FOOD PROCESSING – EMERGING AREAS

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Cereal Products

Bakery Products

Beverage Products

Convenience Foods

Food machinery design

Fruit and Vegetable Products

Meat and Marine Products

Microbiology and Fermentation

Plantation and Spice Products

Protein Specialty Foods

Technologies to suit Cottage/ Tiny, Small, Medium and Large scale units
CSIR-CFTRI TECHNOLOGIES: A BIRD’S EYE VIEW

K. VENKATESH MURTHY. SENIOR PRINCIPAL SCIENTIST
1950
Transformation of Cheluvamba Mansion to CFTRI

1950s
- Community Nutrition
- Protein Energy Malnutrition
- Preventing post harvest losses

1960s
- Amul – First indigenous infant formula
- Supplementary Foods
- Oleoresins & Spice oils
- International Center for training in Food Science & Technology (FT)

1970s
- Convenience & Instant Foods
- Food Research in response to Societal Needs
- Adaptable technologies for rural areas
- Synergizing value addition to agri resources
- Safe food protectants

1980s
- Spirulina Technology
- Package know-how for export of tropical fruits

1990s
- Mechanisation of traditional food machinery
- Food Safety & Food Quality
- CFTRI's global reach, infrastructure to match contemporary development

2000 & beyond
- Nutrition, Nutraceuticals and Functional Foods
- Food Security
- Food Sustainability
- Eco-friendly technologies
- Biotechnology as effective tool
- Nutrigenomics
- Food from Paediatrics to Geriatrics
Parboiling – CFTRIs method

Better methods for curing paddy and rice

Artificial ageing

Steaming paddy

Cure-while you store rice- Modified Atmosphere

Optimally milled brown rice

Rice with slow carbohydrate digestibility

Restructured Rice

Fortified Rice
Improved methods for production of Wheat Germ and wheat germ based products

COMPARABLE TO ANIMAL PROTEIN

Source of **Glutathione**- Mother of all antioxidants; Rich in B group of vitamins

Products developed: Milk, Eggless cake mix, whitener etc
Ragi rice (Decorticated Ragi) and its diversified uses

Totally new, innovative product, non-existent hitherto
Can be cooked similar to rice

Decorticated Finger Millet
(Cooked Ragi Rice)

Expanded Finger Millet
Malt based health beverage

- Based on finger millet malt
- Contains about 14% protein compared to 8-9% of the market sample
- Contains about 450 mg/100g of calcium (almost of 1/3rd of the RDA) from the natural source

<table>
<thead>
<tr>
<th>NUTRIENT</th>
<th>VALUE (g/100g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>4.4±0.01</td>
</tr>
<tr>
<td>Ether extractives</td>
<td>3.2±0.06</td>
</tr>
<tr>
<td>Protein</td>
<td>14.5±0.07</td>
</tr>
<tr>
<td>Total Carbohydrates (by difference)</td>
<td>70±1</td>
</tr>
<tr>
<td>Dietary fibre</td>
<td></td>
</tr>
<tr>
<td>Soluble</td>
<td>1.55</td>
</tr>
<tr>
<td>Insoluble</td>
<td>1.72</td>
</tr>
<tr>
<td>Total</td>
<td>3.27</td>
</tr>
<tr>
<td>Ash</td>
<td>4.3±0.01</td>
</tr>
<tr>
<td>Calcium (mg/100g)</td>
<td>449±5</td>
</tr>
<tr>
<td>Iron (mg/100g)</td>
<td>4.9±0.1</td>
</tr>
<tr>
<td>Zinc (mg/100g)</td>
<td>1.9±0.3</td>
</tr>
<tr>
<td>Carbohydrate digestibility</td>
<td>96.3±1.01</td>
</tr>
</tbody>
</table>
Extruded product

Bakery products
• Ragi malt
  
  Dry blend (5% ragi)
  Instant blend (20 – 25% ragi)

• Malted weaning food (60 – 70% ragi)

• Infant food (~12 - 13% ragi)

• Enteral food (~18% ragi)

