

## Cultivated *Passiflora* sp. in North East region of India

North East region of India is full of wide range of climatic and edaphological condition, and genetic diversity of passion fruits (*Passiflora* spp). The different genotypes are found in Manipur, Mizoram, Meghalaya, Arunachal Pradesh, Sikkim, Nagaland of North East region. Generally it is due to the upland and low land hill conditions, that the yellow, purple and mixed type of passion fruit are found. Purple passion (*Passiflora edulis* Sims) fruit favourably grown at high altitude (>2,000 m), and Yellow or Golden passion fruit (*Passiflora f. flavicarpa* Deg.) at low land, mostly under tropical climate. In some parts of North East, giant granadilla (*Passiflora quadrangularis*) is found which is mostly used for vegetable purpose but more delicious after ripened. Different genotypes under all these species directly help uplift the economy of rural people of these regions.

**P**ASSIFLORA comes from Latin word 'Passio' meaning 'suffering'; 'floris' meaning 'flower', hence the name 'passion flower', that was first time discovered by Spanish discoverers in 1529 and was described as a symbol for 'Passion of Christ'. Passion fruit (*Passiflora* L.), belonging to family Passifloraceae, is a native of Brazil. In family Passifloraceae, >576 species of *Passiflora* L. are present, and *Passiflora quadrangularis* is most important. Passion fruits are herbaceous or woody vines usually climbing with tendrils, but a few are trees or shrubs. Their wide morphological variation seems to be the result of their habitat diversity as well as their co-evolutionary relationships with many organisms, including a wide range of pollinators as small and large insects, birds, and bats. Passion fruits have total cultivated area of about 0.014 million ha with production of 0.082 million tonnes during 2018. The passion fruit is a highly acidic food (pH~ 3.2) due to the predominance of citric and malic acid. It is also rich in minerals like K, P, Ca, Fe, Na, Mg, S, Cl and protein.

### Uses

The leaf of passion fruit is used as a vegetable in the hills of North Eastern India. Boiled extract of fresh

tender leaves is prescribed as a remedy for diabetes, diarrhoea, gastritis, abdominal flatulence and as a liver tonic. The rinds of passion fruit have very low pectin content (2.4%). In addition, it has potential for extraction of secondary metabolites (as total phenols which have therapeutic effects like immunomodulation, anticarcinogenic, and antioxidant properties. The extract of fresh leaves of *Passiflora edulis* is consumed for the treatment against dysentery and hypertension in Nagaland. The rind residue contains about 5-6% protein and could be used as filler in poultry and stock feed. The seeds yield 23% oil, which is similar to sunflower and soybean oil, and accordingly has edible as well as industrial uses. There is currently a revival of interest in the pharmaceutical industry, especially in Europe, in the use of glycoside, passiflorine, as a sedative or tranquilizer. Italian chemists extracted passiflorine from the air-dried leaves. The fruit provides a good source of nutrients such as vitamin A, B<sub>2</sub> and C and non-nutritive phytochemicals, carotenoids and polyphenols. Juice of passion fruit is prescribed as a digestive stimulant and in treatment for gastric cancer.

### Fruit and flower morphology



## Different species in North East regions

Giant granadilla (*Passiflora quadrangularis* L.)

Very large fruit of 20 to 23 cm length, green–yellow skin, oblong shape, is a warm wet tropical lowland environmental adaptation. Giant granadilla is mostly found in Mizoram, Nagaland, Manipur and Arunachal Pradesh. The distribution of HCN (cyanogenic glucosides) in the leaves, stems, tendrils, floral parts, roots are reported up to 138 ppm. The greenish-yellow fruits of *P. quadrangularis* resemble as melons and are the largest in the genus. Fruit flesh is very thick and number of seeds are about 164 per fruits.

Purple passion (*Passiflora edulis* Sims)

Purple passion fruit showed high level of protein, fat and ascorbic acid than the giant granadilla and yellow type. It requires higher elevation (about 2000 m) for proper flowering and fruiting. Temperature below 15°C restrict the vegetative growth and flowering. Fruits are 4-5 cm in diameter, deep purple when ripe each weighing 35-45 g. The juice content varies from 31-35%. The protein and vitamin C content is about 9.4% and 24-30 mg/100 g respectively.

The three main carotenoids in purple passion fruit are carotene,  $\beta$ -carotene and phytofluene. In addition to presence of  $\beta$ -apo-12'-carotenal,  $\beta$ -apo-8' carotenal; cryptoxanthin, auroxanthin and mutatoxanthin are also reported.

### Fruit and flower morphology



Yellow or golden passion fruit (*Passiflora f. flavicarpa* Deg.)

Yellow type of passion fruit are found at lower elevation and mostly found in foothills of Manipur, Mizoram, Arunachal Pradesh and Nagaland. It is relatively rich in phosphorus, iron, sodium, potassium and vitamin A. Citric acid was the predominant acid in yellow passion fruit (6.6 mg/g). Fruits are larger than purple type.



