

Postharvest Technologies of Indigenous Fruits of **Bangladesh: Constraints and Opportunities**

- Name of participants

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BANGLADESH PROFILE



Stretching between 20.34° & 26.38° N latitude and between 88.01° and 92.41° E longitudes

Diverse ecosystems like, hills, plains, coastal and wet lands

um high land are

Rabi (co October-I nd dry months: and kharif (hot months: Anrilof the fruits are produ

Importance of Postharvest Technologies in Bangladesh

- Minimization of Postharvest losses
- * Nutritional improvement
- * Food and financial security of the people of Bangladesh
- Employment generation



SI.	Name of fruit		Scientific name	Family
No.	English	Bengali		
	Aonia	Amloki	Emblica Officinalis	Euphorbiaceae
	Banana	Kala	Musa spp.	Musaceae
	Bael	Bel	Aegle marmelos	Rutaceae
		Kul	Zizyphus mauritiana	Rhamnaceae
	Bilimbi	Bilimbi	Averrhoa bilimbi	Averrhoaceae
	Bullock's heart	Ata	Annona reticulata	Annonaceae
	Burmese grape	Lotkan	Baccaurea sapida	Euphorbiaceae
	Carambola	Kamranga	Averrhoa carabola	Averrhoaceae
	Cashewnut	Kajubadam	Anacardium occidentale	Anacardiaceae
10	Coconut	Narikel	Cocos nucifera	Palmae
	Cowa	Kauphal	Garcinia cowa	Annonaceae
	Custard apple	Sharifa	Annona squamusa	Elaeocarpus floribundu
	Date palm	Khejur	Phoenix sylvestris	Palmae
	Elephants foot apple	Kadbel	Ferinia limonia	Rutaceae
	Flacourita	Lukluki	Flacourtia jangomes	Flacourtiaceae
	Golden apple	Bilati Amra	Spondias pinnata	Anacardiaceae
	Guava	Peyara	Psidium guajava	Myrtaceae
18	Hogplum	Deshi Amra	Spondias dulcis	Anacardiaceae

SL	Name	of fruit	Scientific name	Family
No.	English	Bengali		
	Indian dillenia	Chalta	Dillenia indica	Dilleniaceae
10	Indian olive	Jalpai	Elseocarpus floribundus	Elaeocarpaceae
21	Jackfruit	Kanthal	Artocarpus heterophillus	Moraceae
		Jam	Syzygium cuminii	Myrtaceae
23	Karanda	Karamcha	Carrisa carandas	Apocynaceae
24	Lemon	Lebu	Citrus limon	Rutaceae
25	Lime	Kagzi lebu	Citrus aurantifolia	Rutaceae
26	Litchi	Litchu	Litchi chinensis	Sapindaceae
27	Mango	Aam	Mangifera indica	Anacardiaceae
28	Madagascar plum	Baichi	Flacourtia indica	Flacourtiaceae
29	Mandarin	Komala	Citrus resticulata	Rutaceae
30	Monkey jack	Deca	Artocarpus lakoocha	Moraceae
31	Papaya	Pepe	Carica papaya	Caricaceae
32	Pineapple	Anarash	Ananas comosus	Bromliaceae
33	Palmyra palm	Taal	Borassus flabellifer	Palmae
14	Passion fruit	Passion phal	Passiflora edulis	Passifloraceae
5	Phalsa	Phalsa	Grewia asiatica	Tiliaceae
36	Pummelo	Batabilebu	Citrus arandis	Rutaceae

Table 1. List of indigenous fruits in Bangladesh (contd..)

SI. No.	Name of fruit		Scientific name	Family	
	English Bengali				
	Pomegranate	Dalim	Punica granatum	Punicaceae	
	River ebony	Gab	Diospyros peregrina	Ebenaceae	
	Rose apple	Golapzam	Syzygium jambos	Myrtaceae	
	Sapota	Safeda	Achras sapota	Sapotaceae	
	Satkara	Satkara	Citrus macroptera	Rotaceae	
	Star gooseberry	Arboroi	Phyllanthus distichus	Euphorbiaceae	
	Tamarind	Tentul	Tamarindus indica	Ligominosae	
	Tolkar	Toikar	Garcinia pedunculata	Guttifreae	
	Velvet apple	Bilati gab	Diospyros discolor	Ebenaceae	
	Water chestnut	Paniphal	Trapa bispinosa	Trapaceae	
47	Wax iambu	Zamrul	Eupenia lavanica	Myrtaceae	

Postharvest Technologies of Indigenous Fruits

- Project-A: Maturity indices, handling, chemical treatments, packaging, transportation and storage

Project-B: Processing and preservation



Project-A. Maturity indices, handling, chemical ackaging treatments, p transportation and storage

Maturity indices of mango

- Gopalbhog Khirshapat
- Langra
- Fazli
- Bombai and
- Ashina have been standardized

Harvesting period

Optimum harvesting period of Gopalbhog, Khirshapat, Langra, Fazli, Bombai and Ashina were 84-91, 87-95, 97-105, 112-120, 97-105 and 139-146 days respectively.

