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Final Report on Mini Research project entitled

"To standardize the technique of preparing the fruit leather by blending two indigenous fruit pulp viz Bael and Aonla"

under the project

"International network on preserving safety and nutrition of indigenous fruits and their derivatives"

funded by Leverhulme Trust, UK
14-16 January,2013, Institute of Technology of Cambodia

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Background

- India has a rich heritage of indigenous fruit types.
- For this project two highly nutritious and complementary fruits viz. Bael and Aonla were selected.
- Both of these fruits are known for their therapeutic/medicinal and nutritive properties.
- Blending of bael and aonla pulp could be of great economic as well as nutritional and therapeutic value.

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Aims and objectives

- **Aims:** The aim of the project was to standardize the techniques for preparing fruit leather by blending bael and aonla pulp and evaluation of nutritional and quality parameters of the product.

Objectives:

- To study the physico-chemical composition of bael and aonla fruits
- To determine the optimum ratio of aonla and bael pulp in blended fruit leather
- To standardize the potassium metabisulphite concentration in fruit leather
- To identify the ideal packaging material to maintain storage quality of the leather

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Procurement

- Freshly harvested uniform sized fully mature bael fruit were procured from farmers's field, Kushinagar, Uttar Pradesh.
- Fully matured Aonla fruits were purchased from local mandi of New Delhi.

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Physico-chemical parameters

- **Weight**
- **Peel percent**
- **Pulp percent**
- **Seed percent**
- **Moisture (Ranganna, 2009)**
- **Fibre (Ranganna, 2009)**
- **Non-enzymatic browning (Ranganna, 2009)**
- **Total soluble solids (Ranganna, 2009)**
- **Acidity (AOAC, 2004)**
- **Ascorbic acid (AOAC, 2004)**
- **Total phenolic contents (Bray and Thorpe, 1954)**
- **Organoleptic quality (Amerine *et al.*, 1965)**

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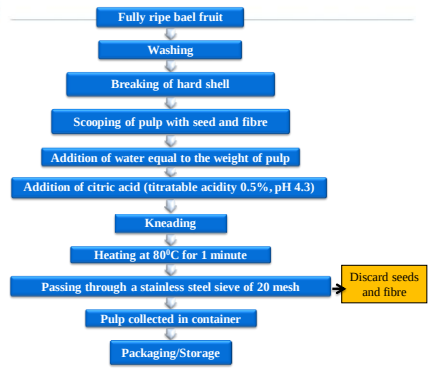
Fig 1. Flow chart of Bael Pulp Extraction



Bael Pulp Extraction

Fig 2. Flow chart of Aonla Pulp Extraction

Fully mature aonla fruit
↓
Washing
↓
Pressure cooking at 10 lbs. pressure for 5 minutes
↓
Manual removal of Aonla seeds
↓
Addition of water to the flakes and mashing with a SS crusher
↓
Blending of pulp in the mixer
↓
Passing through a stainless steel sieve
↓
Packaging/Storage

Anola Pulp Extraction

Table 1: Standardization of proportion of bael and aonla pulp in the fruit leather

S. No.	Aonla (Ratio)	Bael (Ratio)	Sugar
T1	1	1	10 %
T2	1	2	10 %
T3	1	3	10 %
T4	1	4	10 %
T5	4	1	15 %
T6	3	1	15 %
T7	2	1	15 %
T8	0	1	20 %
T9	1	0	10 %

Fig 3. Flow chart for preparation of bael: aonla fruit leather

Blending different proportions of bael and aonla pulp (Table 1)
↓
Addition of sugar to the blended pulp (Table 1)
↓
Heating of whole mixture on hot plate for 1-2 minutes to dissolve the sugar
↓
Pouring of pulp on to butter smeared steel trays
↓
Drying of pulp at 60 ± 5^{0}C for 22 hours
↓
Cutting of leather in to small pieces
↓
Packaging and storage of leather at room temperature

Prepared Leather

Standardization of KMS concentration in blended leather

- Different concentrations of potassium metabisulphite were mixed to the pulp used for preparation of fruit leather and the best concentration was selected on the basis of NEB value.

