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Taste Panel Studies on Foods Made from Fortified Wheat and Maize Flours

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Scope: Impact of Iron Fortification on typical foods consumed in East and Southern Africa and South East Asia

Lead Investigators: Philip Randall, Annoek van den Wijngaart

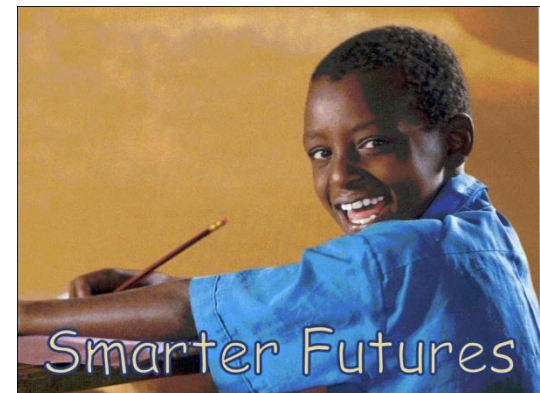
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Flour Fortification Initiative

A Public-Private-Civic Investment in Each Nation

21/42010



Rationale

- Many wheat and maize based foods consumed in South and East Africa are also consumed in Middle East
- Wheat flour export markets for Middle East mills include both South and East African countries and South East Asian countries such as Philippines and Indonesia
- Mandatory flour fortification is becoming the norm and a requirement for doing business

Methodology: South and East Africa

- Three Countries – Kenya, South Africa, Tanzania
- Three iron sources for wheat flour – EDTA, Fumerate, Sulphate @ WHO Guideline level for consumption 75 – 149 g/person/day
- Two iron sources for maize meal – EDTA and Fumerate @ WHO Guideline level for consumption > 300 /person/day

Methodology 2: South and East Africa

- Wheat flour and Maize meal sourced in country – all vehicles could be considered “medium to high” extraction
- Finished product prepared and evaluated under “local conditions and methods”
- Retention samples kept in each country for re-evaluation under local millers shelf life instructions i.e. “cool and dry” conditions – after 3 or 6 months.

Methodology 3: South and East Africa

- Pan Bread – open top
- Chapatti – high extraction flour
- Porridge
- Stiff “porridge” – Ugali/Posho

Wheat Flour Pre-Mixes donated by DSM South Africa



South Africa: Collaborators

- SAGL (Southern Africa Grain Laboratory) a SANAS accredited laboratory using an industry accepted methodology (IAM 018) for test baking wheat flour
- Due to mandatory fortification (instituted 2003) the trial used “cake flour” instead of “bread” flour.

Tanzania: Collaborators

- Bakhresa – Buguruni Wheat Mill
- Bakhresa – Mzizima Maize Mill
- Tanzanian Food & Nutrition Centre (TFNC)
- All used in-house Nationally accepted methodology based on recognised international practice

PAN BREAD - Findings

	Control	EDTA	Fumerate	Sulphate	Control 2
SAGL	Satisfactory	Slightly dark. Spotting. Faint taste but satisfactory	Satisfactory	Satisfactory	Slightly dark
Tanzania Mill	Satisfactory	Spotting. Satisfactory	Faint taste but satisfactory	Satisfactory	N/A
Tanzania TFNC	Relative colour intensity – Sulphate/Control/EDTA/Fumarate Nothing significantly detectable and none considered unacceptable				N/A
GROUP					

PAN BREAD - Findings

	Control B	EDTA E	Fumarate D	Sulphate A	Control 2 C
SAGL	Satisfactory	Slightly dark. Spotting. Faint taste but satisfactory	Satisfactory	Satisfactory	Slightly dark
Tanzania Mill	Satisfactory	Spotting. Satisfactory	Faint taste but satisfactory	Satisfactory	N/A
Tanzania TFNC	Relative colour intensity – Sulphate/Control/EDTA/Fumerate Nothing significantly detectable and none unacceptable				N/A
GROUP +ve	16%	11%	8%	26%	0%
GROUP -ve	11%	34%	11%	11%	30%
Group Undecided	63%	56%	71%	63%	70%