Storage life The mangoes harvested at the above mentioned period was the sholl life 9-10days at amblent condition (28-32*C).

Assessment of Artificial Ripening Practices

Conducted area Five regions of Bangladesh like chapaiNawabgonj, Rajshahi, jessore, Kustia and Modhopur.

Ripening practices The growers and/wholesalers practiced different artificial ripening at immature/mature stage for early ripening;

Calcium carbide Ripen-15

Promote Tom tom

Purpose: To develop yellow colour within 2-3days.

Shelf life and quality of mango fruit in zero energy cool chamber

The mangoes were treated with hot water at 55°C and then packed in;

Non-modified and Modified

Shelf life

8 days under non-modified and 16 days under modified condition

Extension of Shelf life of Mango

There were three packaging techniques

Without package Polyethylene bag (0.04mmthickness) and Bamboo basket with cushioning material (straw) After carrying in destination place, the fruits were exposure at 3 days of interval

Shelf life

The fruits carried out by bamboo basket with cushioning material had the maximum shelf life

The fruit packed in polyethylene bag accelerated ripening and rotting compared to others

Effect of modified atmosphere packaging on shelf life and quality of mango

Packaging techniques: Three packaging techniques;

- Carton and covered with paper
- 0.5% perforated polyethylene bag.
- Without paper

Shelf life Mango packed in carton and perforated polyethylene bag had the maximum shelf life

Minimization of Postharvest Losses of Mango Through Adapting Improved Postharvest Practices

- The mangoes were sorted based on immature, damage, pest and disease infestation "Then the sorted mangoes were treated with hor water at 55°C for 5 minutes and then dried through pedestal fan
- Packaging techniques Corrugated fibre board carton
- Corrugated libre board carton Plastic crate and Bamboo basket Shelf life and Minimization of losses
- The shelf life of mango was increased up to 10-15days with wrapped in the above mentioned packages The minimization of postharvest loss was 38.68%

Postharvest life and quality of mango Postharvest life and que Variety. Langra Treatments Ace: 0.5% and A1=1.0% Factor B: Chemical treatments BoeCaCl; and B = Ca(NO₃)

- Operational system: Sprayed on the surface of the fruits one and two weeks before harvest

Spraying of CaCl₂ and Ca(NO₃) did not reflect the chemical parameters of mango chemical parameters of mango Spraying of CaCl₂ solution (both 0.5 and 1.0%) increased the shell life of mango with retention of good surface Colour development of mango

- Preharvest operation: Ethrel was sprayed on the fruits in the plant at 80days after flowering at the rate of 150,200 nd 250ppm.
- and 250ppm. Postharvest operations: After harvest, the ethrel was sprayed in the bamboo basket contained mango at the rate of 0.2ml, 0.4ml and 0.6ml and then soaked with tissue paper.
- Results Preharvest spraying of ethrel (150,200 and 250ppm) on the fruits in the plant showed less response to develop
- the truits in the plant showed less response to develop colour Maximum yellow fruits (50%) were obtained fruits treated with 250 ppm followed by 150 and 200 ppm. Physical parameter (fruit weight, pulp, seed, skin etc.) and chemical parameters (TSS, sugar, acidity, pH etc.) were not affected by the ethrel

Postharvest treatments on shelf life of mango

Variety: Carabao

- Treatments Factor A: Postharvest treatments

- ractor A: Postilarivest (relations) Acc. Treated with barksin (600ppm) A1- Het water treatment at 55°C for 5 minutes A2- Ethylene absorber Factor B- Packaging techniques Bic-Packaging techniques Bic-Packed in poly bag with ethylene absorber Results/Out put
- Resultation put The minimum rotting percent were packed in polyethylene bag with ethylene absorber Minimum physiological loss was fruits treated with bavistin.

Extension of shelf life of mango under different storage conditions

- Variety: Langra
- Variety: Langra Treatments Factor An Packaging techniques An Solida poly bag and A2=Parlorated poly bag Factor B= Storage conditions B= Deep freeze and B3= Berligerator Shell life

Shelf life The shelf life of mango could be extended in refrigerator condition.

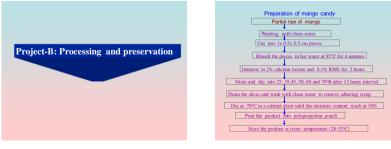
Treatments To= Treated with fresh banana leaves, T= Treated with rice straw

- T2=Rice hull T3= Saw dust
- 4=Fresh shirish leaves and

- T4-Freeh shirish leaves and T5-Catcium carbide Results/Output Catcium carbide ripened mangoes within 3days Rice straw ripened mangoes at 4.47 days. Fresh beams leaves reduced weight loss but activated the incidence of the diseases.

Effect of calcium carbide to improve the colour of mango

- Treatments
- •Calcium carbide (2g) is taken in a small cloth bag
- *Kept in poly bag containing mango in closed condition for 16, 24 and 32 hours
- *Treated mangoes are taken out from bag and kept under ordinary storage condition (28-32*C) Results/Out put
- Calcium carbide was not suitable for improving colour of mango It was also reduced the shelf life of mango.