Packaging and storage of fruit leather

- The best product, selected on sensory parameters was preserved with standardized concentration of KMS and packed in different packaging materials *viz*. aluminium laminated pouches and polyethylene pouches.
- Packed product was subjected to storage of 90 days under ambient conditions and was evaluated at intervals of 0, 45 and 90 days.

Table 2. Physico-chemical characteristics of bael and aonla fruits

Physico-chemical parameters	Mean	
	Bael	Aonla
Weight (g)	525.00	37.00
Peel (%)	29.96	--
Pulp (%)	65.84	88.79
Seed (%)	2.43	6.40
Moisture (%)	61.25	84.69
Fibre (%)	1.29	2.97
TSS (°B)	31.80	11.00
Titratable acidity (%)	0.25	2.15
Ascorbic acid (mg/100g)	19.25	456.35
Total phenolics content (mg/100g	92.84	286.50

Table 3: Standardization of bael and aonla pulp in blended fruit leather on the basis of overall acceptability score given by national participants

Treatments	Overall acceptability score
T_1 : Bael + Aonla Leather (1: 1+ 10% sugar)	**7.33**
T_2 : Bael + Aonla Leather (2: 1+ 10% sugar)	**7.99**
T_3 : Bael + Aonla Leather (3: 1+ 10% sugar)	**6.94**
T_4 : Bael + Aonla Leather (4: 1+ 10% sugar)	**6.45**
T_5 : Bael + Aonla Leather (1: 2+ 10% sugar)	**6.62**
T_6 : Bael + Aonla Leather (1: 3+ 10% sugar)	**6.81**
T_7 : Bael + Aonla Leather (1: 4+ 10% sugar)	**7.00**
T_8 : Bael leather (10% sugar)	**7.52**
T_9 : Aonla leather (20% sugar)	**7.38**

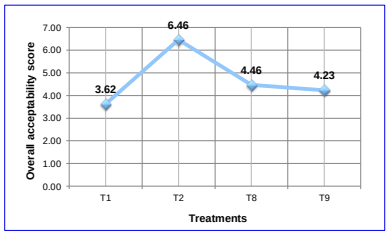
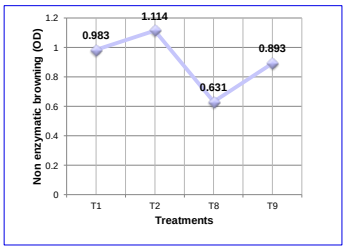
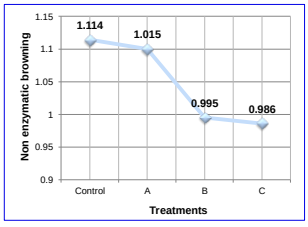


Fig 4. Standardization of bael and aonla pulp in blended fruit leather on the basis overall acceptability score given by international participants at Vietnam workshop



T_1 : Bael + Aonla Leather (1: 1+ 10% sugar), T_2 : Bael + Aonla Leather (2: 1+ 10% sugar), T_8 : Bael leather (10% sugar), T_9 : Aonla leather (20% sugar)

Fig 5. Effect of blending on non enzymatic browning of Bael and Aonla leather



Control: 1000ppm KMS; **A**: 1500ppm KMS; **B:** 2000ppm KMS; **C**: 2500ppm KMS

Fig 6. Effect of potassium metabisulphite concentration on non enzymatic browning of Bael and Aonla blended (2: 1 + 10% sugar) leather

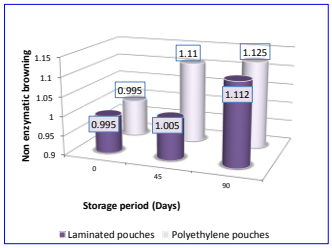


Fig 7. Effect of storage and packaging material on non enzymatic browning of Bael and Aonla blended (2: 1 + 10% sugar + 2000ppm KMS) leather

