DFRL’s Technologies for Value Added Coconut Products

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Food processing is mainly to preserve food as well as it is also needed to:

- Ensure safety (kill microorganisms)
- Increase digestibility
- Increase shelf life (destruction of enzymes, toxins)
  - Help in improving palatability and organoleptic quality (texture, flavor, color)
- Increase seasonal availability of many foods
- Develop new products
CONSUMERS REQUIREMENTS

- QUALITY
- SAFETY
- MINIMUM OR NO ADDITIVES / PRESERVATIVE
- PACKAGING
- SHELF STABILITY
- ACCEPTABILITY
- CONVENIENCE
- COST
ENTREPRENEURS EXPECTATIONS

- PROVEN TECHNOLOGY
- EASILY MARKETABLE
- TOTAL TECHNOLOGY TRANSFER
- COST EFFECTIVE
**Coconut**

- Coconut is the most important palm of the humid tropics with over 11 million hectares planted with the crop in 86 countries.
- About 96% of the crop is grown by poor smallholder farmers.
- 80 million people depend directly on coconut and its processing for their livelihood.
- Coconut industry, from cottage to large mill scales employs millions of low skill laborers.
- The commodity chain also involves processors, traders, exporters, importers/consumers, researchers and other stakeholders both in the producing and importing countries.
- In addition to the traditional products of copra, coconut oil and copra meal, coconut has the advantage of producing a wide variety of food and environment friendly non-food products which are used both domestically and for the export market.
- In some countries, coconut is the only source of foreign exchange earnings.
- Coconut has also been a stabilizing factor in the farming systems of marginal and fragile environments.
Prospects for Coconut Industry Development in India

Post harvest processing is confined to the production of edible and milling quality copra, coconut oil and coir and coir based products.

S&T research is successful in evolving appropriate processing technologies for the profitable utilization of selected products and by-products of coconut palm.

To encourage products diversification and by-products utilization in the industry.

Significant increase in coconut cultivation, production and productivity.

Growth of product development and by-product utilization are lower than other countries like Philippines, Indonesia, Thailand etc.,

Value added coconut based food products which offer possibilities for commercial production are desiccated coconut, coconut cream, tender coconut water, coconut milk based products, coconut jaggery, and other industrial products (non-edible products).
Constraints to Technology Development

- Inadequate support extended for coconut processing technology development
- Low priority on coconut technological research in the research institutes
- Major emphasis has been on agricultural research
- Low priority for coconut industry at the national level, as its contribution to the national economy is insignificant
- Geographical variations in the quality of coconuts
- Development and application of improved processing technologies especially in the area of product diversification and by-products utilization
Effect of geographical variations on the coconut characteristics

<table>
<thead>
<tr>
<th>State</th>
<th>Nut Wt. (g)</th>
<th>Husk Wt. (g)</th>
<th>Husked Nut Wt. (g)</th>
<th>Water Wt. (g)</th>
<th>Shell Wt. (g)</th>
<th>Kernel Wt. (g)</th>
<th>Copra Wt. (g)</th>
<th>Oil Wt. (g)</th>
<th>Oil (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Karnataka</td>
<td>979.0</td>
<td>583.0</td>
<td>396.0</td>
<td>71.0</td>
<td>114.67</td>
<td>210.0</td>
<td>117.67</td>
<td>71.33</td>
<td>67.53</td>
</tr>
<tr>
<td>Tamilnadu</td>
<td>979.0</td>
<td>1001.67</td>
<td>471.0</td>
<td>93.67</td>
<td>131.33</td>
<td>246.33</td>
<td>125.0</td>
<td>78.67</td>
<td>68.61</td>
</tr>
<tr>
<td>Kerala</td>
<td>1373.31</td>
<td>882.46</td>
<td>490.85</td>
<td>108.45</td>
<td>113.75</td>
<td>286.65</td>
<td>148.15</td>
<td>93.34</td>
<td>71.12</td>
</tr>
<tr>
<td>Andhra Pradesh</td>
<td>1213.0</td>
<td>804.5</td>
<td>408.5</td>
<td>86.0</td>
<td>102.5</td>
<td>220.5</td>
<td>104.0</td>
<td>63.0</td>
<td>68.05</td>
</tr>
<tr>
<td>Orissa</td>
<td>1159.67</td>
<td>722.67</td>
<td>437.0</td>
<td>101.67</td>
<td>111.33</td>
<td>224.0</td>
<td>116.67</td>
<td>63.67</td>
<td>65.10</td>
</tr>
</tbody>
</table>
Socio-Economic Constraints on the Development of the Coconut Sector