Preparation of mango jam
Ripen mango
Washing with clean water
Peel and knead with thumb adding 1/3 water of peeled fruit
Extraction of pulp using blender
Extracted pulp is filtered with thin clean cloth
Required ingredients are calculated
Pulp is mixed with sugar and citric acid is added when TSS become 55°B
Pectin is added when TSS become 58°B
Cooking is stopped when TSS become 64°B
Products are poured into pre-sterilized glass bottle and stored ambient condition (28-32°C)

Preparation of green mango pickle
Green mango is selected
Washing with clean water and sliced like finger
Ginger and garlic is sliced and made paste with addition of equal amount of water
All calculated spices are powdered
Extracted pulp is filtered with thin clean cloth
Turmeric and chilli powder is mixed with ginger and garlic paste
Mixture is added with leftover oil and all powdered spices are added gradually
Salt and acetic acid is added
and cooked up to complete removal of water
Products are poured into pre-sterilized glass bottle and stored ambient condition (28-32°C)



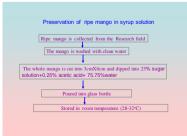
Osmotic dehydration of mango
Mango (Fazli) is collected
Washing with clean water and cut into suitable size
Slices are dipped at different concentrations of sugar (25, 35, 45 and 55°B)
The slices are heated at 80°C for an hour
Then the slices are dehydrated in a mechanical dryer at (55+2)°C
Dehydrated samples are covered in oil paper and packed in polyethylene pouches.
Mixture is added with leftover oil and all powdered spices are added gradually
Products are poured into pre-sterilized glass bottle and stored ambient condition
Treated with 35 and 45oB performed better

7	5% mango pulp, 25% jackfruit and 28% pineapple are taken
Ľ	s w mango pup, 25% jacknan and 20% pricupple are taken
	The pulp is blended to extract juice
su	gar (700g) and pectin (10g) is added with juice
ook up t	o TSS 640 B and added citric acid (0.25%)
í	Cooking is stopped
	Packed the products in polyethylene bag
	racked the products in polyeutyrene bag
Pre	oduct is labeled and stored in room temperature (28-32°C)
	suder is indered and stored in room temperature (20.52.0)

Optimization of processing method for mango fruit bar
Evenly ripe mango is procured from local market
Washing with clean water, peeled and removed the stone
Pulp is prepared through blending and sieved with 50 mesh
Different amount of sugar is used in order to make final TSS content of 20, 25, 30 and $35^\circ B$
Sugar is mixed with pulp and then the heated at 80°C for 3minutes
The pulp is treated with 30°B+ 350ppm KMS and spread on the tray
Pulp is dried in a mechanical dryer at 60°C until the moisture content reach at 15-25%. Then the products are cut into 2cmX8cm pieces
Packed in polypropylene pouches and stored at room temperature (28-32°C)

Standardization of processing method for preparation of green mango juice
The green mango is procured from the local market
Washing with clean water and processed to extract juice
Juice is prepared maintaining its total soluble solid at 12%
Water is boiled at 80oC for 8 minutes and then sugar is added and strained
CMC is added with the mixture and heated at 80oC for 5-6minutes
Pulp is added with the mixture of CMC, stirred and mixed thoroughly
KMS is added with the mixture at the rate of 600 ppm
Then the mixture is heated at 80°C for 2 minutes and poured into PET bottle
Mango pulp treated with 20% green mango pulp+ 0.3%CMC is performed better
performed better



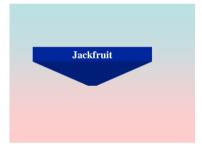


Immature dropped mangoes powder
Immature dropped mango collected from the Research field
Washing with clean water and cut into slices
The slices treated with firming agent and dried sun and mechanically
Dried slices are grinded and sieved to obtain powder
Dried powder is fortified to enrich nutrients
Then the powder is packed in LDPE, ALPE and HDPE
Stored at ambient condition for 2 months



Immature dropped mangoes drink

Selection of mango variety for preparation of Nectar
Mango namely. Langra, Fazli, Gopalbhog, Khirshapat and Surjapuri are selected.
The mangoes are washed, peeled and pulp is separated from the stones through blending and sieving with a fine cloth.
The required quantity of water, sugar and citric acid are added to the pulp
The mixed pulp is heated at 90°C for 3minutes with KMS for preparation of nectar
Variety Langra performed better for preparation of nectar considering its organoleptic test and nutritional analysis





Naturally and artificially ripen jackfruits-its shelf life and quality

- Fruits were harvested from time to time and were ripened naturally and artificially

 Artificially ripen was done by inserting a iron probe
- Jackfruit harvested at early stage took more time to ripen on their own than those harvested subsequently
- •The artificial ripening caused ripening after 3days while the natural ripening caused more than 3days from harvest to storage