• Beverages/ drink mix
  - Ragi seed coat (Ready to cook)
  - Ready to drink

• Food for diabetics (~40% decorticated ragi)
Pulse milling

**Features**
- Capacity: 100 – 150 kg/h
- Power: 16 HP
- Space: 8 x 12 m
- Dehulling: ~98%
- Yield of dhal: ~75 – 78%
- Breakage: ~1 – 2%

**Features**
- Capacity: 250 – 300 kg/h
- Power: 2 HP (2 x 1 HP) single phase
- Foot print: 2 x 1.2m x 2m

**Mini Dhal Mill**
- Suitable for bolder pulses

**Versatile Dhal Mill**
- 2000 large scale dhal mills
- 2000 Mini dhal mills - UNDP
SPICE / CURRY POWDERS

NATURAL FOOD COLOURS
- Increasing awareness on use of natural colorants
- Safety data available for selected colorants
- Colorants developed from: Blue grapes, Kokum Fruits, Safflower petals, Turmeric, Chill, Annatto, Marigold, Beet root, Coffee
- Color shade can be adjusted by blending

OILS & OLEORESINS
Innovative process for the production of turmeric powder

1. Fresh turmeric rhizomes
2. Grading/separation
3. Slicing
4. Drying
5. Dried turmeric slices
6. Grinding/Powdering
7. Colouring
8. Drying
9. Turmeric Powder
10. Sieving
11. Packing
12. Process time: 10-15 days

- Hygienic Turmeric powder
- Cycle time within 24 h
- Higher yield – 10-15% (no polishing loss)
- Higher curcumin and volatile oil content
Coconut based products

Virgin Coconut Oil by Wet Processing

Freeze Dried Coconut Bites

Vacuum Dried Coconut Bites

Oven Dried Coconut Bites

Sugar Coated Coconut Bites

Coconut beverage from tender coconut
Processing neera into shelf-stable products

**PREMIUM NEERA**

- Process assures unfermented and safe neera
- Colour & taste close to original neera
- Microbiologically safe
- Nutritious drink
- Consistent quality
- Enhanced stability: TWO MONTHS at RT

**PREMIUM NEERA CONCENTRATE**

- On dilution with water (1:5 or 1:6) is almost like FRESH NEERA
- Shelf life: 180 days

Neera....

† A sugar containing juice (Coconut sap)

† Highly susceptible for spontaneous fermentation

† becomes ‘toddy’ after fermentation

Coconut sap was provided by M/s Palakkad Coconut Producers' Company Ltd., Mudhalamada under MOU signed with CFTRI to develop various products.
Sugarcane juice

Cleaning

Hygienic Crusher

Processing & bottling

Sugarcane Beverage

Shelf life: 4 months (in glass bottles)
Coffee concentrate

- Instant Filter Coffee
- Two months shelf-life at RT
- Mix approximately 5 ml concentrate for a 100 ml of coffee. Add milk & sugar to taste....
SPIRULINA – NUTRACEUTICAL FOOD

- A Cyanobacterium / Blue Green Alga
- Rich source of protein (about 60-65%); vitamins, minerals and γ - linolenic acid
- A nutritional supplement to provide protein, vitamins and minerals
- Rich source of Phycocyanin, a blue pigment with applications in food, cosmetics and pharma sector
- Technology available for outdoor cultivation for small and industrial scale.
- Technology transferred to several entrepreneurs
Processing of Sesame

Dehulling (wet process)

Dehulling (dry process)

Heat resistant white sesame seed
Hurdle technology for preservation of Indian traditional sweets and snack foods

- Prevention of bacterial growth
- Prevention of oxidative rancidity
- Destruction of yeasts, molds & vegetative bacteria
- Prevention of moisture loss/gain, oxidative rancidity & microbial contamination

Better quality and nutrition compared to sterilized products
Technologies for

Ready to eat Idly, Paddu and Dosa  
  – 8 weeks shelf life; need refrigerated storage

Ready to bake Chapathi  
  – 6 months shelf life

Ready to eat Chapathi  
  – 6 months shelf life

Ready to eat Sambar and Chutney  
  – 8 weeks shelf life; need refrigerated storage

Ready to eat Indian traditional sweets
Laddu, Sweet boondi, Doodh peda, Jamoon, Rasagolla, Bombay halwa, Milk burfi, Coconut burfi, etc.  
  – 3 to 6 months shelf life
RTE Foods in Retort pouches
Minimally processed vegetables