RSA Flour

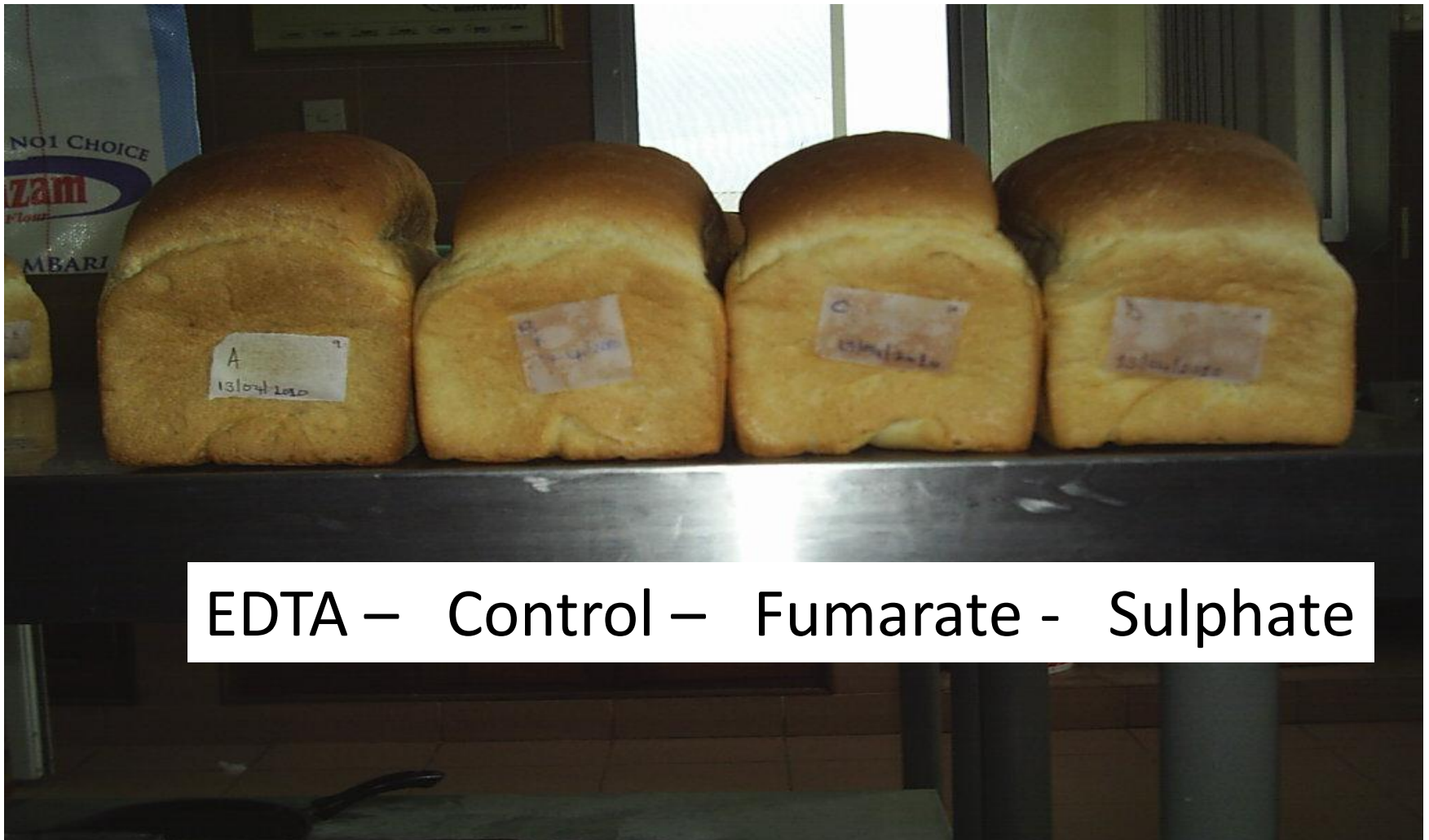


Control 2 – Sulphate – Fumarate – EDTA - Control

RSA Flour



Tanzanian Wheat Flour - Mill



EDTA – Control – Fumarate - Sulphate

Tanzanian Wheat Flour - Mill

EDTA - Control



Fumarate - Sulphate



Tanzanian Flour - TFNC

Bakhressa TFNC

EDTA–Control–Fumerate-Sulphate



Sulphate-Control-EDTA-Fumerate



Tanzanian Flour - TFNC

Bakhressa TFNC

EDTA–Control–Fumerate-Sulphate



Sulphate-Control-EDTA-Fumerate



Chapatti's

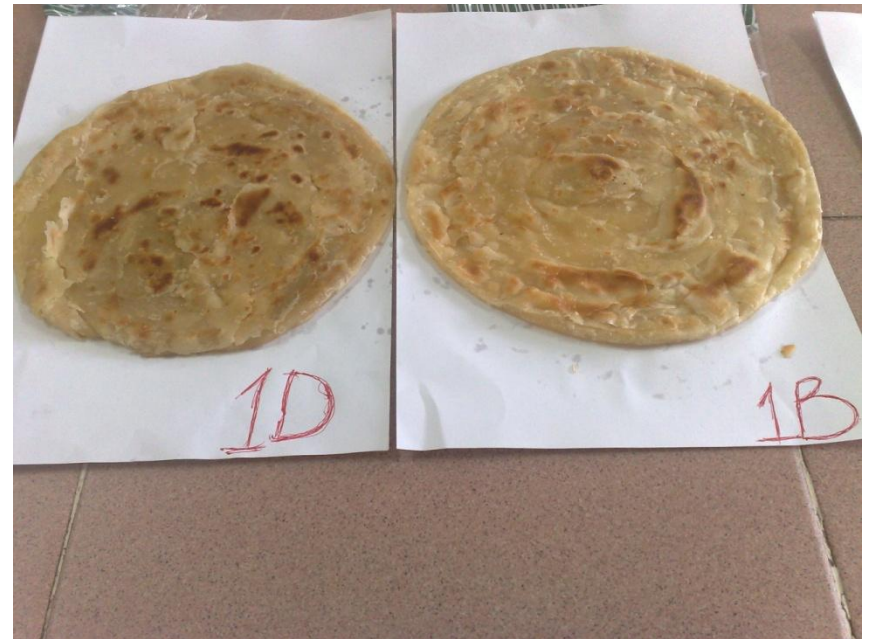
	Control	EDTA	Fumerate	Sulphate
Tanzania Mill	Satisfactory	Slight green brown colour and faint aroma	Satisfactory	Faint green brown colour
	All samples had satisfactory eating characteristics			
Tanzania TFNC	Control "shinier" (more attractive) All samples had satisfactory eating characteristics			