Preparation of jackfruit candy
Select half ripe (Khaja) jackfruit
Washing with clean water
Cut into 1x 0.5x 0.5 cm pieces
Blanch the pieces in hot water at 95°C for 4 minutes
Immerse in 2% calcium lactate and 0.1% KMS for 2 hours
Drain and dip into 25, 35,45, 50, 60 and 70°B after 12 hours interval
Drain the slices and wash with clean water to remove adhering syrup
Dry at 70°C in a cabinet dryer until the moisture content reach at 10%
Pour the product into polypropylene pouch
Store the product at room temperature (28-32°C)



Storage periods: 6 months

Preparation of jackfruit chips

Select mature (Khaja) jackfruit
Washing with clean water
Cut into 4x 2 cm pieces
Blanch the pieces in hot water at 95°C for 5minutes
,
Fry the slices at 60°C for 1 hour and 70°C for 6 hours to save oil
Finally the slices fried at 160°C in palm oil and stirred with narrow stick
Put out the slices from the pan and mixed with salt and gloves
• • · · · · · · · · · · · · · · · · · ·

Pour the product into ALPE pouch
Store the product at room temperature (28-32°C)

Preparation and packaging of jackfruit chips



Storage periods: 4 months

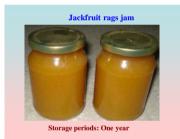
Preparation of jackfruit leather
Selection of fully ripe jackfruit
Washing with clean water
Cut into half lengthwise
Take bulb and remove seeds
Blend the bulb with 10-15% sugar and boil for 5-7 minutes for extracting juice
Add KMS (0.1g/kg) and then boil for 3-5minutes
Concentrate the mixture with steam jacket pan
Spread the mixture in a stainless ateel tray
Put the tray in a cabinet dryer and dryed at 60°C for 20 hours
Cool and pour the products into polypropylene pouch

Jackfruit leather



Storage periods: 4 to 6 weeks at room temperature

Preparation of jackfruit Jam
Select the fully ripe jackfruit
Wash with clean water
Cut into half lengthwise
Take bulb and remove seeds
Blend the bulb and boil for 5-7 minutes and extract juice
Add sugar (700g) and pectin (10g) with juice
Cook up to TSS 64º and add citric acid (0.25%)
Determine end point through flake test
Sterilize bottle and then poured into bottle and then waxing
Label and store in room temperature (28-32°C)



Preparation of jackfruit rind Jely Select. fully mutured, fresh ripen jackfruit Watak with clean wate: Rel separation and cyring into onall pieces Add water and cirric acid ef 1.5ktr./Kg and 2 g Kg. Boil 35minutes and correcting piece Add sugar and 200mg cirric acid with piece, start cooking Cook up to TSS 65⁹ and addi rest cirric acid Determine the end point of cooking Determine the end point of cooking Label and store the product at noon temperature Preparation of jackfruit rind jelly









Preparation of jackfruit sweet pickle
Collection of fully matured but not yet soft, fresh jackfruit
Washing reasonably
Separation of bulb and separation of seeds
Slicing of bulbs, ginger and pepper
Mixing the slices of bulb, ginger and pepper
Pouring mixture in bottle, adding syrup and capping
Pasteurization at 85°C
Cleaning bottles and labeling
Storing in a cool and dry place



Storage period: One year

Preparation of Jackfruit nectar

Select ripe Jackfruit Washing with clean water Extract the bulb as and paper the seeds Ellend the bulb and paper the seeds Ellend the seeds Elle

Preparation of jackfruit squash Select ripe Jackfruit Washing with clean water Cut into and patted at 80-88°C for 10-15 minutes.

Pass through a size pr stain to get a smooth purce. Add §/4th of water_with sugar and heated in h boil [Mix the syne_with prepared jackfruit purce] Add citric acid and KMS and then stirred to get a 3quash [Streithog the bottles] [Pour and store in a cool and dry place]

Dehydration of jackfruit

Select ripe jackfruit
4
Washing with clean water
Cut into 1x 3x 5 cm slices
Drain and dip into 25, 35,45, 50, 60 and 70°B after 12 hours interval

Drain the slices and wash with clean water to remove adhering syrup Dry at 70°C in a cohisted dyper until the moisture content, reach at 10% Pour the product juto polypropylene poach Store the product at room temperature (28-32°C)

Canning of jackfruit

Select this jackfirst Working with clean water Extract the bills on in jackfirst Extract the bills on in jackfirst neetur Dissolve bulb in segar, water and citric poid at the rate of 5g/kg Immerse in 59-B syrup with 0.5%, citic axid and heated at 80-88°C Fill the can welp represent finit, and syrup Poar the product into can Extract the thin proved cans, at 82°C Seal the can and code immediately Store in a cool and dry place

Preservation of jackfruit in brine solution

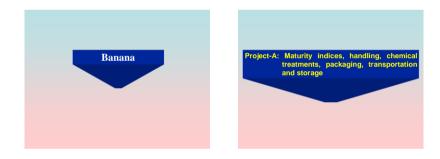
Jackfruit (Khaja) are washed with clean water and peeled and then kept in 8% salt, 1.25% acetic acid, and 0.1% KMS and 91.65% water solution. Then the materials poured into air tight plastic container. container.

