

## ANALYSIS OF TRACE METALS CONTENT AND PHYSICOCHEMICAL PROPERTIES IN *Carica Papaya* NEAR Jhunjhunu, (Raj.) India

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### ABSTRACT :

Papaya (*Carica Papaya*) also known as 'pawpaw', is pulpy fruit of a large plant of family Caricaceae. *Carica Papaya* seeds, ripe, leaves and unripe fruit are used as traditional medicine, also considered as nutraceutical fruit due to its multifaceted medicinal properties. It has a high content of Vit. A, B, and C. The plant of *Carica Papaya* has versatile biological function and pharmacological activity such as anti-inflammatory antioxidant, diuretic, hypoglycemic, anthelmintic activity. In the latex of *Carica Papaya*, the present enzyme 'papain' useful for industrial utilization and of high research interest. Other, Chymopapain having antiviral, antifungal properties. Nearby industrial areas of Khetri, Jhunjhunu, Rajasthan samples of *Carica Papaya* seeds germinated, accumulated and utilized for assimilating and finding metals. By using Soxhlet apparatus oil extracted and heavy metals were detected by Atomic Absorption Spectroscopy (AAS). This technique (AAS) was used for the finding and confirmation of trace metals (Cd, Cr, Co, Fe, Zn, Pb and Ni) stored in *Carica Papaya* seed oil. The following trace metals concentration were obtained (mg/100g) Cr (2.78), Fe (1.91), Pb (1.43), Cd (0.82), Cu (1.48), Ni (1.23), Co (0.99), and Zn (0.79). Among the other major environmental contaminants the obtained trace metals created a major threat to human and animal health by their long time presence. During analysis of GC-FID (Gas Chromatography Flame Ionization Detection), Oleic (49.20%), Linoleic acid (36.99%), Palmitic acid (6.07%), Stearic acid (3.49%), Linolenic acid (0.78%), Behenic acid (0.62%), Palmitoleic acid (0.29%), Arachidic acid (0.27%), were found to be present in *Carica Papaya* seed oil. Oleic acid was also found as a major fatty acid. *Carica Papaya* is one of the naturally gifted plants which in turn stop and decrease different type of diseases & illnesses.

**Key words:** Trace metals, AAS, *Carica Papaya*, Fatty acid composition, GC-FID.

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### INTRODUCTION

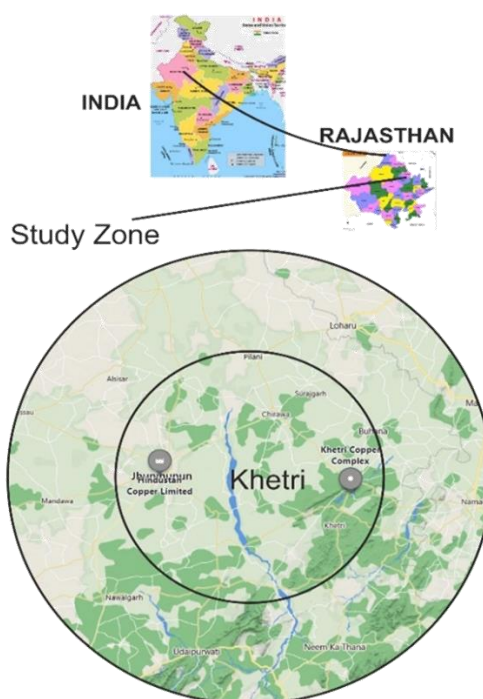
Papaya (*Carica Papaya*) also called 'pawpaw' and belongs to the Caricaceae family. *Carica Papaya* seeds, ripe, leaves, and unripe fruit are used as traditional medicine, [1,2] also considered as nutraceutical fruit due to its multifaceted medicinal properties like treatment of

a wide range of diseases, treatment of dengue, malaria, jaundice, immune modulatory and antiviral activity.[3,4,5] It has a high content of Vit. A, B and C.[6] Completely ripened Papaya fruit contain important digestive enzymes which produce calm, soothing feelings in the stomach. It is popular for its lubricancy and natural purgative feature which improves digestion. Papaya fruits are enriched with papain and chymopapain enzymes that breakdown the food proteins into amino acid, thus helpful in digestion.[7] From the seeds of *Carica Papaya*, the obtained oil has a nice pleasant taste and can be compared to other edible oils like peanut oil and sunflower oil.[8]

## SEED MATERIAL

Nearby industrial areas of Khetri, Jhunjhunu, Rajasthan, germinated samples of *Carica Papaya* seeds, accumulated and utilized for assimilating and finding metals.