- Identification of the social and economic constraints to participation by smallholders in replanting and/or rehabilitation programmes
- Factors affecting adoption/non-adoption of new technologies
- Policy regulations and constraints
- Market constraints and opportunities
- Institutional development
DFRL’s CONTRIBUTIONS
<table>
<thead>
<tr>
<th>Enhancements</th>
</tr>
</thead>
<tbody>
<tr>
<td>NATURAL - NUTRITIOUS - HEALTH DRINK</td>
</tr>
<tr>
<td>CONSUMED BY ALL AGE GROUPS</td>
</tr>
<tr>
<td>CHARACTERISTIC DELICATE FLAVOUR (LACTONES)</td>
</tr>
<tr>
<td>MEDICINAL PROPERTIES</td>
</tr>
</tbody>
</table>
# Tender Coconut Water Composition

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage or Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>WATER</td>
<td>95%</td>
</tr>
<tr>
<td>PROTEIN</td>
<td>0.1%</td>
</tr>
<tr>
<td>FAT</td>
<td>&lt;0.1%</td>
</tr>
<tr>
<td>MINERALS</td>
<td>0.4%</td>
</tr>
<tr>
<td>CARBOHYDRATES</td>
<td>4.0%</td>
</tr>
<tr>
<td>MICROBIOLOGICAL QUALITY</td>
<td>STERIAL</td>
</tr>
<tr>
<td>MINERAL COMPOSITION</td>
<td>(PER 100 ML)</td>
</tr>
<tr>
<td>SODIUM</td>
<td>100 mg</td>
</tr>
<tr>
<td>POTASSIUM</td>
<td>290-320 mg</td>
</tr>
<tr>
<td>CALCIUM</td>
<td>25 mg</td>
</tr>
<tr>
<td>MAGNESIUM</td>
<td>30 mg</td>
</tr>
<tr>
<td>PHOSPHROUS</td>
<td>35 mg</td>
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</table>
PROBLEMS IN TENDER COCONUT MARKETING

- WIDE VARIATION IN QUALITY AND QUANTITY
- QUALITY DETERIORATION AFTER THE PLUCKING FROM TREE
- BULKY- TRANSPORTATION COST ADDITION- STORAGE AND HANDLING PROBLEMS
- HOLDING WITH SMALL AND MARGINAL FARMERS
- SOLD IN UNORGANISED SECTOR
DFRL PROCESSING TECHNIQUE FOR TENDER COCONUT WATER

- STANDARDIZATION OF ADDITIVES & THEIR CONCENTRATION
  (BIO PRESERVATIVES: 5 mg/ L & NON NUTRITIVE SWEETENER: 50 mg/ L)

- STANDARDIZATION OF HEATING REQUIREMENTS

- STANDARDIZATION OF SUITABLE PACKAGING SYSTEMS
  - FLEXIBLE: PET/PP – STAND UP POUCHES
  - PET/ ALUMINIUM FOIL /PP
  - CANS: ALUMINIUM CANS- 200 ML & 330 ML CAPACITY WITH EASY OPEN ENDS
  - BOTTLES: PP

- SHELF LIFE: 12 AT AMBIENT CONDITIONS

- SALIENT FEATURES: SIMPLE – LOW CAPITAL – INDIGENOUS – AMENABLE TO INDIAN INDUSTRY – EXPORT POTENTIAL

- TECHNOLOGY TRANSFER: 19 FIRMS IN THE COUNTRY.
TECHNOLOGY FOR PRESERVATION OF COCONUT SAP (NEERA)

- ERIOPHYID MITE / BLACK CATERPILLAR DISEASE ATTACK ON TENDER COCONUT
- ESTIMATED LOSS - 12 CRORE NUTS (KARNATAKA) - VALUE APPROXIMATELY 30 CRORE
- COCONUT SAP HIGHLY SUSCEPTIBLE FOR MICROBIOAL SPOILAGE – FERMENTATION PROBLEM
# QUALITY ATTRIBUTES OF NEERA

## COMPOSITION OF NEERA

<table>
<thead>
<tr>
<th>Component</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specific gravity</td>
<td>1.058 - 1.077</td>
</tr>
<tr>
<td>Total solid (g/100 ml)</td>
<td>15.2 - 19.7</td>
</tr>
<tr>
<td>Sucrose (g/100 ml)</td>
<td>12.3 - 17.4</td>
</tr>
<tr>
<td>Total Ash (g/100 ml)</td>
<td>0.11 - 0.41</td>
</tr>
<tr>
<td>Protein (g/100 ml)</td>
<td>0.23 - 0.32</td>
</tr>
<tr>
<td>Ascorbic acid (mg/100 ml)</td>
<td>16.0 - 30.0</td>
</tr>
</tbody>
</table>
ADVANTAGES IN NEERA PRESERVATION

