Baking Trials with fortified flour

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Methodology 1

- 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

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

Methodology 3

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

BREAD

	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/Fumerate Nothing significantly detectable and none rejectable				N/A
GROUP +ve	16%	11%	8%	26%	0%
GROUP -ve	11%	34%	11%	11%	30%
Group Undecided	63%	56%	71%	63%	70%

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			

Porridge

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

2nd Phase

- Repeat tests of flour stored at premises of collaborators
- Introduce new samples using NaFeEDTA at 20 ppm in all wheat and maize products (previously 40 ppm and 15 ppm)
- NO control to be used in this last test

Results

- South Africa and Tanzania both reported - Similar comments but on different iron sources
- Kenya reported – Similar comments but with a slight overall decrease in acceptability; age a more contributory factor?
- All reported no problems with 20 ppm NaFeEDTA

Current Thinking

- Problem is one of perception not reality
- NaFeEDTA at 40ppm may be problematic in bread – though not tested it is more than likely in maize too – add cautionary note in WHO Guidelines?
- NaFeEDTA at 20ppm no problems noted
- No problems either with Ferrous sulphate or fumerate.

Methodology and Technical Issues

Why No Control?

- Do controls exist in “real” life?
- All industry samples EASILY passed in-house acceptability scores (scoring high 90’s rather than min 75).
- Are we making too much of the “remarks” column – we did imply differences?

Is “spotting” real or a pigment of our imagination?

- Spotting has been seen on a few occasions:

SAGL – original flour – EDTA on bread crust

SAGL – old flour – both controls on bread crust

Buguruni – original flour - EDTA in bread dough

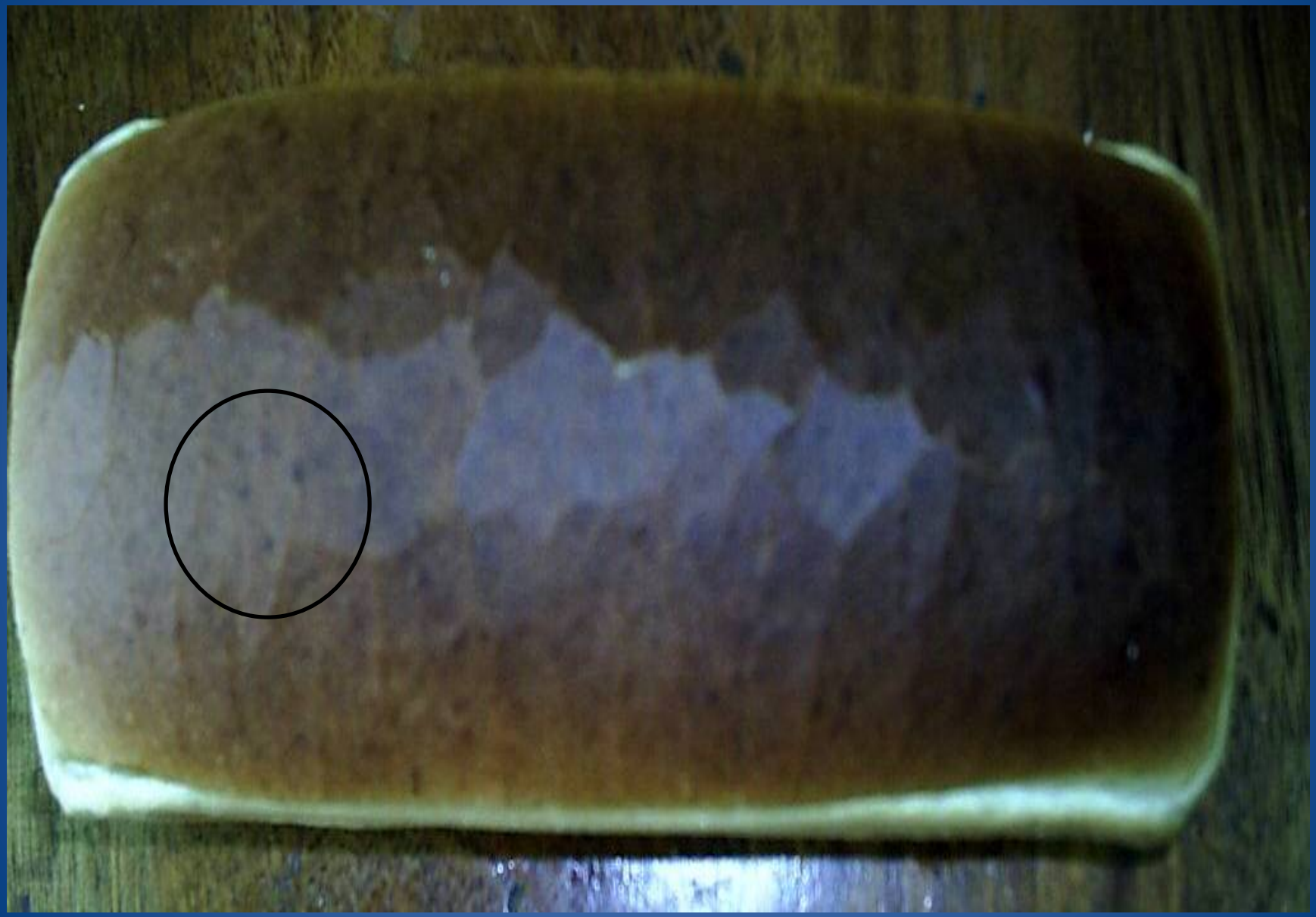
Buguruni – old flour – Sulphate in bread dough and on bread crust