- Raw material
- Dicing
- Surface drying
- Pretreatment
- Packing & sealing
- Finished product
- Storage
- Trimmed product
- Finished product
- Pretreatment
- Dicing
- Surface drying
- Packing & sealing
- Storage
<table>
<thead>
<tr>
<th>Vegetable</th>
<th>Leaf/Leafy Vegetable</th>
<th>Root/Other Vegetable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ash gourd</td>
<td>Coriander leaves</td>
<td>Mint leaves</td>
</tr>
<tr>
<td>Beet root</td>
<td>Curry leaves</td>
<td>Okra</td>
</tr>
<tr>
<td>Beans</td>
<td>Cucumber</td>
<td>Onion</td>
</tr>
<tr>
<td>Bitter gourd</td>
<td>Drumsticks</td>
<td>Plantain</td>
</tr>
<tr>
<td>Carrot</td>
<td>Field Beans</td>
<td>Ridge gourd</td>
</tr>
<tr>
<td>Cabbage</td>
<td>Fenugreek leaves</td>
<td>Snake gourd</td>
</tr>
<tr>
<td>Cauliflower</td>
<td>Green peas</td>
<td>Spinach leaves</td>
</tr>
<tr>
<td>Cluster beans</td>
<td>Green chillies</td>
<td>Tomato</td>
</tr>
<tr>
<td>Coccinia</td>
<td>Knol-khol</td>
<td>Turnip</td>
</tr>
</tbody>
</table>
Modified atmosphere packaging of vegetables
Gelatin from dried fish skin

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Skin (w/w%)</th>
<th>Skin gelatine (w/w%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>74.68</td>
<td>9.20</td>
</tr>
<tr>
<td>Protein</td>
<td>19.40</td>
<td>89.20</td>
</tr>
<tr>
<td>Fat</td>
<td>2.85</td>
<td>0.48</td>
</tr>
<tr>
<td>Ash</td>
<td>0.56</td>
<td>0.85</td>
</tr>
</tbody>
</table>

Moisture content in gelatin well below the prescribed limit of 15% for edible gelatin
Machinery
**BIOPLATE MACHINE**
- Low cost
- Value addition to agro waste material
- Biodegradable, environment friendly product
- About a million machines in operation

**LEMON CUTTER**
- For Cottage pickle industry
- High productivity
- Simple operation

**PAPAD PRESS**
- Easy to operate, manual process
- Uniform quality products
- Widely used by cottage industries and women entrepreneurs
1. Amla Candy
2. Composite ragi bread
3. Fruit spreads
4. Ginger dehydration and bleaching
5. Green chilli sauce
6. Protein enriched buns
7. Ready-to-use dosa batter
8. Ready-to-use idli batter
9. Turmeric curing and polishing
10. Refined Millet flour
11. Cereal flakes: Rice
12. Papad press – Hand operated
13. Rice-Milk Mix
14. Papad press – Leg operated
TECHNOLOGY TRANSFER FROM CFTRI

- Identification of the CFTRI technology by the entrepreneurs
- Payment of premium to CFTRI by the entrepreneurs
- Signing of License Agreement
- Technical dossier to the Licensee
- Demonstration of process know-how, at CFTRI, Mysore
- Participation of two authorized representatives in the demonstration-cum-training
- One to one discussion with the concerned faculty and quality control procedure
USER ORIENTED SERVICES OF CFTRI

- Analytical and Quality Control for Food Industries
- Industrial Consultancy to Industries
- Contract Research for Product Development and Trouble-Shooting in Food Processing Sectors (Technical Services)
- Sensory Assessment and Consumer Acceptance Studies
- Packaging Materials Testing & Food Packaging Assistance
- Need Based Bibliography in Food Science and Technology
- DPR for Establishing Food Industry/ Food clusters
- HRD & Training
CONTRACT RESEARCH

✓ Sponsored Projects
✓ Consultancy Projects
✓ Technical Services Projects

With interim reviews/ mid course corrections
Customer feedback for further improvement
Thank You

Happy to take your Questions & Suggestions!
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