Tanzanian Wheat Flour - Mill

EDTA - Control



Sulphate - Control



Tanzanian Wheat Flour - Mill

Fumarate - Control



Tanzanian Wheat Flour - TFNC



Mill - TFNC

EDTA - Control



Sulphate- Control

EDTA - Fumerate

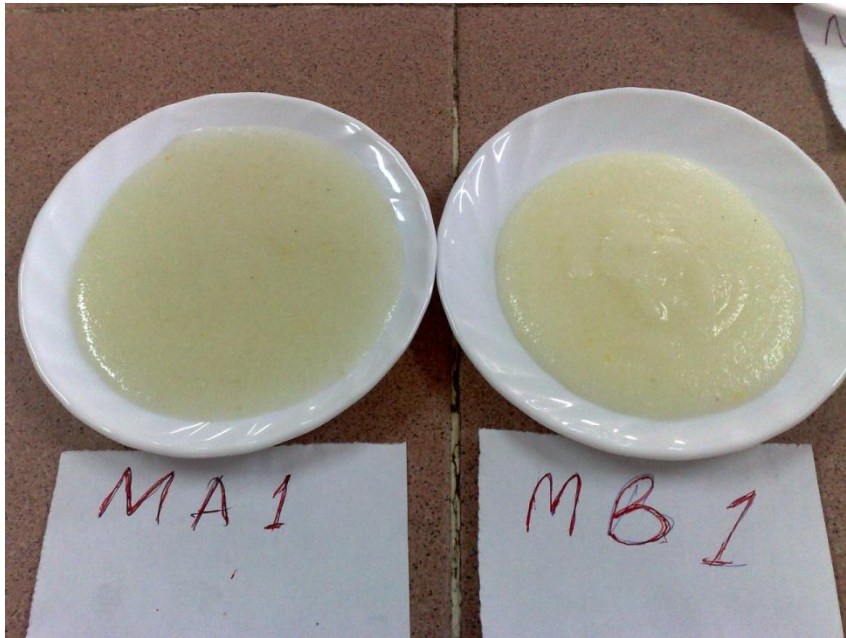


Maize Porridge

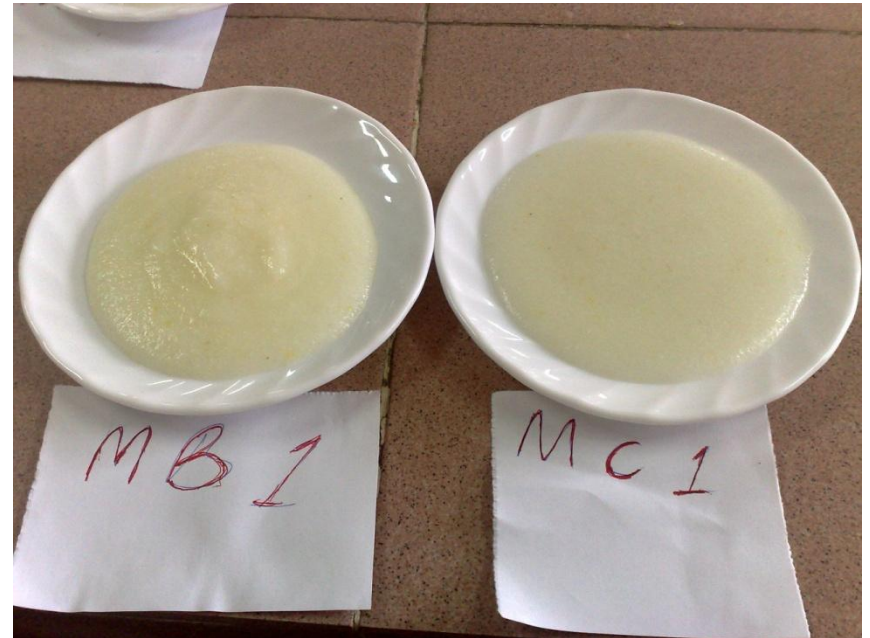
	Control	EDTA	Fumerate
Tanzania Mill	“Some slightly different colour” with EDTA and Fumarate described as faintly “greenish white” when directly compared to each other but all considered acceptable.		
Tanzania TFNC	No differences noted – all acceptable.		

Tanzanian Maize Meal - Mill

EDTA - Control



Control - Fumerate



Tanzanian Maize Meal - TFNC



Tanzanian Maize Meal - TFNC



Impact on Asian Food Products

- Lead Collaborator: Annoek van den Wijngaart, Flour Fortification Initiative, Jakarta, Indonesia

South East AsiaResults: Noodles

Foods	Results
Wet noodles	Overall insignificant changes.
	NaFeEDTA slightly darker (Indonesia), no other differences in texture, taste, aroma.
	Spots on dough sheet (Philippines), but no differences texture, taste, aroma
Yellow alkaline noodles	Slight but acceptable differences in sensory characteristics of noodles
Instant noodles	No significant differences in processing properties, slight but acceptable changes in sensory characteristics, firmness and colour

South East Asia Results: Bread

Foods	Results
Steamed bread	<p>Acceptable end product.</p> <p>Slight changes: NaFeEDTA slightly darker, ferrous fumarate slightly lighter (Indonesia), no differences in texture, taste aroma.</p> <p>Grayishbrown spots in dough (Philippines) but acceptable end product.</p>