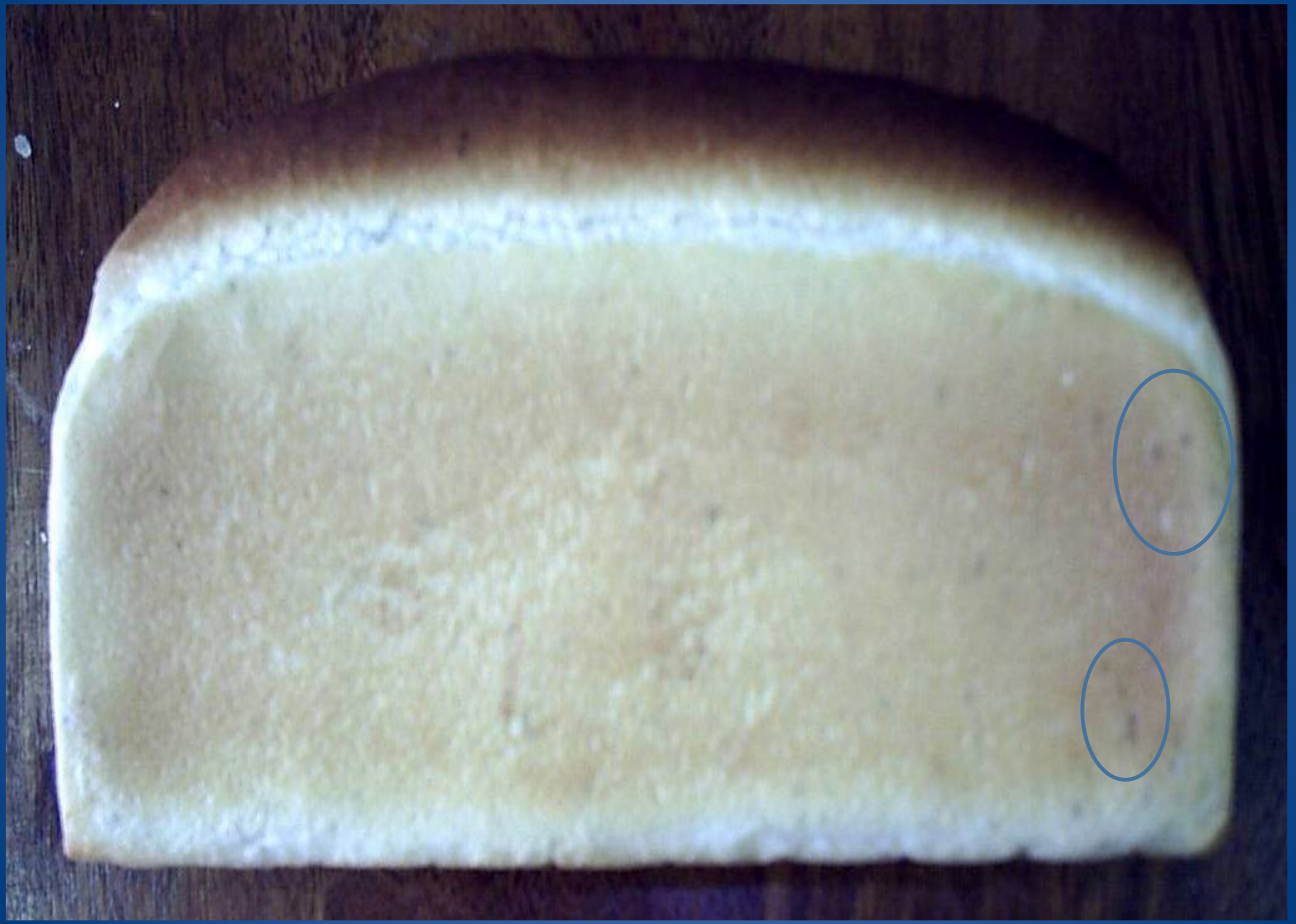
- This begs the questions:

