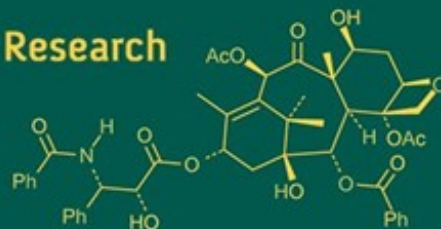
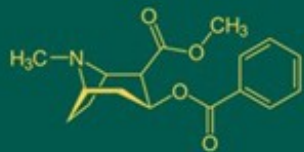


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## Qualitative and quantitative analysis of phytochemicals by standardization of *Carica papaya*

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**ABSTRACT**

Tropical fruits like *Carica papaya* (L.) are produced in large quantities and consumed in excess due to their many health benefits as well as their wonderful flavor. The fruit, leaves, roots, peel, bark, seed, and pulp of the entire plant were utilized as medicine. India was initially exposed to it in the seventeenth century. Method: Here We have prepared the solution in our lab and the standardization is done in our R&D cells of Parul University. Result: We have seen that the prepared diluted solution has the same property as the raw material has. And also we can see the mineral and chemical property of carica. Therefore, the diluted solution also can be taken as a medicine.

**Keywords:** Phytochemicals, Chymopapain, Flavonoids, Standardization

**1. Introduction**

*Carica papaya* leaves can grow enormous, with an average diameter of 25 to 70 centimeters, depending on the cultivar and maturation stage. The leaves have a broad, flat, lobed shape and emerge from the tips of long hollow stems. Each leaf typically has seven to eleven deep lobes, each of which tapers to a pointy tip.<sup>1</sup> Papaya leaves have a matte appearance with a dark green top and a pale green underside. The leaves have noticeable yellowish veins that are particularly elevated on the underside, giving the leaf a somewhat rough and textured appearance. 2 Papaya leaves, which range in color from green to yellow, have a number of advantages, including the potential to treat dengue, malaria, and other viral illnesses.<sup>3</sup> Enzymes like papain and chymopapain are abundant in the white, milky latex that the leaves release when they break or separate from the plant.<sup>4</sup> Both raw and cooked leaves can be consumed. Because they have a softer flavor and a softer texture, young papaya leaves are typically chosen for eating. The flavor of fresh leaves is crisp, succulent, and somewhat bitter with hints of green vegetation. Steaming or cooking enhances palatability and lessens bitterness.

**Availability & season**

In tropical and subtropical areas where papaya plants are widely grown, carica papaya leaves are accessible all year round.<sup>5</sup>

The fruit is typically spherical to cylindrical in shape, ranges in diameter between 75 to 500 millimeters (3 to 20 inch) or even more, and can weigh from 9 to 11.5 kilo. Flesh is juicy deep yellow or orange color. Inside the cavity there is numerous round, wrinkled black seeds.

**Papaya leaves and their use in medicine**

The need for nutrition-based preventative measures has increased as chronic diseases have grown to be a significant global public health concern.

Because a good diet is so important to human health, functional foods are important in lowering the risk of chronic illnesses. In addition to being linked to a lower incidence of obesity, type 2 diabetes, heart disease, viral infections, and some types of cancer, plant-based diets are thought to be environmentally sustainable. In this regard, nutritional and medical research has given functional agriculture—which involves growing medicinal food crops like *Carica papaya*—a lot of attention.<sup>6</sup>

**An overview of papaya**

*Carica papaya*, sometimes referred to as papaya, pawpaw, or kates, is a member of the Caricaceae family. It is more common in India, Brazil, Malaysia, Australia, China, Thailand, Myanmar, Philippines etc. It came from south part of Mexico and Central America, respectively.