Storage periods: 10 months









Extension of shelf life of banana through scrubber

Banana treated and packed in;

- Polyethylene bag without scrubber and
- •Packed in polyethylene bag with scrubber.

Results/Output

Maximum shelf life and less ripening were observed in fruits treated with scrubber and packed in polyethylene bag

Prolonging shelf life of banana

- Mature banana (sabri, sagar and Champa) of uniform size, shape and colour were harvested from the farmers field carefully.
- The banana treated with different postharvest treatments like
- arments (based by bag lyethylene bag with ethylene absorber cated and

Results/Output

Fruits packed in partially vacuum polyethylene bag (Banavac) were green and fresh up to 21days storage while it was 7days (champa) and 9days at ambient condition (28-32°C)

Effect of different ripening methods on quality of banana Treatments Factor A: Variety with two levels (1. BARI Kola-1 and Sabri) Factor B: Postharvest treatments with nine levels

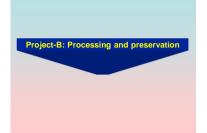
- Bo- Control B1=. Ripen-15; 250 ppm B2= 3. Ripen-15; 500 ppm B3= Ripen-15; 750 ppm B5= Ripen-15; 1000 ppm

- d heated for 24 hours Factor C: Packaging techniques with two levels

Results/Output: Fruits heated in Tundur at 31.3°C for 18 hours and packed in non-perforated poly bag prolonged the shelf life with good quality

Effect of ripening chemical on the quality of banana

- Different concentrations of ethrel solution viz. without ethrel, 2,4,6,8 and 10ml ethrel/l of water were used for ripening of banana (Nepali sagar)
- Banana treated with 8and 10ml/l of water had activated very early (3days) and more uniform ripening than untreated banana (9days).
- Untreated banana was light yellowish colour and medium soft texture while treated banana showed attractive yellowish colour and very soft texture.



Preparation of Banana chips

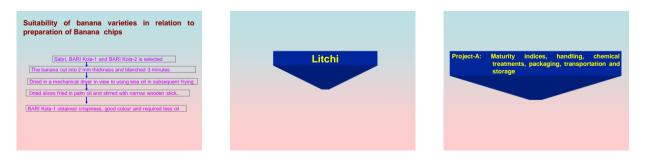
Fully mature banana is taken and peeled
The banana cut into 2 mm thickness and blanched 3 minutes
Dried in a mechanical driver in view to using less oil in subsequent frying
Dried slices fried in palm oil and stirred with narrow wooden stick.
When slices obtained light yellow colour, the chips put out from saucepan
Mixed with fasting salt and spices in a bowl
Processed chips packed in metalex foil pouch and stored in ambient temperature (28-32 $^{\circ}$ C)



Osmotic dehydration of banana
Ripe banana is selected
Washing with clean water
Cut into 2-3 mm slices
Dipped in 45°B sugar syrup containing 1000 ppm KMS and 0.50% citric acid for 1.5hours
The slices are dehydrated at 60°C in a mechanical dryer for three days
Dehydrated banana packed in HDPE pouches and stored at ambient condition
·
The shelf-stable of the products are 2 months

	banana , deep colour tomato, matured papaya and ripe tamarind is o prepare pulp
	The double amount of water is added with pulp
Calculated	sugar and salt mixed with pulp and cooked in a sauce pan
Grinded	spices with onion and garlic are binded in a thin cloth and put into the pulp and stir continuously
All	calculated ingredients are added gradually in a saucepan.
Sodium	benzoate is added as preservative when TSS became 21-26
The pr	ducts are poured into pre-sterilized glass bottle at ambient condition





Extension of shelf life of litchi

Treatments Factor: packaging techniques Ao=Without package A1= Sealed polyethylene bag A2 =0.5% perforated polyethylene bag

A3= browning paper) Factor B: Storage techniques B0= Ambient condition B1=Zero energy cool chamber and B2= Refrigerator temperature (5-7°C)).

Results/output Fruits packed in sealed polyethylene bag (0.09mm thickness) and kept in refrigerator had the maximum shelf life(105 days)

Project-B: Processing and preservation

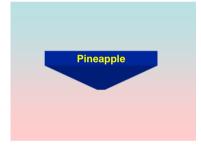


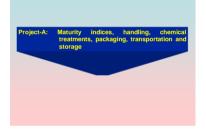
Preservation of Litchi in syrup solution

Preservation of litchi and jackfruit slices in glass or plastic container covering with 30-40^o B sugar syrup makes the product shelf stable stable.



Storage periods: 12 months





Extension of storage life of pineapple

The fruits (var. Giant kew) treated with SO2 and hot water and packed in perforated polyethylene bag at ambient condition increased the storage periods 21days compared to sealed polyethylene bag.

Storage at low temperature

Factor A: postharvest treatments Factor B: storage condition

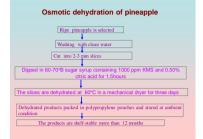
Bo=Refrigerator and B1=Deep freeze

Results/Output The blanched fruit and stored in deep freeze had better considering its retention of colour, texture, less weight loss and spollage.