"Are we looking for problems?"

"Would anyone but us actually notice?"

See the following photographs and then make up your mind:






A

Kenyatta University – Some Observations

5 = Neither like nor dislike

6 = Like slightly

7 = Like Moderately

Colour

Bread

	Control	EDTA	Sulphate	Fumerate
April 2010	6.9	7.1	7.2	7.3
Oct 2010	6.8	6.2	6.4	6.8
20ppm		7.2		

Chapatti

	Control	EDTA	Sulphate	Fumerate
April 2010	6.9	6.8	7.2	7.7
Oct 2010	6.5	6.9	5.9	6.7
20ppm		6.9		

	Ugali		
	Control	EDTA	Fumerate
April 2010	7.7	7.6	7.2
Oct 2010	7.2	6.6	6.8
20ppm		6.7	

	Uji		
	Control	EDTA	Fumerate
April 2010	7.3	6.9	7.0
Oct 2010	5.9	6.0	6.3
20ppm		6.6	

Overall Liking

Bread

	Control	NaFeEDTA	Sulphate	Fumerate
April 2010	7.0	6.9	6.8	7.1
Oct 2010	7.0	5.8	6.2	6.4

Chapatti

	Control	NaFeEDTA	Sulphate	Fumerate
April 2010	6.6	6.5	7.5	6.3
Oct 2010	6.2	6.3	4.9	6.0

	Ugali		
	Control	NaFeEDTA	Fumerate
April 2010	7.5	7.2	6.7
Oct 2010	6.4	6.5	5.6

	Uji		
	Control	NaFeEDTA	Fumerate
April 2010	6.9	6.8	6.5
Oct 2010	5.8	5.9	6.5

- Fortification of wheat flour and maize meal with different iron compounds: Results of a series of baking trials
- Philip Randall, Quentin Johnson, and Anna Verster
- http://www.ingentaconnect.com/content/nsinf/fnb/2012/00000033/A00304s3/art00011?crawler=true

- Regulatory monitoring systems of fortified salt and wheat flour in selected ASEAN countries
- Annoek van den Wijngaart, France Bégin, Karen Codling, Philip Randall, and Quentin W. Johnson
- http://nsinf.publisher.ingentaconnect.com/content/nsinf/fnb/2013/00000034/a00102s1;jsessionid=6ehjj9g1vbt9j.alice

Nigeria

- 3 wheat mills
- 1 maize mill
- NaFeEDTA at 25 and 40 ppm

Units mg/Kg	Normal	Scenario 1	Scenario 2
Vitamin A	10	2	2
Vitamin B1	2.4	6	6
Vitamin B2	1.5	5	5
Vitamin B3	16	45	45
Vitamin B6		6	6
Folic acid	1.5	2.6	2.6
Vitamin B_{12}		0.02	0.02
NaFeEDTA		25	40
Electrolytic iron	16		
Zinc	20	50	50