

## Papaya and Their Wild Relatives

**Gurwinder Singh<sup>1\*</sup>, Prabhdeep Singh<sup>2</sup>, Gagandeep Kaur<sup>3</sup> and  
Nikhil Thakur<sup>4</sup>**

<sup>1,4</sup> Sher-e- Kashmir University of Agricultural Sciences and Technology of  
Jammu, Main Campus, Chatha, Jammu

<sup>2,3</sup> Punjab Agricultural University, Ludhiana

**ARTICLE ID: 47**

Papaya is one of the fruit crops grown both commercially as well as a backyard crop. Papaya was mainly a backyard crop till recently. It emerged as a main commercial crop during the last decade, because of the high nutritive value. It is a rich source of vitamin A (2020 I.U), vitamin B1 (40 mg), Vitamin C (46mg), protein (0.5%) and mineral matters (0.4 %). Ripe papaya is a favorite breakfast and dessert fruit available year-round. It is used for making fruit salads, refreshing drinks, jams, jelly, marmalade, candies and crystallized fruits. Green fruits are pickled or cooked as vegetable. Carpine, an alkaloid present in papaya, can be used as a heart depressant, amoebicide and diuretic. It is also grown for the extraction of papain, a proteolytic enzyme presents in the latex, collected mainly from the green fruit. In 1875, T. P. Lucas, a British physician discovered the medicinal value of papaya and started a hospital in Brisbane, to treat patients solely with papaya. The people in Papua New Guinea use papaya for the skin and to treat rashes or sunburn or, with repeated applications, to remove the brown spots of aging. They also say that if you put papaya into the compost pile, they grow especially large! Natives in the Pacific Islands use all parts of the papaya tree for medicinal purposes-leaves, skin, seeds, bark, roots, flowers and of course, the fruit. South American women massage their breasts with thin slices of green papaya to stimulate the milk glands. Eating the fruit provides energy and nutrients for both herself and the baby. Papaya bark is used as a toothache remedy and the flowers in teas, to treat bronchial infections. For centuries, teas from the roots were used to expel parasites and to alleviate bleeding, kidney colic, and jaundice.

Papaya is widely grown in the tropical and sub-tropical regions of the world. It is being grown in about 57 countries of the world. Brazil, India, Indonesia Mexico and Nigeria are the leading countries. Other countries which grow papaya are Indonesia, Mexico, China, Thailand, Peru and Philippines.

### Centre of diversity

Papaya is a native of tropical America. The South America and Costa Rica are the micro centre of the origin of papaya. It was introduced from the Philippines through Malaysia into India during 16<sup>th</sup> century. It is likely that papaya originated in the lowland of eastern Central America, from Mexico to Panama. The seeds were distributed to the Caribbean and Southeast Asia during the 16<sup>th</sup> century, and to India and Africa.

### Taxonomy

Papaya (*Carica papaya* L.) is an almost herbaceous (succulently soft-wooded), typically unbranched small tree in the family Caricaceae. Europeans first encountered papaya in the Western Hemisphere tropics by at least the early 1500s and various interests were soon disseminating it widely. Papaya is now cultivated worldwide in tropical and subtropical climates mainly for its melon-like fruit. Recently, consensus has been developing that the genus *Carica* L. has only the one species *Carica papaya*, and that the Caricaceae may comprise six genera. Most of the genera are neo tropical forest plants, occurring in South America and Mesoamerica or only in Mesoamerica. *Vasconcellea*, the largest genus with 21 species, had usually been considered as a section within *Carica*.

### The distribution of different genera is as follows

1. ***Cyclicomorpha***: It is the only genus of the family that is restricted to humid habitat and occurs in mountainous forests of equatorial Africa.
2. ***Horovitzia***: It is a monotypic genus of hairy herbaceous plants, endemic to Mexico.
3. ***Jarilla***: This genus consists of three herbaceous species; all restricted to southern Mexico and Guatemala.
4. ***Jacaratia***: It contains seven species of trees with compound leaves, distributed from Mexico to the north of Argentina.
5. ***Vasconcellea***: The largest genus of the family with 21 species, has only recently been resurrected on a generic level based on morphological and genetic characteristics (Aradhya *et al.*, 1999 and Badillo, 2000) Due to their morphological resemblance to the common papaya and occurrence in higher altitudes of Ecuador, Colombia, Venezuela and North of Argentina, *Vasconcellea* spp. are often referred to as highland or mountain papayas. However, the fruits are smaller, less succulent and quite different in taste. Since *Vasconcellea* seems to be a young complex network of closely related species,

the following species complexes with different subspecies might be recognized within *Vasconcellea*:

✚ **Complex 1:** *Vasconcellea stipulata*, *Vasconcellea* × *heilbornii*, *Vasconcellea weberbaueri*, *Vasconcellea Parviflora*

✚ **Complex 2:** *Vasconcellea quercifolia*, *Vasconcellea chilensis*, *Vasconcellea candicans* *Vasconcellea crassipetala*.

✚ **Complex 3:** All other analyzed taxa (*Vasconcellea crassipetala*).

6. **Carica:** *Carica* is mono specific containing the best known and economically most important species of this family, namely papaya. *Carica papaya* diverged from the rest of *Carica* species early in the evolution of this genus (Kim *et al.*, 2002).

#### Taxonomic Classification of Papaya

Kingdom	<i>Plantae</i>
Subkingdom	<i>Tracheobionta</i>
Super division	<i>Spermatophyta</i>
Division	<i>Magnoliophyta</i>
Class	<i>Magnoliopsida</i>
Subclass	<i>Dilleniidae</i>
Order	<i>Violales</i>
Family	<i>Caricaceae</i>
Genus	<i>Carica L.</i>
Species	<i>Carica papaya L.</i>

#### Importance of wild relatives in Papaya Breeding Program

Papaya although was varied uses, it is under exploited. Crossing of Papaya within family may leads to overcome several problems such as diseases, biotic and abiotic stress. However, of late papaya growing for processing and papain production has become a profitable proposition. Looking back at the progress made, the future needs of varietal improvement in papaya are:

✚ **Exploration, conservation and characterization of genetic variability:** Exploration needs to be systematically carried out so that variability can be exploited for the development of new varieties.

- ✚ **Development of stable gynodioecious genotypes for papain production:** There is a need to develop gynodioecious genotypes for papain production, as only dioecious types suitable for papain extraction are there.
- ✚ **Production of genetically pure seeds by controlled pollination:** Production of genetically pure seeds by controlled pollination is very much necessary as stable population can be obtained. Production of seeds by open pollination should at all costs be avoided.
- ✚ **Development of dwarf gynodioecious lines:** Development of dwarf gynodioecious lines having medium sized fruits with good fruit quality suitable for high density planting is needed so that yield can be increased with better management practices.
- ✚ **Breeding varieties resistant to biotic and abiotic stresses:** Varieties resistant to biotic stresses like 'PRSV' and which can tolerate high temperature as well as tolerant to frost need to be developed so that cultivation can be taken up in other regions as well.