Traditional medicinal formulations include a variety of papaya plant parts, including fruits, seeds, roots, bark, flowers, latex, and leaves. Because of their abundance of bioactive chemicals that promote health, papaya leaves have become one of these parts with the highest therapeutic value.<sup>7</sup>

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Malaria, dengue fever, asthma, digestive issues, and several inflammatory diseases have all historically been treated with papaya leaf decoction. Papaya leaf extract is recommended by DIFFERENT practitioners in India to improve red and white blood cell levels and increase platelet counts in dengue patients. A number of Asian nations also employ papaya leaves to cure infectious disorders like beriberi.<sup>8</sup> According to recent research, papaya leaves have a variety of pharmacological effects, such as: The activity of antioxidants, Anticancer property, The ability to reduce inflammation, Antimicrobial properties, Antiviral properties, Antimalarial action, Anti-diabetic action Hepatoprotective action, Nephroprotective action, Hypolipidemic behavior, The activity of immunomodulation, Anti-sickling measures. Because of these therapeutic qualities, scientists are investigating papaya leaves as functional foods and possible components of herbal and nutraceutical formulations.<sup>9</sup>

### **Papaya phytochemical composition**

Many different phytochemicals found in papaya, what give them their therapeutic properties. Chemical analysis has demonstrated the existence of: Alkaloids, Flavonoids, Glycosides, Saponins, Phenolic substances, Amino acids, Enzymes, Vitamins, Minerals, Carbs and fats

### **Important phytochemicals in papaya**

1. **Flavonoids:** Several flavonoids, such as quercetin and kaempferol, have been discovered in papaya leaves. Myricetin, Orientin, Luteolin: These compounds have strong antioxidant and *anti-inflammatory* properties.
2. **Phenolic Compounds**  
Papaya leaves contain significant phenolic acids, such as: Caffeine acid, Acid chlorogenic  
Acid protocatechuic, *P*-coumaric acid, Phenolic compounds help neutralize free radicals and protect cells from oxidative damage.<sup>8,10</sup>
3. **Alkaloids:** Papaya leaves contain three main alkaloids: carpaine and dehydrocarpaine I–II. These drugs support: A decrease in blood pressure, Allow the bronchioles to unwind. Reduce your heart rate. Display antiplasmodial qualities, Exhibit anticancer and antihelminthic properties, Carpaine content is highest in mature papaya leaves.
4. **Enzymes**  
Papaya leaves are widely available in the Philippines. The enzyme Chymopapain have strong *anti-inflammatory* and digestive properties and aid in the breakdown of proteins more effectively than pepsin.<sup>11</sup>
5. **Vitamins and Minerals**  
Vitamin C, calcium, magnesium, iron, zinc, manganese, and copper are all abundant in papaya. These nutrients promote improved immunity, hemoglobin synthesis, and antioxidant protection.

### **The pharmacological and medicinal properties of papaya leaves & fruits**

1. **Antioxidant Activity**  
Flavonoids and phenolic compounds found in papaya leaves and fruits scavenge free radicals and reduce oxidative stress. Long-term diseases like cancer and heart issues can be avoided with the help of antioxidant activity.<sup>7,12</sup>
2. **Anti-Cancer Activities**  
Studies have demonstrated the *anti-proliferative* qualities of papaya leaf & fruit react against cancer cells. Bioactive compounds found in the leaves help regulate immune responses and stop abnormal cell growth.
3. **Dengue Prevention**  
Dengue is commonly treated with papaya leaf extract because it increases the number of platelets. Increase the quantity of white and red blood cells Increase immunity. Prevent red blood cell sickling.<sup>13</sup>
4. **Antimalarial Characteristics**  
Strong antiplasmodial action against resistant strains of *Plasmodium falciparum* has been shown by papaya leaf ethyl acetate extracts.
5. **Decrease in Inflammation**  
Flavonoids, alkaloids, and phenolic compounds found in papaya leaves, fruits reduce inflammation and cure inflammatory diseases.

### **6. Antidiabetic and Hypolipidemic Characteristics**

By controlling blood glucose and cholesterol levels, papaya leaf & fruit extracts reduce the risk of complications from diabetes.<sup>12</sup>

### **7. The Impact of Nephroprotection and Hepatoprotection**

Papaya leaves and fruits protect liver and kidney tissues from toxins and oxidative stress.<sup>8</sup> Antimicrobial and Antiviral Properties  
Papaya leaves have shown antibacterial action against a variety of illnesses as well as *anti-HIV* potential in a number of experimental studies.