Project-B: Processing and preservation

Preparation of pineapple candy
Matured and half ripen pineapple is taken
Washing with clean water
Cut into 1x 0.5x 0.5 cm pieces
Blanch the pieces in hot water at 95°C for 4 minutes
Immerse in 2% calcium lactate and 0.1% KMS for 2 hours
Drain and dip into 25, 35,45, 50, 60 and 70°B after 12 hours interval
Drain the slices and wash with clean water to remove adhering syrup
Dry at 70°C in a cabinet dryer until the moisture content reach at 10%
Pour the product into polypropylene pouch
Store the product at room temperature (28-32°C)



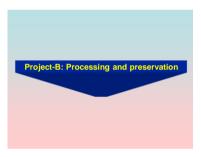


Preservation of pineapple in syrup solution

Pineapple preserved in 30-40°B syrup solution and poured into glass container. The products containing glass container were exhausted and preserved in ambient condition. The shell fife of the products more than one year

L	Matured pineapple is collected from the Research field
	Washing with clean water and cut into slices
	lices treated with firming agent and dried as per principle o mat drying
	•
F	coam is created in the starry by incorporation of egg albumin followed by the air incorporation in a blender
F	





Optimization of processing methods for guava pulp preservation
Guava sliced and cooked with addition of water at the ratio of

ITUIL LO WALEF 2.1	
The citric acid (1g/kg) and KMS	(200ppm) added with pulp
Then the pulp is poured into	pre-sterilized glass container
1	
The treated pulp is stored a	at ambient condition (28-32oC).

Preparation of guava fruit cheese
The guava pulp was mixed with sugar at the ratio of 1:15
Amount of butter and salt is calculated as 5.25 and 0.15% on the basis
of weight of pulp solid and sugar
Adding of acidity depends on the amount by subtracting the content of acid present in the pulp
Sugar, citric acid and butter added and cooked up to TSS become 85°B
· · · · · · · · · · · · · · · · · · ·
Then cooking is stopped and immediately spread on the trays with 0.6cm thickness
The fruit cheese cut into 3cmX6cm slices and packed into polypropylene pouches and stored at ambient condition for one year
······



Project-A: Maturity indices, handling, chemical treatments, packaging, transportation and storage

Minimization of Postharvest Losses of Papaya through Improve Postharvest Practices Papaya treated with different postharvest treatments;

 Papage sector

 * Wash with tap water

 • Wash with chlorine

 * Treated in hot water and

 • Treated in hot water with sodium hypochlorite)

Results/Output

Restlitutouput Treated papaya performed better compared to untreated *Postharvest diseases, physiological loss in weight and bruising could be minimized by wrapping without excessive deterioration *Physical damage could be minimized by using plastic rate.

Preparation of papaya candy
Fully matured papaya is taken
Washing with clean water
Cut into 1X0.5X0.5 cm slices
Blanch the pieces in hot water at 95°C for 4 minutes
Immerse in 2% calcium lactate and 0.1% KMS for 2 hours
Drain and dip into 25, 35,45, 50, 60 and 70%B after 12 hours interval
Drain the slices and wash with clean water to remove adhering syrup
Dry at 70°C in a cabinet dryer until the moisture content reach at 10%
Pour the product into polypropylene pouch
Store the product at room temperature (28-32°C)

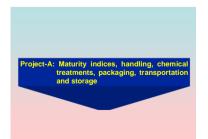


Papaya candy

Preparation of mixed papaya jelly

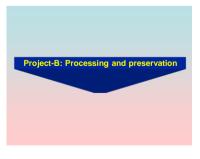
Taken mixed fruit golden apple, sweet orange, papaya and guava
The double amount of water is added with pulp
Calculated sugar and salt mixed with pulp and cooked in a sauce pan All calculated ingredients are added gradually in a sauce pan
 All calculated ingredients are added gradually in a saucepan
 The pectin and citric is added when the TSS reached at 55°B and 58°B
 Sodium benzoate is added (before 2-3 minutes) and cooking is
 stopped, when the jelly reached at 66° Brix
 The products are poured into pre-sterilized glass bottle at ambient condition





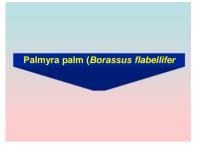
- Marketable life and quality of ber as affected by storage condition and packaging

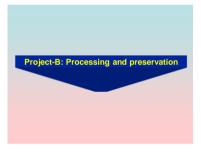
 Fresh fruits of ber variety, BARI Kul-2 were harvested at colour turning i.e. greenish-yellow stage from Fruit Research Farm and packed in 0.5% perforated polythene bag and non-perforated polythene bag after removing field heat
- Then the packed fruits put into plastic crates and CFB carton
- Stored at ambient condition and zero energy cool
- The marketable life of fruits packed in non-perforated polythene bag kept in plastic crates was 5.75 days followed by ambient condition (4.50 days).