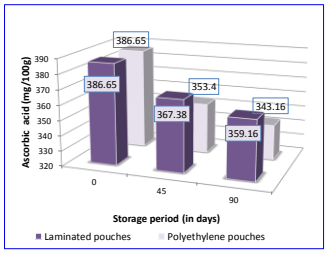


Fig 8. Effect of storage and packaging material on ascorbic acid content of Bael and Aonla blended (2: 1 + 10% sugar + 2000ppm KMS) leather

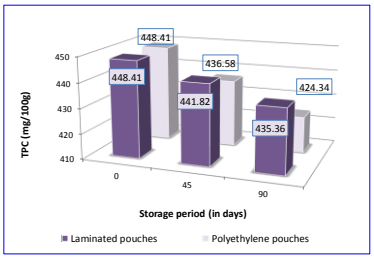


Fig 9. Effect of storage and packaging material on total phenolics content of Bael and Aonla blended (2: 1 + 10% sugar + 2000ppm KMS) leather

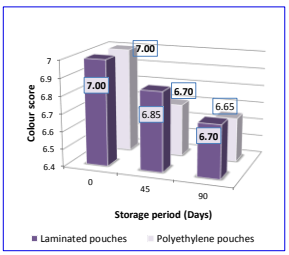


Fig 10. Effect of storage period and packaging material on colour score of Bael and Aonla blended (2: 1 + 10% sugar + 2000ppm KMS) leather

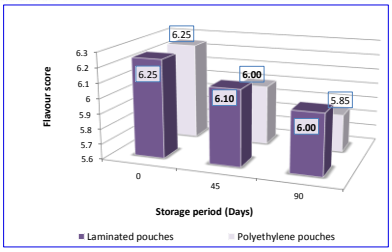


Fig 11. Effect of storage period and packaging material on flavour score of Bael and Aonla blended (2: 1 + 10% sugar + 2000ppm KMS) leather

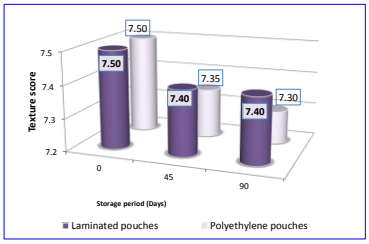


Fig 12. Effect of storage period and packaging material on texture score of Bael and Aonla blended (2: 1 + 10% sugar + 2000ppm KMS) leather

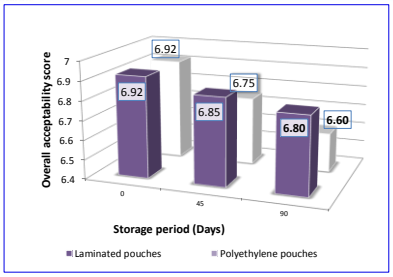


Fig 13. Effect of storage period and packaging material on overall acceptability score of Bael and Aonla blended (2: 1 + 10% sugar + 2000ppm KMS) leather

Outcomes

- Proportion of Bael + Aonla pulp in 2: 1 ratio with 10% sugar, was found as the best for the preparation of blended fruit leather
- 2000ppm KMS was preferred over 2500ppm for the preservation of fruit leather from the safety point of view.
- Fruit leather packed in laminated pouches showed the better storage quality during the storage of 90 days in comparison to polyethylene pouches

Conclusion

- Preparation of bael and aonla blended leather is a low cost technique because being underutilized these fruits are cheaper in the market.
- Besides, the leather is easy to handle and distribute and requires no special storage conditions.
- It can be included as a nutritious sweet item in the mid day meal and can be readily acceptable to children.
- Small entrepreneurs and rural women can easily prepare it at home and make it available throughout the year.
- Blended leather also adds a new variety of functional foods (being rich in riboflavin, antioxidants and vitamin C) in the market ensuring good returns to the growers.

Follow up

- Present findings can be published in the form of research note
- Work can be disseminated by organizing training programme to the small entrepreneurs/ housewives/ self help groups etc.
- Quantification of nutritional and antioxidant properties of the leather need to be studied
- Market acceptability of the product is necessary
- Fortification of leather with soy flour to improve nutritional quality
- Financial support required for training and research work

THANK YOU