### **9. Health of the Digestive System**

Papain and chymopapain improve digestion and help with protein metabolism, but dried leaves are traditionally used as blood purifiers and digestive tonics.<sup>11</sup>

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## **2. Materials and Methods**

### **2.1 Sample**

Unripe green fruit from the carica papaya

### **2.2 Carica Primary Tincture Preparations**

In August 2024, the *Carica papaya* plant is harvested at Parul University's Jaysudha Garden in Vadodara.

The Carica papaya species was identified by Parul University's Agricultural Department, and its traits were investigated in Jnhmc's pharmacy lab under code number Pharma: CP 61.23.

A tiny bit of water is used to rinse the fruit and green leaves.

After that, pulps are made by chopping them into little pieces. 10g megma, 12.2 ml alcohol, and 40 ml water are combined in a macerator and left for 15 days. A What Man's filter paper is then used to filter it. We now have *Carica Papaya's* crude medicine.(In line with HPI).

### **2.3 Research design**

SEM of Papaya Fruits dilution

### **2.4 Time Spent**

One Month

### **2.5 Study locations**

Jawaharlal Nehru Homeopathic Medical College; Micro-Nano Research and Development Center; Parul University, Vadodara, Gujarat

### **2.6**

. For preparation of Mother tincture from fruit:

10g magma: 12.2 ml is the ratio Alcohol, forty milliliters of water

100 grams of magma solids as the HPI ratio

Furthermore, 400 ml of plant moisture is equivalent to 500 ml.

635 milliliters of potent alcohol

Approach:

1. Take a young, green papaya.
2. Wash and pat dry.
3. Slice fruit.
4. To produce pulp, use a pestle and motor.
5. Mix 40 milliliters of water, 12.2 milliliters of alcohol, and 10 grams of magma.
6. Put a label on it and keep it in a glass jar.
7. Keep it for fifteen days.
8. Filter and save it.

### **SEM + EDS study**

B. *Carica Papaya* leaves mother's tincture.

The ratio is 10g magma: 12.2 ml & Forty milliliters of water

Methodology:

1. Pick up few papaya leaves.

2. Dry and clean.
3. Finish the leaves.
4. Use a motor and pestle to create pulp. 5. Combine 10g magma with 12.2 ml alcohol and 40 ml water.

Put in a messaging jar and mark it.

Store it for fifteen days.

Filter and keep it.

UV spectroscopy is the investigation.

*Carica papaya* leaves for UV spectroscopy and unripe green fruit for primary tincture

The Hitachi SU3800 SEM has the following specifications precise surface data at the nanoscale with high-resolution analysis and description. It has sophisticated optics and detection technologies, including as BSE, SE, STEM, and UVD detectors.

By using an EDS approach for component composition assessment, the SEM provides comprehensive information on the material's exter-

nal shape.

### Synthesis of Nanoparticles

1 st step; Cleansing of all the laboratory utensils under Hot air oven for attest 10-15 minutes

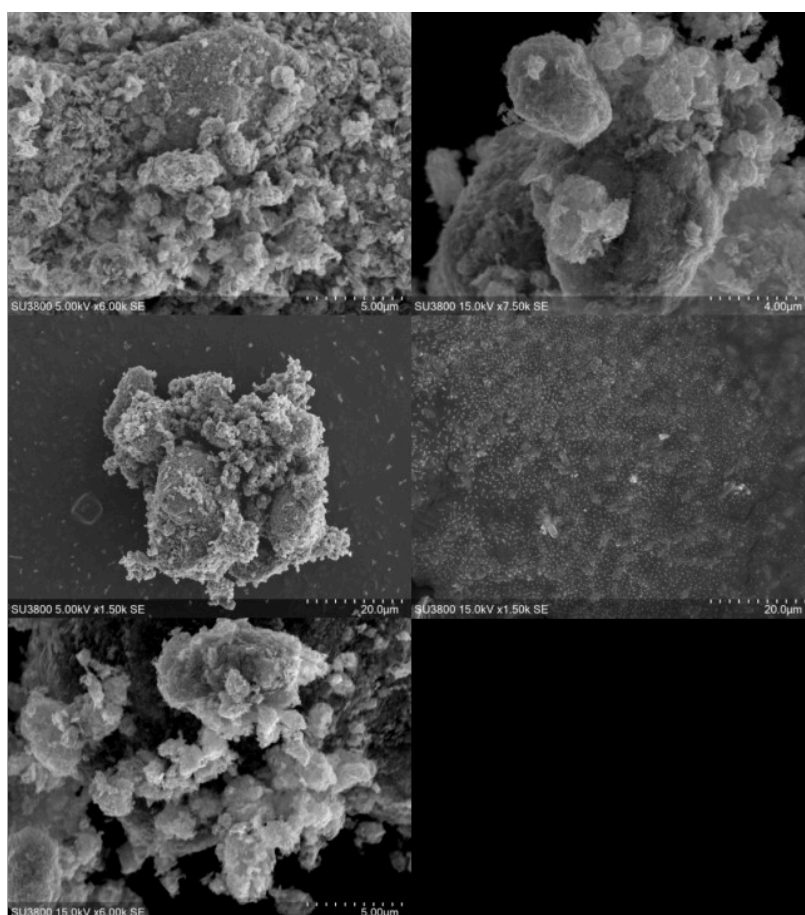
2 nd Step: As a biocatalyst, add one gram of ferricyanide of potassium with 20 milliliters of normal distilled water plus one milliliter of the carica papaya parent tincture. The mother base of nanoparticles is called a solvent.