Local or mix type

Pasighat local red fruit have different morphotype as compared to purple, yellow and giant granadilla. The

### Fruit morphology



### Shrink wrapping of Pasighat Local Red



pulp surface is mix with yellow colour with purple spot on the body.

To increase the shelf-life and market value of the passion fruit, use of shrink wrapping helps, leading directly to upliftment of the economy of rural people of North East Region of India. The post-harvest life of passion fruits can be effectively increased by polyolefin film packaging which helps to maintain the quality of fruits under good condition, reducing the percentage loss of fresh matter content and shrinkage of rind portion. Overwrapping freshly harvested fruits and vegetables by using highly permeable films like HDPE, LDPE, polyvinyl chloride (PVC), etc. helps to maintain the post-harvest quality and extends the shelf-life by minimising transpiration and respiration. The shelf life of purple passion fruit was up to 22 days with attractive colour, appearance and quality when packed in 25  $\mu$  thickness of polyolefin film.

### Value addition

*Squash and nectar*

**Beverages:** Passion fruit squash is a delicious drink having excellent nutritive properties. It is a popular after-dinner drink in the warm summer. According to the Indian standards, the minimum sugar concentrations prescribed for cordial, squash, crush and syrup are 30, 40, 55 and 60%, respectively, with a minimum juice content of 25% in each product. They are usually preserved with 220-350 ppm of  $\text{SO}_2$  or 600-700 ppm of benzoic acid and are diluted 1:3 to 1:5 with water before consumption.

**Wine from passion fruit and Mandarin orange blended juice:** Wine from passion fruit and orange juice are recently in demand. Wine is prepared by blending 10%



passion fruit juice in orange juice and inoculated by 5% *Saccharomyces cerevisiae* adjusting TSS 24°Brix with sucrose and acidity 0.7%. The cost of production of 1 litre wine is ₹ 82. The costs are for laboratory (small) scale preparation of wine. These may still be reduced during mechanization of the process for mass production.

## Conclusion

This study provides an overview of a variety of genetically different individuals that could be commercialized in Pasighat, Arunachal Pradesh and used in future breeding programs. Cultivation of passion fruit is a technically feasible, financially viable and bankable activity. Population studies of *Passiflora* species are highly relevant to conservation and breeding activities. The therapeutic efficacy of the genus *Passiflora*, extensively used in Indian System of Medicine, has been established through modern testing and evaluation (pre-clinical and clinical trials) in different disease conditions.

For further interaction, please write to:

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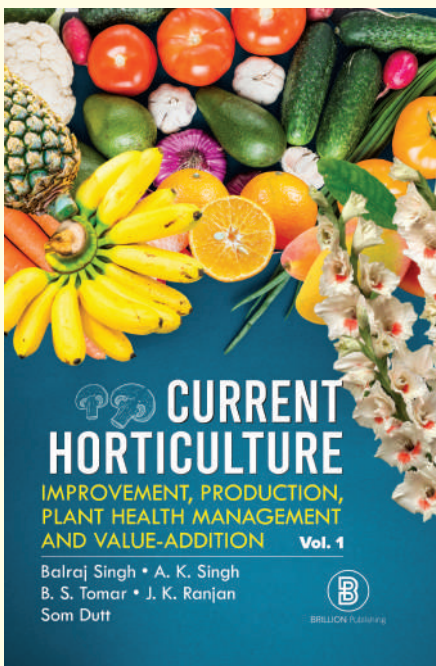
## Book Review

# Current Horticulture: Improvement, Production, Plant Health Management and Value-Addition

Singh Balraj, Singh A.K., Tomar B.S. and Dutt Som (Eds).

Brillion Publishing, 22B/5 D.B. Gupta Road, Karol Bagh, New Delhi 110 005

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In our country, fruit, vegetable, flower medicinal and plantation crops provide food, nutritional, health, economic and environmental security to the people. A number of books and manuals on horticultural crops have been brought by scientists and working groups. The book **Current Horticulture: Improvement, Production, Plant Health Management and Value-Addition**, in two volumes, is a compilation of the latest scientific information to be followed for furtherance of horticultural science and will serve as encyclopedia for all stakeholders.

Both volumes consisting 38 chapters each, authors have attempted to compile the advances in horticultural science especially on advances in crop improvement, production technology, biotic and abiotic stress and post-harvest management in general and prospects, challenges and future thrust of horticultural crops in particular which have been contributed by experts and eminent horticulturist in the area of specialization.

Major issues and concepts and how to mitigate the changing climatic scenario have been elaborated perfectly and comprehensively in easy-to-understand language. Overall the chapters are nicely written

which will be of immense use to the researchers, growers, industrialists, policymakers, students, etc. Thus, the wealth of information documented in these books will serve as a reservoir for exploitation of useful information on various horticultural aspects. Keeping in view the various issues related to horticultural crops, such books are the need of hour to enrich the knowledge of workers in the field of research and development as well as growers and horticultural entrepreneurs of the country.

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