

# Waste Utilization by Biotransformation of *Carica papaya* Linn Peels and Development of a Value-Added Product from obtained by-products: An Organoleptic and Biochemical approach

Jyoti D Vora and Dipak Vora

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## Abstracts:

The diverse agro- climatic zones make India as the second largest producer of fresh fruits and vegetables granting fruit and vegetable prepared goods, such as oils, preserves etc. to number along that leads to generation of large amounts of wastes, both solid and liquid. This waste is incautiously being thrown without any treatment promoting environmental deterioration. However, these wastes hold immense potential nutritionally which can be utilized for producing cheaper value added ingredients that bear economic benefits.

*Carica papaya* Linn is a widely known as “the Fruit of Angels”, serves as an ideal, low cost food. It ranks second as a source of beta carotene and is an excellent source of natural sugars, vitamin C, and potassium, with fair amounts of calcium and phosphorus. Low in calories, this exotic fruit holds immense medicinal value since ancient times for treating innumerable disorders and conditions like toothache up to the prevention of cancer.

To substantiate the potential of fruit wastes, proximate profiles of papaya peel were analyzed using bench science experiments. The peels were bio valorized to procure commercially important acetic acid which in its own holds several health benefiting attributes. Further in order to project the organoleptic appeal of the fruit vinegar under study, invasive and non-invasive sensory evaluation was carried out by a semi-trained panellist. This was executed with a recipe. The data were subjected to biostatistical analysis which demonstrated high appreciation of the novel recipe. Critical control points were established during the process of novel product development and hazard analysis at critical control points was carried out. The commercial appeal of the recipe was also speculated using value for money (VFM) studies. Future prospects include determination of anti- nutrients and anti-microbial activity of vinegar. The use of this waste utilized novel product as a functional food and development of novel products keeping in mind the nutritional profile and organoleptic acceptance needs to be explored.

Food; the cradle for human sustenance; appeals to the senses, nourishes the body and satiates the soul. Food is not just a medium of nourishment, but also a mode of elevating the physical, emotional and spiritual quotient of an individual, thereby acting as the epicentre of human living. Fast paced lifestyles, hectic schedules and workaholic cultures have made our ability to make healthier food choices plummet to a great extent. Sedentary lifestyles have kindled the Spectrum of nutrition from balanced diets to more convenient, but imbalanced diets. Therefore, emphasis on quality nutrition is need of the hour.

To somewhat address this problem; a new trend of convenience foods has evolved. Convenience foods greatly reduce the time required in procuring, processing and preparation of foods, thus are poised on the fulcrum of consumer convenience. However, this manufacturing initiative may be considered as a double edged sword. Albeit the boons of extended shelf life, novelty to unfamiliar ingredients, great exposure to non-indigenous cuisines etc. have been made possible through processing operations, the bane of inception of wastes, both solid and liquid, which is incautiously been discarded in environs cannot be neglected. These wastes constitute untapped sources of valuable compounds which can act as functional ingredients in enrichment of pre-existing products or development of a novel product as a whole.

Fruits among the conjoined twins, viz fruits and vegetables, are often considered as the ‘perfect foods’ due to their high fiber content and raw consuming ability. Papaya is one such wholesome fruit popularly known to be carotene-rich, full of antioxidants, contributing for the treatment of innumerable ailments. Papaya finds application in food industry as vegetable, pickles, candy, jam, jelly etc. The unexplored parts of papaya fruit include its seeds and the peel which are oft discarded. The following research attempts to unfold the untapped potential of fruit and vegetable byproducts by utilizing them to develop a novel nutritional product thus providing cheaper but value added ingredients through diverse frameworks of biochemical analysis, sensory evaluation, HACCP along with others.

## About Papaya (*Carica papaya* Linn):

The Chinese saying, “The papaya is the fruit of a long life”, rightly upholds the reputation of the fruit to be a knockout when it comes to its vital ingredients - vitamins, minerals, trace elements, enzymes and much more!

## Varieties of papaya:

There are numerous strains of this melon-like fruit and the variation in size, form and colour is greatly immense. Very few true cultivars of pawpaw exist on account of its complex genetic make-up. Improvement of cultivars is directed toward high yielding, export health, strong flesh density, moderate sugar content, intermediate fruit scale, same cavity and pest and disease resistant uniformity. Some varieties of papaya are Coorg Honey Dew, Pusa Dwarf, Giant Majesty, Delicious, Dwarf, CO.1, 2, 3, 5; Washington; Solo; Ranchi; IHR39 and IHR54; Taiwan-785, 786 etc.

Papayas are spherical or pear-shaped fruits with flesh that is rich orange in color with either yellow or pink hues. With an undeniably tropical flavor, papaya provides an understated, mellow sweetness. Its composition is wonderfully thick, soft and as smooth as a butterfly. It ranks second only to mango as a source of beta carotene and is an excellent source of natural sugars, vitamin C, potassium and also contains fair amounts of calcium and phosphorus as well. Papaya peels often discarded as wastes and/or find application in cosmetic industry have a tremendous scope of being bio transformed into cheaper functional ingredients in food products.

Numerous comprehensive studies on showcase that *Carica papaya* Linn is an economically and culturally important fruit tree proving valuable for professionals involved in both research as well as commerce. Though the fruit holds maximum nutritional value as rich sources of antioxidant nutrients such as carotenes, vitamin C and flavonoids; the B vitamins, folate and pantothenic acid; and the minerals, iron, calcium, potassium, copper, and magnesium; and fiber, the leaf and seed account for good amount of carbohydrates while stem accounts good amount of protein as well. The extracts of *C. papaya* contain terpenoids, alkaloids, flavonoids, carbohydrates, glycosides, saponins, and steroids along with numerous enzymes namely Papain (digestive enzyme), Chymopapain (anti- inflammatory), Carpaine (anti-hypertensive), Lycopene (anti-cancer), Fibrin (anti-clotting). Papaya is well known for its myriad scientifically proven therapeutic properties. Some of which include anti fertility, diuretic, anti-helminthic, wound healing, antifungal, antibacterial, antitumor, anti-oxidant, laxative, anti- sickling, and nephro protective. Fruit vinegar the Novel Product Developed was an emphatically superior Nutraceutical food from Papaya peels. It was quality endorsed through HACCP and Sensory Evaluation. Value for Money studies from this Waste utilization was very promising.

Name: Jyoti D Vora and Dipak Vora

Affiliation: Dhirang Consultants, Mumbai, India Email: drjyotidvora@gmail.com