### Map showing the study zones



## OIL EXTRACTION

The present study includes the process of solvent extraction by the extraction of oil from the *Carica Papaya* seeds. In the oven at temperature of 104°C – 108°C the cleaned seeds of *Carica Papaya* are dried for 6 hours and by the help of an Electric Grinder, seeds were grinded. In a Soxhlet apparatus, ether compounded with accumulated oil (60 – 80°C) and waited for the duration of 6 hours. [9,10] That recovered oily compound stored at cool spot (cooler) for further analysis. [11]



**Fruit and seeds of the *Carica Papaya***

## REAGENTS

For dilutions of  $\text{H}_2\text{SO}_4$ ,  $\text{HNO}_3$ ,  $\text{HF}$ ,  $\text{H}_2\text{O}_2$ ,  $\text{HCl}$  and  $\text{HClO}_4$  analytical reagents and double deionized water were used. By Soaking in dilution  $\text{HNO}_3$  all the glassware and plastic were cleaned. The standard solution of metals used for colibration. By diluting a stock solution of  $1000 \mu\text{g/L}$  (Pb, Cd, Zn, Fe, and Ni) calibration process completed.[12]

## PREPARATION OF STANDARD FOR METAL

By adding deionized water (stock solution) standard are made in a volumetric flask. 1 gm of each metal (Ni, Cd, Zn, Pb, Fe) dissolved. A little quantity of Nitrotydrochloric Acid ( $\text{HCl}$  and  $\text{HNO}_3$ ) dissolved by the ratio of 1 : 2.

## DIGESTION OF SEED OIL

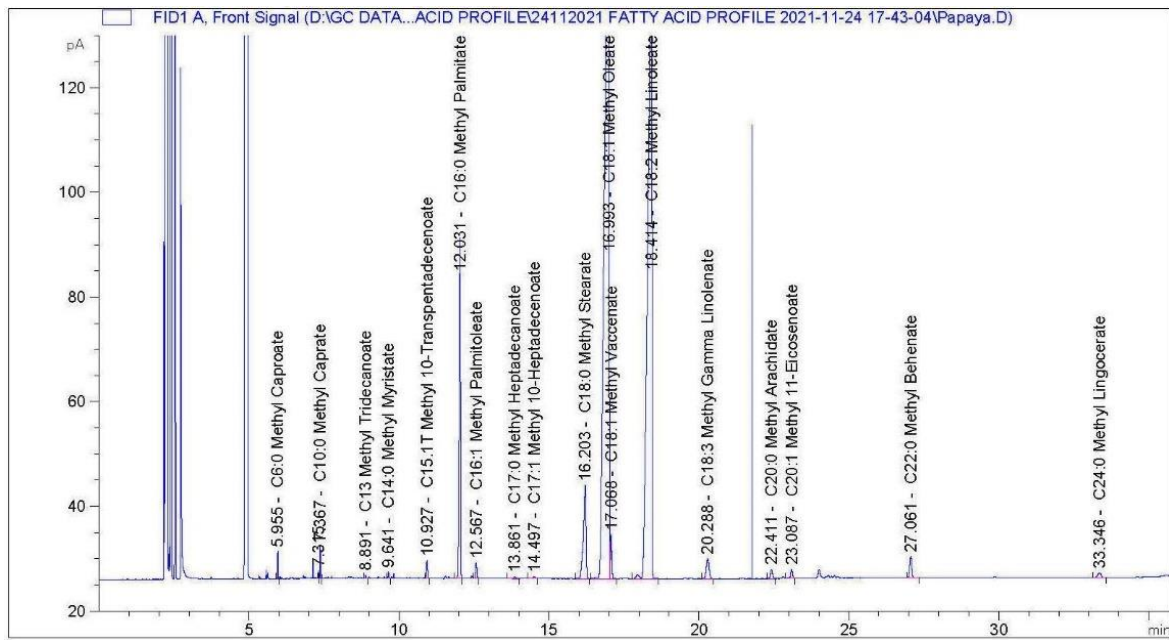
In a 100 ml Pyrex glass beaker *Carica Papaya* seed oil was processed. We took 1 gm of seed oil added 10 ml concentrated  $\text{HNO}_3$ . For cold assimilation kept that compound for 24 hours. For the duration of 4 hours the solution was boiled at  $50^\circ\text{C}$  with the ratio of 1 : 5 of concentrated acids  $\text{HCl}$  and  $\text{HNO}_3$ . Separation took place after cooling. Using double distilled water extract was made upto 25 ml.[16] For these standard metal ions from the calibration curves, in the seed oil sample the concentration of metals was determined.