Preparation of mixed ber and tamarind chutney
Dried ber and tamarind is taken
The ber and tamarind mixed at the ratio of 1:0.20
Seeds of ber and tamarind not removed
All calculated spices are powdered
All measure powdered were added gradually
The glacial acetic acid is added before 2 minutes of cooking stopped
Then the products were poured into pre-sterilized glass bottle
Products are poured into pre-sterilized glass bottle and stored ambient condition (28-32°C)







Preservation of Palmyra palm

Pulp is extracted and the pulp is strained After straining the pulp is poured into MST cellophane package Then the packages is sealed and stored at -20°C for six months

Preparation of candies from immature palmyra palm seed
Immature seed of palmyra palm
Seeds are beeled and cut into eight pieces
The slices treated with preservative and firming agent
The slices are pricked, blanched and then kept into 25°B sugar solution
By slow heating, concentration of syrup maintained into 70°B for candies
The prepared candies packed in polypropylene pouches
The products were shelf stable more than one year

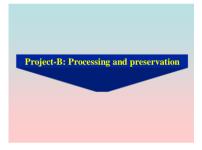
Formulation of jam from palmyra palm The fruit was washed with clean water Peeled and kneaded with flumb adding one-third water of peeled fruit The extracted pulp was filtered by thin clean cloth All calculated ingredients are added gradually in a saucepan The peelin and citric is added when the TSS reached at 55°B and 55°B Softum horacete is added (before 3.3 minutes) and cooking is atopped, when the jelly reached at 66° Brix The predicts are poured into pre-sterilized glass battle at amhient condition Palmyra palm jam



Extension of shelf life of wax jambu

The fruits packed in polyethylene bag and kept in refrigerator had the maximum shelf life (15 days) compared to ambient condition.



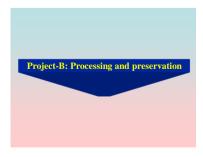


Preparation of mixed jam from golden apple Taken mixed fruit golden apple, bael, papaya and guava The fruits mixed at the equal amount of pulp Calculated sugar and sait mixed with pulp and cooked in a sauce pan All calculated ingredients are added gradually in a saucepan All calculated ingredients are added gradually in a saucepan The pectin and citric is added when the TSS reached at 55°B and 58°B Sodium benzoate is added (before 2-3 minutes) and cooking is stopped, when the jelly reached at 55°B rix The products are poured into pre-sterilized glass bottle at ambient condition

Preparation of mixed jelly from golden apple
Taken mixed fruit golden apple, bael, papaya and guava
The juice is extracted from the fruits and mixed at the equal amount of water
Calculated sugar and salt mixed with pulp and cooked in a sauce pan
All calculated ingredients are added gradually in a saucepan
The pectin and citric is added when the TSS reached at 55°B and 58°B
Sodium benzoate is added (before 2-3 minutes) and cooking is stopped, when the jelly reached at 65° Brix
The products are poured into pre-sterilized glass bottle at ambient condition

Preparation of golden apple fruit cheese
The pulp is collected and mixed with sugar at the ratio of 1:14
Amount of butter and salt is calculated as 5.25 and 0.15% on the basis of weight of pulp solid and sugar
Adding of acidity depends on the amount by subtracting the content of acid present in the pulp
Sugar, citric acid and butter added and cooked up to TSS become 85°B
Then cooking is stopped and immediately spread on the trays with 0.6cm thickness
The fruit cheese cut into 3cmX6cm slices and packed into polypropylene pouches and stored at ambient condition for one year

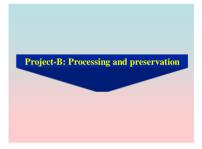




Preparation of Indian olive pickle
Olive is taken, washed and cut into three pieces
The pieces are salt cured with 10% brine for 24 hours
Ginger and garlic is sliced and made paste with addition of equal amount of water
All calculated spices are powdered
Turmeric and chilli powder is mixed with ginger and garlic paste
Mixture is added with leftover oil and all powdered spices are added gradually
Salt and acetic acid is added
and cooked up to complete removal of water Products are poured into pre-sterilized glass bottle and stored ambient condition

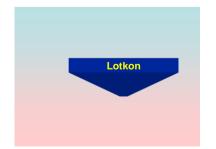






Preparation of chutney from Indian dillenia
Mature Indian delania is taken and washed with clean water
The fruits is sliced like finger
The slices are cooked in a pan with equal amount of water for an hour
Eighty percent fibres are removed from this pulp
All measure powdered spices are added gradually
The glacial acetic acid is added when TSS reached at around 56°B
The cooking is stopped when TSS reached at around 62°B
The products poured into pre-sterilized glass bottle and stored ambient condition





Project-A: Maturity indices, handling, chemical treatments, packaging, transportation and storage

Effect of different storing technique on shelf life of lotkon

Lotkon were kept under different packaging and storage conditions. Fruits packed in sealed poly bag with ethylene absorber under refrigerator had the maximum shelf life compared to without ethylene absorber.