Pan bread	<p>No differences in colour, texture, flavour, taste and overall acceptability (Sri Lanka)</p> <p>Slight difference in colour- NaFeEDTA slightly darker, no differences texture, taste aroma (Indonesia).</p>
Sandwich bread	<p>No sensory differences, slight colour differences (more yellow) between control and fortified, firmness same (Malaysia) - Normal but greyish spots were visible, slight differences in crust but acceptable (Philippines)</p>
Soft rolls	<p>In dough normal but greyish brown spots (Philippines), acceptable finished product</p>
Hard crust rolls/baguettes	<p>In dough normal but greyish brown spots, acceptable finished product (Ph)</p>

Results (others)

Foods	Results
Martabak	Colour slightly darker with NaFeEDTA, no differences for texture, taste aroma (Indonesia)
Roti (canai)	No differences in sensory (Malaysia)- No differences in terms of colour, texture, flavour, taste and overall acceptability of the product (Sri Lanka)
Chapatti	NaFeEDTA is overall preferred
Puri	Control least preferred, ferrous sulphate most preferred overall
Pittu	all acceptable, slight colour differences
Godambaroti	all acceptable, slight colour differences
String hoppers	all acceptable

Overall Conclusions

- Overall minimal difference between fortified and non-fortified products.
- Minimal reported differences between products fortified with different iron compounds.
- Overall acceptability of fortified products same as control.
- It is possible to fortify African and Asian foods with flour fortified as per the current WHO recommendations.