- NATURAL DRINK
- EXTENDED SHELF STABILITY
- RURAL ECONOMY IMPROVEMENT
- VALUE ADDITION
- REDRESSAL MEASURE FOR FARMERS
DFRL PRESERVATION TECHNIQUE FOR COCONUT SAP (NEERA)

- CENTRIFUGATION TECHNIQUE
- STANDARDIZATION OF ADDITIVES CONCENTRATION
- STANDARDIZATION OF IN-PACK PASTEURIZATION
- STANDARDIZATION OF PACKAGING SYSTEMS – POLYESTER / ALUMINIUM FOIL / POLYPROPYLENE (PET/AL.FOIL/PP)

SHELF STABILITY

- 3 MONTHS UNDER REFRIGERATED CONDITION
- 12 MONTHS UNDER AMBIENT CONDITION
Tender coconut water was blended with different fruit juices

Lemon, mango, pineapple, blue grapes, apple, pomegranate, etc. to increase the palatability as plain tender coconut water has bland taste

The products were found highly acceptable
Tender and mature coconut water with suspended kernels (lemon flavoured)

Tender / mature coconut water with and suspended kernels

Kernels treated to remain in suspended form as well as to avoid discoloration in the coconut water

Increase the palatability

Increase in nutritive value

Shelf stable for 6 months under ambient storage conditions

M/s Subicsha Coconut Producer Company Ltd., Calicut
Mature coconut water beverage blended with lemon juice

2% Lemon Juice is optimum & 13.5°Brix

Processed by in-pack pasteurization for 15 minutes

Increase the palatability

Increase in nutritive value
Marmalade type coco jam from Tender and Mature coconuts

Prepared as such from the tender pulp with addition of sugar, pectin and acid

Mixed fruit jam can also be developed from tender coconut pulp with incorporation of pineapple pulp

Jam prepared from tender coconut was found to be stable for 6 months

Jam prepared from mature coconuts was stable for 4 months under ambient storage conditions
### Instant coconut chutney

**DEHYDRATION – REDUCED MOISTURE CONTENT**

**NO RANCIDITY PROBLEM**

**EXCELLENT REHYDRATION PROPERTIES IN COLD WATER AS SUCH**

**SHELF STABILITY – 6 MONTHS UNDER AMBIENT CONDITIONS**

**VAST MARKET POTENTIAL – HOTELS AND RESTAURANTS – FAST FOOD CHAINS – LOW CAPITAL – SIMPLE PROCESS TECHNIQUE**

_M/s Southern India Spice and Essences, Thiruvananthapuram_
VCO meal based compressed bar

Prepared by mixing the ingredients such as VCO meal, pineapple powder, sweet potato powder, skim milk powder, green gram powder, gooseberry powder, powdered sugar, cashews, raisins and cardamom powder with date syrup and compressed to develop bars.

- Increased the palatability
- Increased in nutritive value
- Increased sensory attributes
- Stable 9 months under ambient storage conditions
VCO meal based biscuits

Prepared by using VCO meal, desiccated coconut, sieved wheat flour and baking powder along with measured quantity of water

Biscuits rich in protein, fibre, carbohydrate content

Stable 6 months under ambient storage conditions

M/s Subicsha Coconut Producer Company Ltd., Calicut
VCO meal based noodles

Prepared VCO meal based noodles at the level of 10%

Enrich in protein, fibre, carbohydrate content

Increased the palatability

Increased in nutritive value

Increased sensory attributes

Stable 6 months under ambient storage conditions
VCO meal based halwa

Instant wheat sooji (semolina)-halwa mix with better nutritional attributes

VCM incorporated instant halwa mix was found to possess good nutritional and sensory attributes

It provides energy of 523.86 Kcal / 100g

Stable for about 12 months under ambient storage conditions
VCO meal based porridge

Porridge comprises of VCO meal, pineapple powder, sweet potato powder, gooseberry powder, skim milk powder, green gram powder, sugar and flavorings.

It can be consumed as such as well as it can be reconstituted in water or milk.

Stable for a period of 10 months under ambient storage conditions.

VCO meal based ladoo

Prepared by using wheat flour, hydrogenated fat, powdered sugar, cashew nut and desiccated coconut powder.

It can be consumed as such.

Stable for a period of 4 months under ambient storage conditions.
FUTURE THRUST

- DEVELOPMENT OF VALUE-ADDED FOOD PRODUCTS
- DEVELOPMENT OF NEWER PROCESSING TECHNIQUES / PRESERVATION METHODS
- DEVELOPMENT OF NEWER PACKAGING CONCEPTS
- DEVELOPMENT OF VALUE-ADDED INDUSTRIAL AND NON-EDIBLE PRODUCTS
- SETTING OF CLEAR GOALS AND OBJECTIVES
- MISSION APPROACH
- IDENTIFICATION OF FOCUS AREA
THANK YOU