## RESULTS AND DISCUSSION

### Fatty acids analysis results:

*Carica Papaya* seed oil's acid composition obtained by the method of GC-FID (Gas Chromatography-Flame Ionization Detection).[17,18] It contained (Oleic acid (omega-9) (C18:1) 49.20%, Linoleic acid (omega-6) (C18:2) 36.99%, Palmitic acid (C16:0) 6.07%, and Stearic acid (C18:0) 3.49%, Linolenic acid (C18:3) 0.78%, Behenic acid (C22:0) 0.62%, Palmitoleic acid (C16:1) 0.29%, Arachidic acid (C20:0) 0.27%).

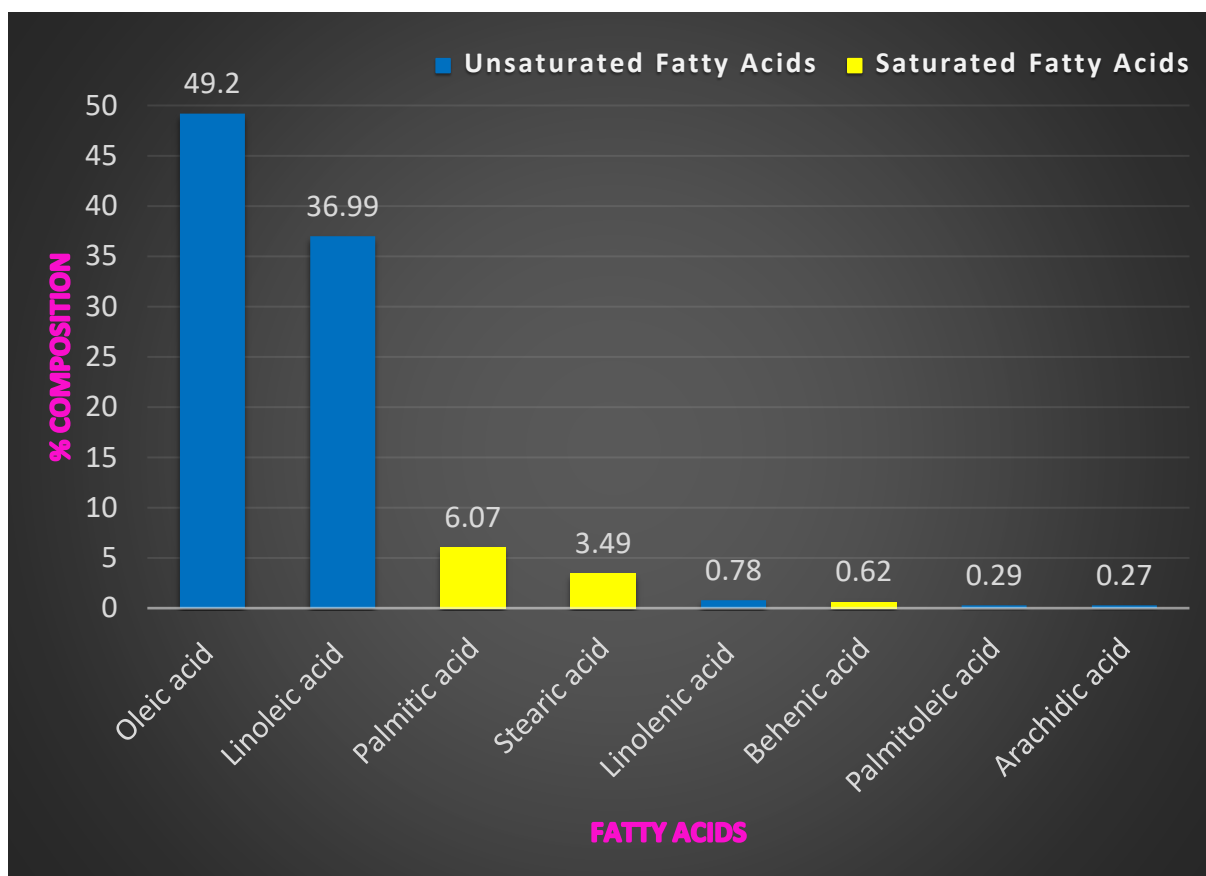
**Fatty acid content in *Carica Papaya***



