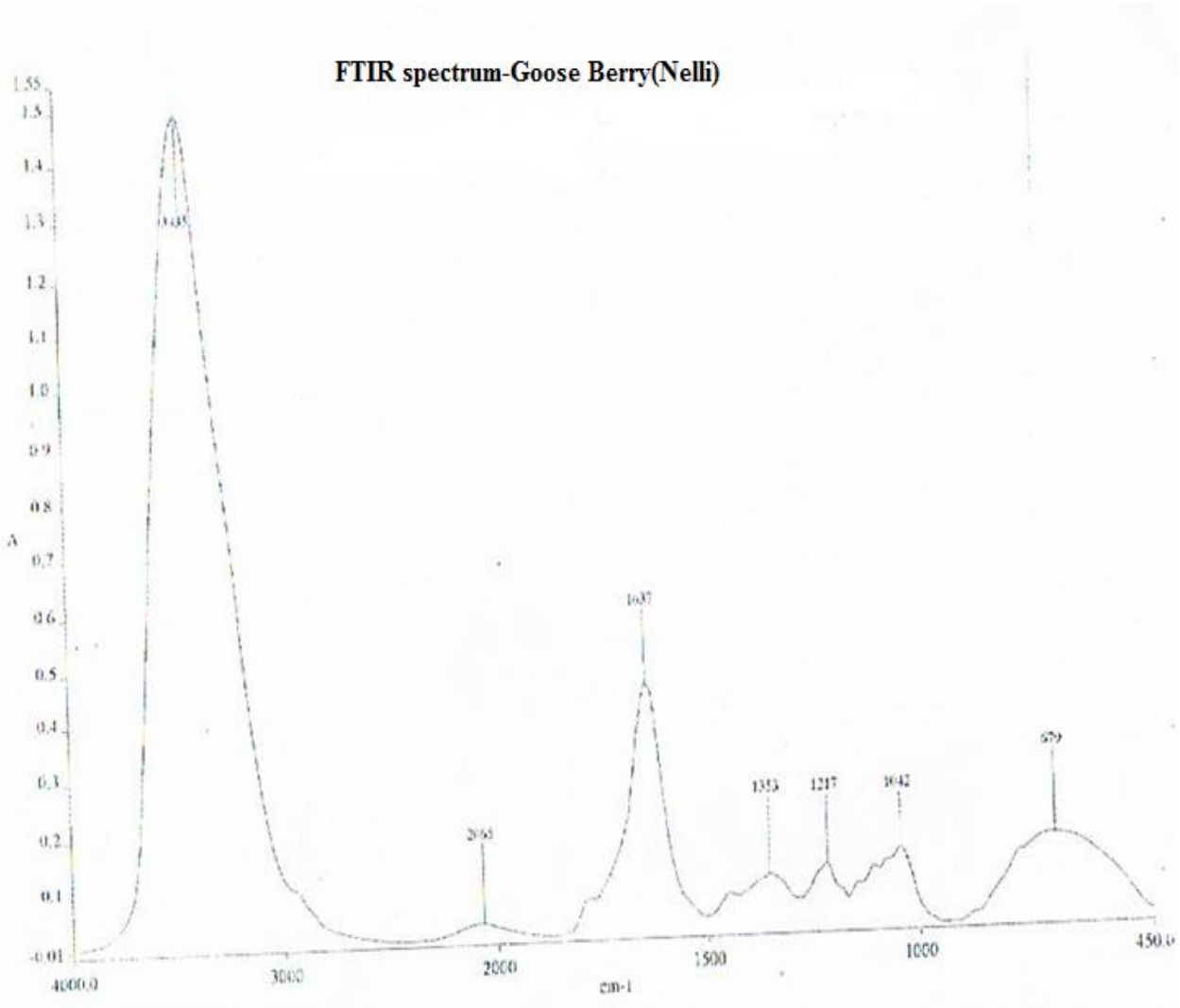

FTIR spectrum of Indian apples
3388
2936
2114
1635
1414
1257
1058
920
867
817
780
625
A
cm-1
4000.0
3000
2000
1500
1000
450.0


FTIR spectrum-Goose Berry(Nelli)
A
cm-1
4000.0
3000
2000
1500
1000
2065
1637
1353
1217
1042
679