Project-B: Processing and preservation

Formulation of bael jam
Ripe bael is taken and washed with clean water
The bael is broken. Seeds, fibres and other mucilage's removed
The water is added with equal to the weight of pulp
All calculated ingredients are added gradually in pulp
The pectin and citric is added when the TSS reached at 58°B and 65°B
Sodium benzoate is added (before 2-3 minutes) and cooking is stopped, when the jelly reached at 66° Brix
The products are poured into pre-sterilized glass bottle at ambient condition



Preparation of bael beverage
Ripe bael is taken and washed with clean water
The bael is broken. Seeds, fibres and other mucilage's removed
The bael pulp (16%), sugar (11.07), citric acid (0.28%), KMS (0.06%), carboxy methyle cellulose (CMC: 0.2%) and water is taken
Carboxy memyre centrose (onio, o.2.76) and water is taken
Sugar and citric acid mixed with water and the mixture was heated to prepare syrup
Then CMC mixed with hot syrup, cooled and blended for 2 minutes
1
Blended beverage again filtered through a fine mosquito net
KMS is added and stirred thoroughly for uniform mixing
The products are poured into pre-sterilized glass bottle at ambient condition



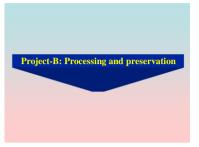




Preparation of Tamarind sauce
Ripe tamarind was taken with seed and washed with clean water
The double amount of water is added with pulp
Seeds and fibres are removed by sieving mash
The mixed pulp cooked with adding all calculated ingredients
Grinded spices with onion and garlic are binded in a thin cloth and put it into the pulp and stir continuously
Sodium benzoate is added and cooking is stopped, when the jelly reached at 45° Brix
The products are poured into pre-sterilized glass bottle at ambient condition





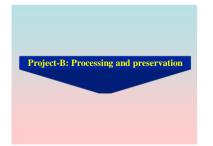


Preservation of green coconut water	
The water is taked from green coconut	
The green coconut water is heated at 90 and/or 100°C for 10 minutes	5
The heated water is poured into pre-sterilized bottle	
The product is stored at ambient condition	
The product was shelf-stable up to 6 months storage periods	

Optimization of processing parameters for coconut candy

- Different amounts of sugar and rice malt are used with same amounts of coconut milk and flavoring materials
- Fifty percent coconut milk +25% rice malt + 25% sugar
 The products were shelf-stable up to 6 months of storage.

Aonla (Emblica officinalis)



Preparation of aonla candy
Fully matured aonla is taken
Washing with clean water
By separating seed, aonla is cut into four pieces
Aonia slices pricked by bamboo made stick
Immerse in 2% calcium lactate and 0.1% KMS for 2 hours
Drain and dip into 25, 35,45, 50, 60 and 70°B after 12 hours interval
Drain the slices and wash with clean water to remove adhering syrup
Dry at 70°C in a cabinet dryer until the moisture content reach at 10%
Pour the product into polypropylene pouch
Store the product at room temperature (28-32°C) for 6 months





Constraints of Postharvest Technologies in Bangladesh

- Lack of linkage among the different government organizations, universities and private organizations at national level
- Inadequate national policy to develop and disseminate postharvest technologies of indigenous fruits at end user level
- fruits at end user level Lack of adequate training programme on positarvest technologies of indigenous fruits and their cold chain management Lack of Research strategy to develop full positharvest technological packages for individual
- crops

Constraints of Postharvest Technologies in Bangladesh Lack of cold chain management practices from harvest to consumption level

- to consumption level Lack of users especially growers and wholesalers response to adopt the postharvest Technologies
- High cost of improve postharvest practices compared to traditional practices traditional practices Lack of consumers' awareness to purchase improved postharvest technological products Lack of entrepreneur's interest to invest money on processing and preservation of indigenous fruits

- Lack of promotional activities to encourage the SMEs to enhance Postharvest Technologies of indigenous fruits

Constraints of Postharvest Technologies in Bangladesh

- No special program for loan with minimum interest for
- * High cost of the equipments
- Abuse of ripening chemicals

Opportunities

- Through developing large, medium and small scale processors in Bangladesh
- Increased indigenous fruit production and its processed products
- The application of Good Agricultural Practices (GAPs), Good Manufacturing practices (GMPs), Total Quality Management (TQM) and HACCP principles to the whole chains

Developing postharvest technologies of indigenous fruits with their diversified products

- To develop simple low-cost postharvest technologies for small scale farmers
- Retaining nutritive value through value addition Establish integrated postharvest Horticulture management, training and Services Center
- Develop value chain and supply chain of horticultural
- Develop linkage among SMEs, University, Research and Private organizations

Conclusion

- Some of the post-harvest technologies of indigenous fruits are already developed and very popular among the users and contributing a lot in increasing income and nutritional status
- status There is a tremendous scope to develop cold chain and integrated postharvest management and services centre in Bangladesh
- norease consumption of processed products will prevent the incidence of mainutrition disorders and generate more income to the farmers and traders
- It is therefore, high time to minimizing postharvest losses of indigenous fruits through improved postharvest practices especially cold chain management



