DIVERSIFIED INITIATIVES IN COMMUNITY BASED FOOD FORTIFICATION TO ENHANCE NUTRITION AND HEALTH IN WESTERN KENYA

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Dr. Rhoda Nungo, KALRO –FCRI
THE PROBLEM

Persistent malnutrition with high levels of stunting nationally at 26%.

Western Kenya in 6 counties:
1. Migori       26.4%      2. Siaya       24.7%
3. Bungoma      24.4%      4. Vihiga      23.5%
5. Busia        22.0%      6. Homabay     18.7%
UNDERLAYING CAUSE

Lack of Knowledge in Nutrition, Diet Diversity and Food Fortification

Complicated by:
- Poor feeding habits
- Culture and stigmatization of certain foods
- Under estimation of Indigenous knowledge.
OBJECTIVES

(1). Develop nutrient-enhanced, consumer-acceptable cassava product and Finger millet based Ready-to-use-Food.

(2). Train willing small scale entrepreneurs in development and promotion of nutritious food products.
WHY LIMITED SKILLS IN FOOD FORTIFICATION

- Small scale Entrepreneurs (SMEs) not conversant with diversified Food Fortification and safety for nutritious food products.

- Expensive food processing equipment.

- Complicated laws and regulations for SMEs to understand and adhere to.
MATERIALS AND METHODS

- Products formulated at KALRO
- Food materials and equipment purchased or sourced locally and assembled in a homestead.
PROCESSING PRODUCT 1

1: Scrap off soil and Peel.        2: Wash and Grate
3: Sieve with Coconut sieve.  4: Mix in soya bean flour
PROCESSING 1 CONT---

5: Ferment on wooden plunks.
6: Sun-dry on raised surface
7: Sieve in a wooden frame.  
8: Roast on open-fire
9: Ready product, cool and pack.  10: Cyanide determination
SENSORY EVALUATION

11: Product preparation

12: Women farmers Taste and select 2 products.
NUTRIENT AND MICROBIOLOGICAL ANALYSIS

- Crude Protein, determined by the micro-Kjeldahl (AOAC 1975: 984.13) method,

- βeta-carotene, determined by column chromatography and spectrophotometer as described by Pearson, (1978).

- Microbiological analysis for products safety from coliforms and staphylococcus aureus carried out using the standard laboratory methods in food and dairy microbiology (Harrigan and McCance (1966)).
PROCESSING PRODUCT 2

MATERIALS USED:

- Finger millet,
- Soya beans,
- Groundnuts,
- Local brown sugar,
- Home processed red palm oil,
- Minerals and vitamins.
PROCESSING PRODUCT 2

METHODS USED:

- Germination, sun-drying, roasting and milling Finger millet.
- Soaking, boiling, sun-drying and milling soya beans:
- Roasting and de-hullling Groundnuts
- Mixing and pasting all ingredients.
- Nutrient analysis
TRAINING SMEs

The processing of products was carried out by Potential Small and Medium Scale Entrepreneurs as part of Community involvement.
RESULTS and DISCUSSIONS

Two Nutrient Enhanced products
### RESULTS and DISCUSSIONS

Table 1: Results for Product Sensory evaluation. (N =43)

<table>
<thead>
<tr>
<th>Product</th>
<th>Appearance</th>
<th>Taste</th>
<th>Flavour</th>
<th>Acceptability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product1</td>
<td>4.53 ± 1.45b</td>
<td>4.63 ± 0.85b</td>
<td>4.51 ± 1.55b</td>
<td>4.19 ± 1.03b</td>
</tr>
<tr>
<td>Product2</td>
<td>5.98 ± 1.18a</td>
<td>5.44 ± 1.03a</td>
<td>5.72 ± 1.05a</td>
<td>5.88 ± 1.00a</td>
</tr>
<tr>
<td>Product3</td>
<td>5.63 ± 1.59a</td>
<td>5.37 ± 1.09a</td>
<td>5.77 ± 1.15a</td>
<td>5.95 ± 1.27a</td>
</tr>
<tr>
<td>Product4</td>
<td>3.93 ± 1.82d</td>
<td>4.84 ± 1.38b</td>
<td>4.60 ± 1.45b</td>
<td>4.53 ± 1.32b</td>
</tr>
<tr>
<td>Product5</td>
<td>4.16 ± 1.57c</td>
<td>2.74 ± 1.48c</td>
<td>2.47 ± 1.16c</td>
<td>2.47 ± 1.20c</td>
</tr>
</tbody>
</table>

