Workshop on "Valorisation of traditional processing of indigenous and underutilized fruits"
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Integrated Processing of *Jamun* (*Syzygium cumini* Skeels) Fruit For Value Addition and Assesment of its Impact on Health and Nutrition

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INTRODUCTION

- An important indigenous fruit of the family Myrtaceae.
- Large, evergreen tree widely distributed in different agro-climatic conditions in South Asia but remains underutilized
- The ripe fruits are purplish black in colour due to the presence of anthocyanins
- Fruits are rich in minerals and have high antioxidant property which contribute to many health benefits
- Jamun is highly perishable, therefore, very difficult to store and market at distant places
- Jamun seeds are used in traditional medicine

Average Nutritional composition (per 100g) of Jamun fruit

Carbohydrate	14.00%
Protein	0.15-0.30g
Fibre	0.30-0.90%
Calcium	8.30-15.00mg
Potassium	55.00mg
Magnesium	35.00mg
Phosphorus	15-16.20mg
Iron	1.20-1.60mg
Folic acid	3.00mcg

Harvesting

- The ripe fruits are available during summer and disappear with onset of the monsoon.
- **Common method of harvesting-** By shaking the tree and collecting the fruits by holding a big piece of cloth or canvas under the tree.
- The fruits cannot remain on the tree in the ripe stage and start dropping to the ground immediately after ripening.
- As a result, a considerable amount of fruit is damaged and become unfit for fresh consumption.
- It is unfortunate that no proper technique for harvesting jamuns has yet been developed.

Cultivar

- There is no standard cultivar of jamun.
- Recently some cultivars have been developed and are being propagated.
- There are two different types of jamun one small and the other big .
- **The big fruits (small seeded)** are oblong in shape, have more pulp and are suitable for fresh marketing.
- They have high °Brix ratio, low content of acid, tannins and total anthocyanins
- **The small fruits (large seeded)** are round in shape, grow wild and have very little pulp.
- The small sized fruits are not suitable for fresh marketing but are ideal for processing
- They contain high amount of acids, tannins and anthocyanins.

Physico-chemical composition of different types of Jamun

Parameter	Large seeded	Small seeded
Weight (g)	9.50	3.30
Seed (%)	18.58	36.36
Edible portion (%)	81.42	63.64
Juice (%)	57.75	49.42
TSS (°B)	15.00	11.12
Acidity (%)	1.44	1.60
Total sugars (%)	13.16	8.40
Total anthocyanins (mg/100g)	179.00	242.5
Total tannins (mg/100g)	297.5	428.75

(Ramanjaneya, 1985)

Therapeutic value of Jamun seed

- Seeds contain an alkaloid **Jambosine** and glycoside jambolin or **antimellin** which halts the diastatic conversion of starch into sugar (Morton, 1987)
- Seed extract has been reported to lower blood pressure by 34.6% due to the presence of **ellagic** acid (Morton, 1987)
- Seeds are also rich in flavonoids and are well know antioxidants (Ravi *et al*., 2004)
- Seeds are fairly rich in protein, calcium and other minerals also (Ayyanar and Babu, 2012)

Composition of Jamun seeds

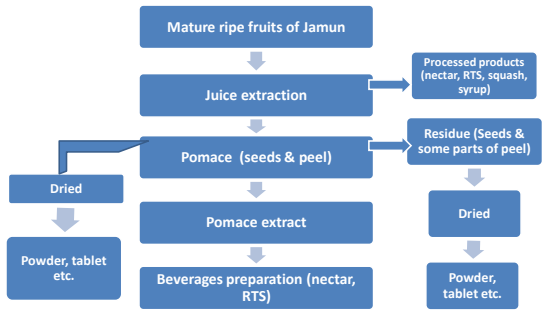
Parameters	Quantity on dry weight basis
Moisture (%)	40.86
Crude protein (%)	4.16
Extractable fat (%)	1.55
Ash (%)	2.16
Crude fibre (%)	1.28
Total carbohydrate (%)	90.85
Energy (kcal/100g)	393.96
Starch (%)	29.20
Total dietary fibre (%)	40.38
Polyphenol (mg/100g)	361.40

(Kochhar et al., 2006)