**Plot showing comparison b/w Unsaturated and Saturated Fatty Acids**

Fatty Acid	Obtained % by weight
• Oleic acid	49.20
• Linoleic acid	36.99
• Palmitic acid	6.07
• Stearic acid	3.49
• Linolenic acid	0.78
• Behenic acid	0.62
• Palmitoleic acid	0.29
• Arachidic acid	0.27

Conc.<sup>n</sup> of metals obtained in seed oil of *Carica Papaya*



Using AAS (Atomic Absorption Spectroscopy) quantitative calculation of heavy metals components was carried out. In the sample the absorbance is linearly related to the concentration of metal.[19,20] By using AAS (Atomic Absorption Spectrophotometer) concentration of metals in plant seed oils determined. The wavelength dial was adjusted. It based on the nature of the metal present in the sample and to be analysed. For various metals the desired wavelengths are given below :-

Wave lengths for various metals uses in AAS

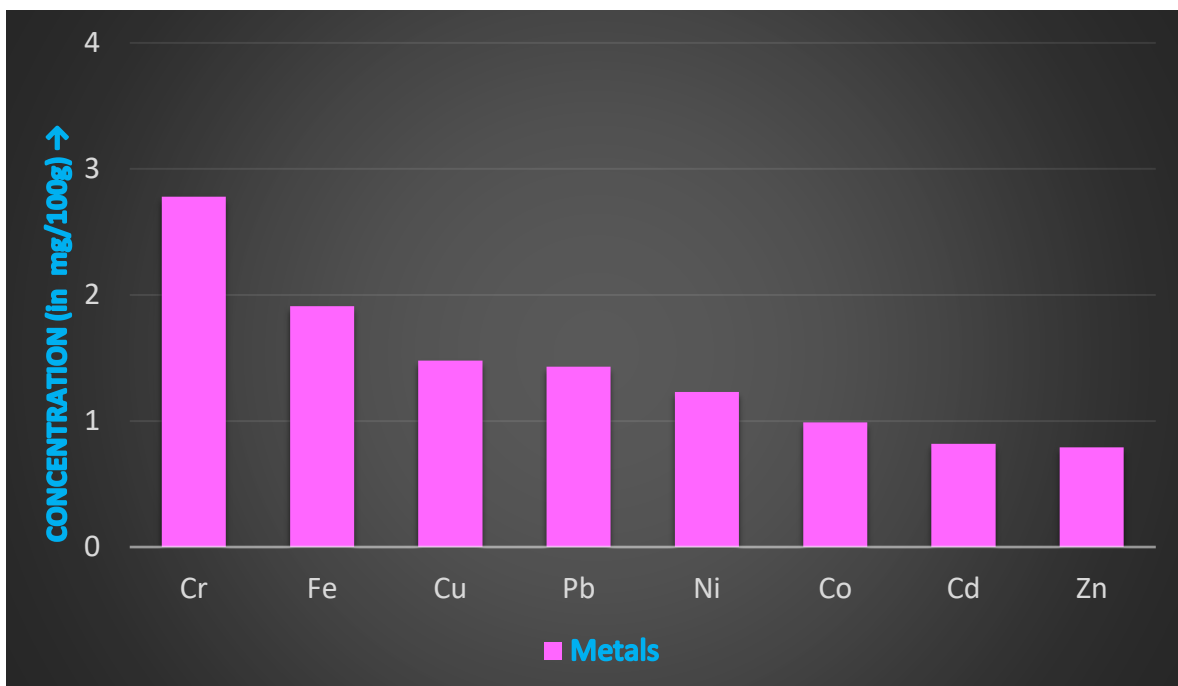
Sr. No.	Metals	Wave length (λ) of main resonance line in nm.	Flame Type
1	Cd	228.8	Air Acetylene mixture
2	Fe	248.3	Air Acetylene mixture
3	Ni	232.0	Air Acetylene mixture
4	Pb	283.3	Air Acetylene mixture
5	Zn	213.9	Air Acetylene mixture
6	Cu	324.8	Air Acetylene mixture
7	Cr	359.7	Air Acetylene mixture
8	Co	240.7	Air Acetylene mixture