*Evaluation done on 7-point hedonic scale. Score 4 acceptable lower limit.*
RESULTS and DISCUSSIONS

- Product2 and Product3, selected for high acceptability, 6.25, 5.42: 6.04, 5.84 mean values. These products had been incorporated with 5%:10% soya bean flour.
- Product4 with 20% soya bean flour had a very thin consistency, panelists wanted a thick consistency of high satiety value.
- Product5, least acceptable and below expected score lower limit of 4.00. Product had been prepared using the “Quick unplanned method” which should never be practiced.
## RESULTS and DISCUSSIONS

### Table 2: Nutrient and HCN compared to FAO/KEBS

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Product2</th>
<th>Product3</th>
<th>FAO</th>
<th>KEBS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protein g</td>
<td>4.99</td>
<td>6.21</td>
<td>N/D</td>
<td>N/D</td>
</tr>
<tr>
<td>Vitamin A mg</td>
<td>137.50</td>
<td>287.50</td>
<td>N/D</td>
<td>N/D</td>
</tr>
<tr>
<td>HCN/ppm/kg</td>
<td>10</td>
<td>5</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>
## RESULTS and DISCUSSIONS

### Table 3: Microbiological load results as mean values

<table>
<thead>
<tr>
<th>Product Number</th>
<th>Total Count per ml</th>
<th>Coliform count per ml</th>
<th>Staphylococcus count per 0.5ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product2</td>
<td>6.35x10^2 cfu</td>
<td>No coliform cfu count at 10^-1</td>
<td>No cfu count at 10^-1 dilution</td>
</tr>
<tr>
<td>Product3</td>
<td>6.25 x 10^2 cfu</td>
<td>2.0 x10^2 cfu</td>
<td>No cfu count at 10^-1 dilution</td>
</tr>
</tbody>
</table>

The low coliform count and absence of staphylococcus indicate high personnel handling and good hygienic conditions during processing and hence products safe for consumption.
**RESULTS and DISCUSSIONS**

Table 4. Nutrient of product compared to marketed RTUF

<table>
<thead>
<tr>
<th>Product name</th>
<th>Nutrient Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Energy  Kcal</td>
</tr>
<tr>
<td>Study product /100g</td>
<td>445.9</td>
</tr>
<tr>
<td>Plumpy’Doz /100g</td>
<td>534</td>
</tr>
<tr>
<td>Supplementary Plumpy/100g</td>
<td>545</td>
</tr>
</tbody>
</table>

Source of RTUFs in the Market*, WFP [https://www.wfp.org/nutrition/special-nutritional-products](https://www.wfp.org/nutrition/special-nutritional-products)
STUDY OUTCOME 1

Cassava Gari Branded: ‘WITABIXS MTAANI’
Produced, sold and enjoyed by both Children and Adults in Nambale, Busia County.
STUDY OUTCOME 2

Small scale entrepreneur: EASTCOM FOODS in Siaya county taken up product production challenge,
2: Moved to the next level, Kenyan RTUF Branded “TAMUU FIMSNUTS”,
3: Certified by KEBs, Bar coded and Free from Afflatoxins.
4: Product successfully used by the Vulnerable.
CONCLUSIONS

- Food Fortification at community level using diversified food is possible with adequate supervision.
- Use of locally grown foods familiar to communities may lead to increased production and consumption for enhanced Nutrition and Health.

- Use of locally available cereals and legumes could provide RTUFs that are cheaper and accessible.

- Locally made RTUFs have the potential to contribute to reduction of malnutrition for both children and the vulnerable and reduce poverty in developing countries.
RECOMMENDATIONS

1: Multi-Stakeholders to validate the products efficacy to enable wider use.

2: Create awareness and promote products in the wider Kenya community.

3: Make other RTUF products using Sorghum, Pearl millet with Pigeon peas/Green grams to give more options for other counties with high levels of malnutrition.
REFERENCES

Chelule et al, (2010)
KEBs, (2010).
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COLLABORATORS

Dr. Rhoda Nungo¹, Prof. M. Okoth², Dr. C.A.Oduori¹, Mr. D. O. Ajaku³ and Prof. A. Makokha¹

Contact details: Rhoda A. Nungo, rhodazik@gmail.com, +254 724687774
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