3rd step: A microscope with scanning electrons was employed for the analysis.

### Results

After scanning under Scanning electron microscope the sample size are given below as:

Quantitative element composition:



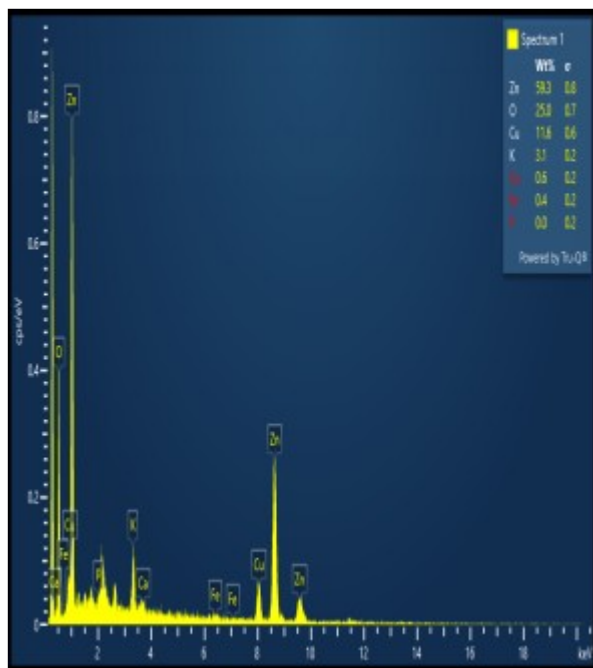
(From Parul University R& D Cells)

**Table 1.** Images under SEM:

| Sr .no | Constituent | Weight% | (σ)  | Sample role                       |
|--------|-------------|---------|------|-----------------------------------|
| 1      | O           | 24.95   | 0.70 | Major element as oxide            |
| 2      | P           | 0.00    | 0.21 | Not Detected                      |
| 3      | K           | 3.11    | 0.20 | Minor element                     |
| 4      | Ca          | 0.63    | 0.15 | Trace Element                     |
| 5      | Fe          | 0.38    | 0.21 | Trace Element                     |
| 6      | Cu          | 11.60   | 0.59 | 2 <sup>nd</sup> ary major element |
| 7      | Zn          | 59.32   | 0.85 | Major matrix element              |

Elemental composition, X Ray energy level and Peak intensity:

Pic 2: Elemental composition, X ray energy level and Pick intensity  
(From Parul University R& D Cells)



### 3. Discussion

If we go through the SEM analysis we can see that the different elements which are shown here are used for different health conditions. Cu, Zn are used as an antioxidant, tissue repair, immune function except that Ca helps for bone growth whereas P produces adenosine triphosphate. And all the elements are present in carica.

### 4. Conclusion

It has been seen that by SEM of diluted carica papaya has given the same phytochemical compounds which can be used in different health conditions.

### 5. Acknowledgement

Authors want to show their gratitude to Parul University.

|         |   |
|---------|---|
| Table   | 1 |
| Picture | 2 |

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