Uses of Jamun seeds in folk medicine

Ethnic group /region	Mode of preparation, administration and ailments	References
Lakher and Pawi in North-East India	▪ Juice of seeds is applied externally on sores and ulcers. ▪ Powdered seeds mixed with sugar are given orally in the treatment of dysentery.	Sharma et al., 2001
Malayalis in South India	▪ Paste of seeds along with combination of leaves of bittergourd and flowers of Cassia auriculata is used to treat diabetes.	Udayan et al., 2006
Traditional medical healers, Madagascar	▪ Seeds are taken orally as an effective therapy for slow debilitating impacts of diabetes	Ratsimamanga, 1998
Local population in A.P. India	▪Powder of shade dried seeds are taken orally thrice a day in treatment of diabetes	Nagraju et al., 2006

Integrated processing of Jamun



Outline of the work

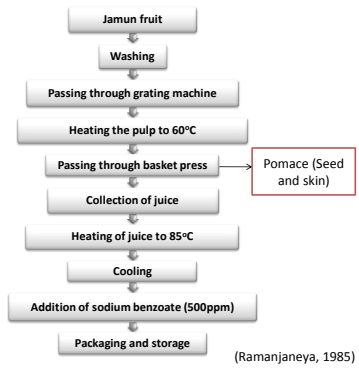
1. Extraction of Jamun juice

- A method of extraction of Jamun juice with high level of anthocyanins and other soluble constituents has been standardized (Ramanjaneya, 1985)

Grating of Jamun

Basket Press

Flow chart for juice extraction



(Ramanjaneya, 1985)

2. Utilization of Jamun Juice

- Jamun juice can be processed into different types of beverages like RTS, nectar, syrup etc.
- A method of concentration of Jamun juice on lab scale has been standardized by Ramanjaneya (1985)
- Concentrate can be used by the beverage industries.

Potential for processing

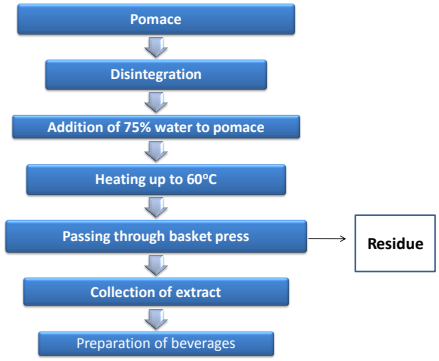
Vacuum concentration

Jamun Nectar

3. Utilization of Pomace

- During extraction of Jamun juice a large amount of pomace remains as waste
- It contains a considerable amount of anthocyanins, tannins and sugars
- A pomace extract can be obtained by mixing water with pomace in standardized ratio and this can be used for making fruit beverages

Flow chart for preparation of pomace extract

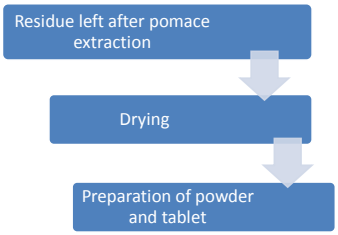


Chemical composition of pomace and residue of Jamun fruit

Character	Pomace	Residue
TSS (°B)	4.50	1.00
Acidity (%)	0.62	0.13
Total sugars (%)	3.79	0.62
Total anthocyanins (mg/100g)	143.00	43.00
Total tannins (mg/100g)	445.00	142.50

(Ramanjaneya, 1985)

4. Utilization of pomace residue



- After second extraction the residue which contains both seed and peel will be dried and used as powder or tablet for medicinal purpose.

5. Determination of level of bioactive compounds

Level of bioactive compounds will be determined:

- At different steps of processing
- In pomace and residue
- In different parts of fruit (skin, seed, pulp etc).
- In different processed products
- In seed powder

Outcomes

- Training programs to be organized for the dissemination of technology will provide livelihood as well as nutritional security to the rural people
- Re-extraction and utilization of functional compounds from pomace extract and utilization of seeds for preparation of herbal medicines will provide a direct benefit to the private sector

Research Gaps

- Wild Jamun is a very rich source of many nutritional and functional compounds but it has not yet been utilized for preparing different value added products
- Medicinal properties of Jamun seeds need to be established.

Conclusion

- Fruit processing industry is not very viable in South Asian Countries due to non utilization of waste
- Integrated processing of Jamun will provide complete utilization of fruit so that nothing goes waste
- Development of products from underutilized fruits like jamun could be ideal for processed food market.
- The new nutritious natural and healthy processed foods are in great demand.

THANKS