The following metals were obtained (in mg/100g) Cr (2.78), Fe (1.91), Pb (1.43), Cd (0.82), Cu (1.48), Ni (1.23), Co (0.99), and Zn (0.79) by using Atomic Absorption Spectroscopy (AAS).[21,22] By their long term availability Trace metals are among the major environmental contaminants which cause a dreadful threat to human and animal health.[23,24]

**Conc.<sup>n</sup> of metals obtained in seed oil of *Carica Papaya***

Metals	Concentration (in mg/100g)
Cr	2.78
Fe	1.91
Cu	1.48
Pb	1.43
Ni	1.23
Co	0.99
Cd	0.82
Zn	0.79

**Plot showing comparison b/w metals conc.<sup>n</sup> in parts per million (ppm)**



## CONCLUSION :

*Carica Papaya* is a nutraceutical medicinal plant related to 'Caricaceae' plant family. It improves and cure NAFLD are globally health issues particularly related to anxiety, stress and obesity. Many gastroenterologists suggest *Carica Papaya* in daily diet for the heal of intestinal diseases. It is also beneficial for diabetic patients and sufferers of hypertension. For the patients of hypercholesterolemia and hepatotoxicity doctors and dieticians suggest *Carica Papaya* in daily diet. *Carica Papaya* includes multiple properties to cure viral, parasitic and microbial disease. It is a highly nutritional source of antioxidants, essential minerals, fibres and multiple vitamins particularly Vitamin A, Vitamin C and Vitamin E. In seed oil of *Carica Papaya* concentration of detected metals are (Cr : 2.78, Fe : 1.91, Cu : 1.48, Pb : 1.43, Ni : 1.23, Co : 0.99, Cd : 0.82, Zn : 0.79). In seed oil of *Carica Papaya* concentration of Unsaturated Fatty Acids are Oleic Acid (49.2%) and Linoleic Acid (36.99%). Saturated Fatty Acids are Palmitic Acid (6.07%), Stearic Acid (3.49%), Linolenic Acid (0.78%) Behenic Acid (0.62%), Palmitoleic Acid (0.29%) and Arachidic Acid (0.27%)

## Graphical Abstract:

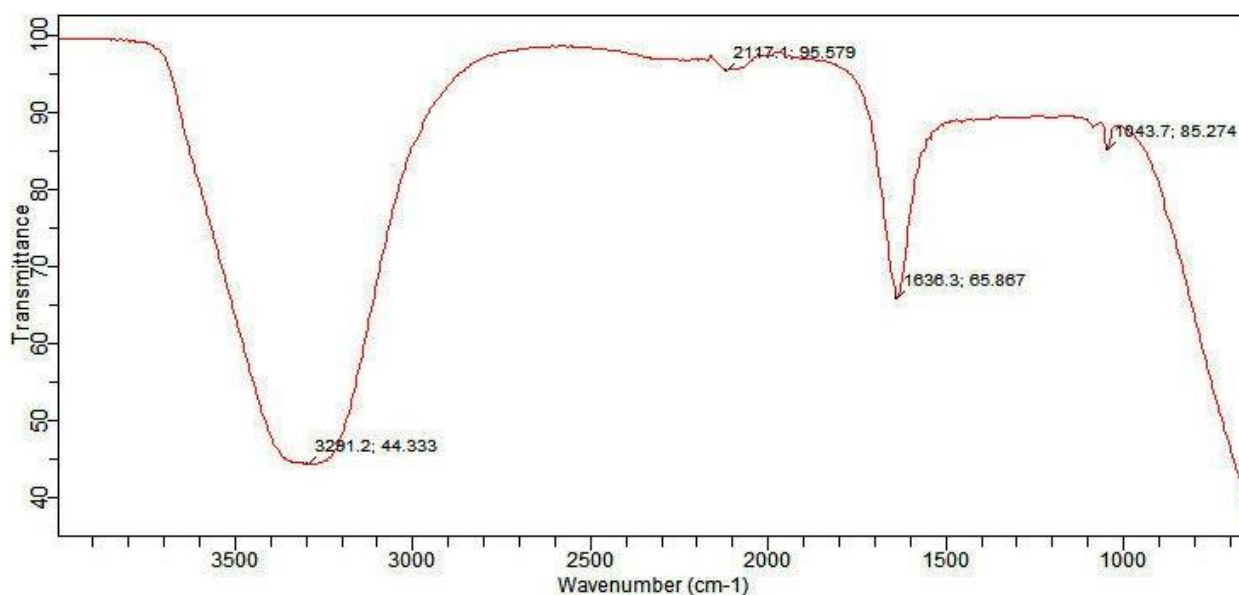
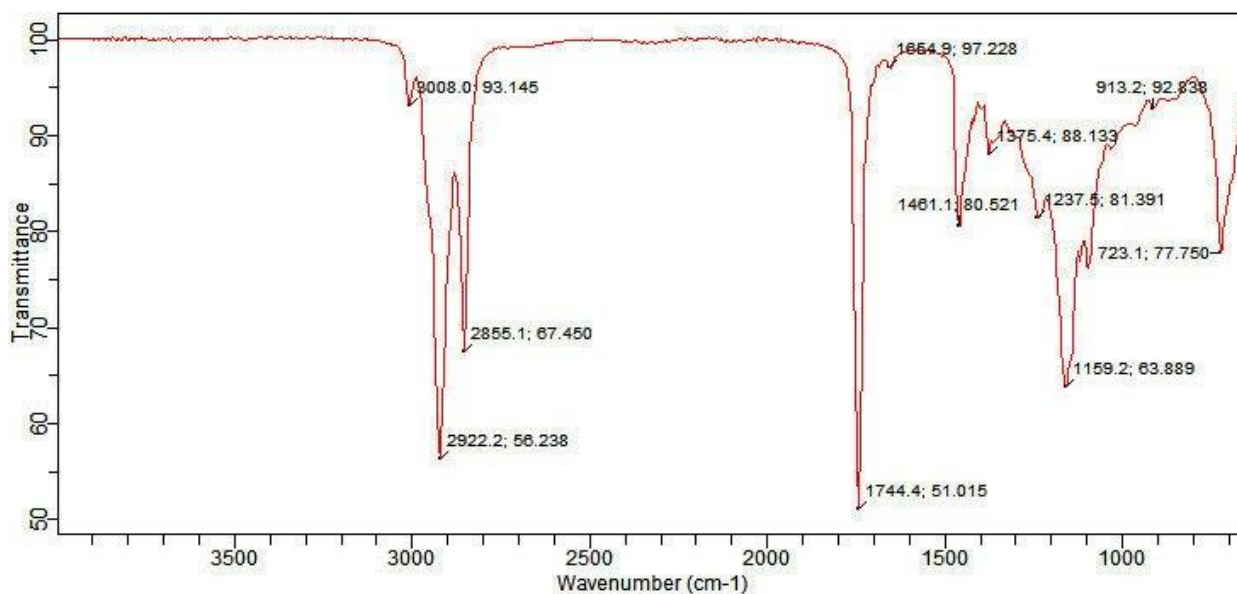


Fig:1IR Spectra of FAME



**Fig:2** IR Spectra of *Carica Papaya*

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