

Carbohydrate composition, viscosity, solubility and sensory acceptability of sweetpotato- and maize-based complementary foods

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Outline

- Background
- Methods
- Results & Discussion
- Limitation
- Conclusion
- Recommendation



Awesome scenery,
Queenstown, NZ



Background, the gloomy picture

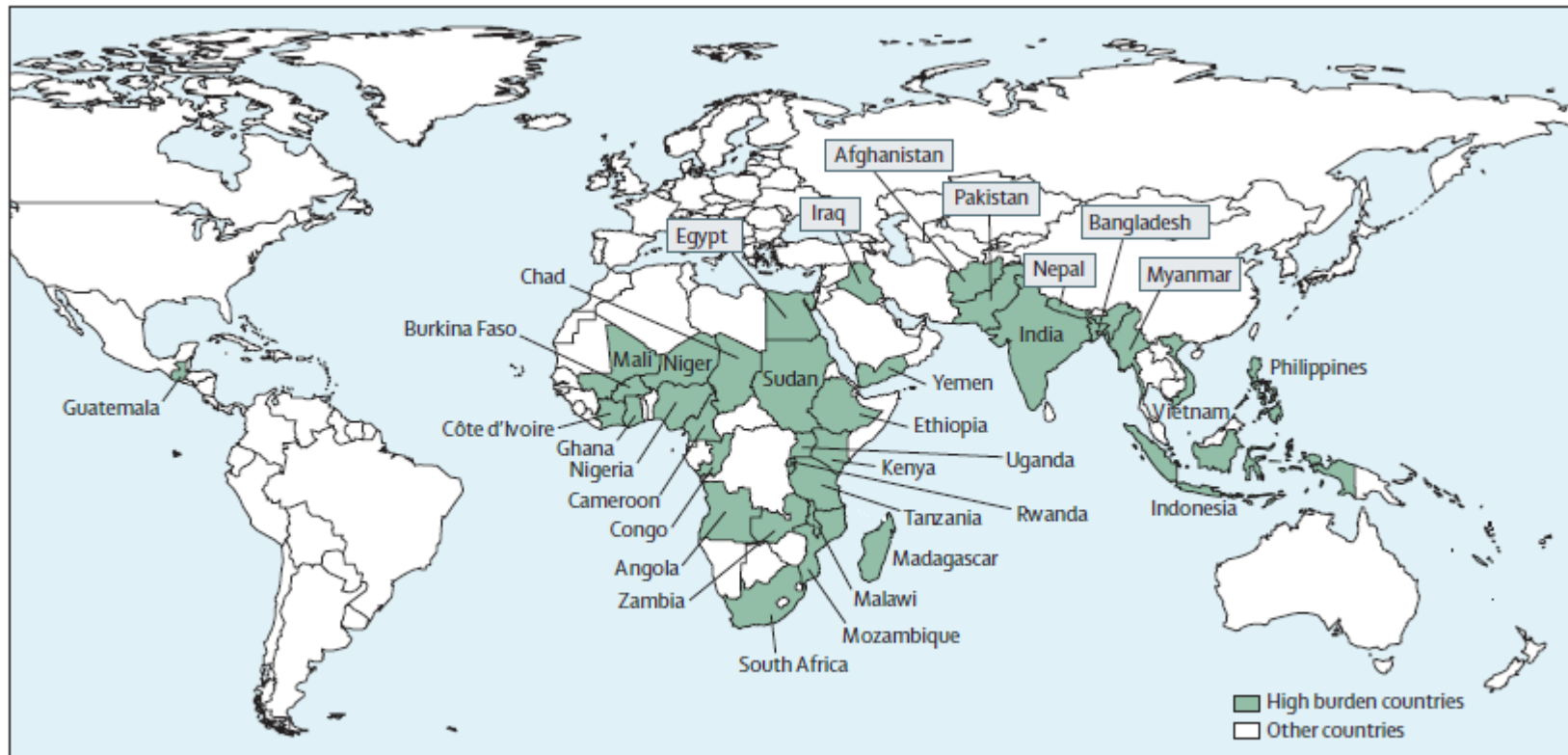


Figure 3: Countries with the highest burden of malnutrition
These 34 countries account for 90% of the global burden of malnutrition.

Bhutta Z A *et al.* Evidence-based interventions for improvement of maternal and child nutrition: what can be done and at what cost? *The Lancet*, 2013, Epub ahead of print



Background *Contd*

- “Deficiencies of **vitamin A** and zinc result in deaths; deficiencies of iodine and iron, together with stunting, can contribute to children not reaching their developmental potential.”

Black R E *et al.* Maternal and child undernutrition and overweight in low-income and middle-income countries. *The Lancet*, 2013: Epub ahead of print

- “However, evidence of the nutritional effect of agricultural programmes is inconclusive—**except for vitamin A from biofortification of orange sweet potatoes**—largely because of poor quality evaluations.”

Ruel M T *et al.* Nutrition-sensitive interventions and programmes: how can they help to accelerate progress in improving maternal and child nutrition? *The Lancet*, 2013, Epub ahead of print



Background *Contd.*

- To address VAD, the **ComFa** complementary food blends- **cream-fleshed** sweetpotato, soyabean, oil, fish powder/skimmed milk were developed as alternative to maize-soyabean-groundnut blend (Weanimix)*
- Both the sweetpotato- and maize-based met the energy (1670 kJ/100 g) and fat (10-25 g/100 g) stipulated levels in the Codex Standard

* Amagloh F K *et al.* Sweet potato-based complementary food for infants in low-income countries. *Food Nutr. Bull.*, 2012, 33: 3-10



Background *Contd.*

- Extrusion-cooked ComFa and roller-dried ComFa containing skimmed milk (industrial-level product) contained 83% of the recommended protein content of 15 g/100 g in complementary food in the Codex standard
- But oven-toasted ComFa containing fish powder and Weanimix met 100% the protein requirement



Background *Contd.*

- Nutritional advantages of ComFa over Weanimix
 - Relatively low in phytate (a quarter of level in Weanimix)♣
 - Phytate: mineral molar ratios for Ca, Fe and Zn predicted that the ComFa formulations may not adversely affect absorption of these minerals♣
 - High in retinol activity equivalent (28 vs. 2 RAE/100 kcal)*

♣ Amagloh F K *et al.* Sweetpotato-based complementary food would be less inhibitory on mineral absorption than a maize-based infant food assessed by compositional analysis. *Int. J. Food Sci. Nutr.*, 2012, 63: 957-963

* Amagloh F K *et al.* A household-level sweet potato-based infant food to complement vitamin A supplementation initiatives. *Matern. Child Nutr.*, 2012, 8: 512-521



Background *Contd.*

- Cereal-based complementary foods from non-malted ingredients form a relatively high viscous porridge
- Therefore, **excessive dilution**, usually with water, is required to reduce the viscosity to be appropriate for infant feeding
- **The dilution invariably leads to “energy and nutrient thinning”**, that is, the reduction of energy and nutrient densities



Objectives

- To compare the sweetpotato-based complementary foods (extrusion-cooked ComFa, roller-dried ComFa and oven-toasted ComFa) and enriched Weanimix (maize-based formulation) regarding their:
 - Carbohydrate composition;
 - Viscosity;
 - Water solubility index; and
 - Sensory acceptability evaluated by sub-Saharan African women as model caregivers.



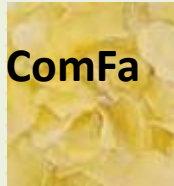
Processing Method-ComFa



Industrial-based (SP, soybean flour, oil, skimmed milk powder and sugar)



Roller-dried ComFa



Extrusion-cooked ComFa



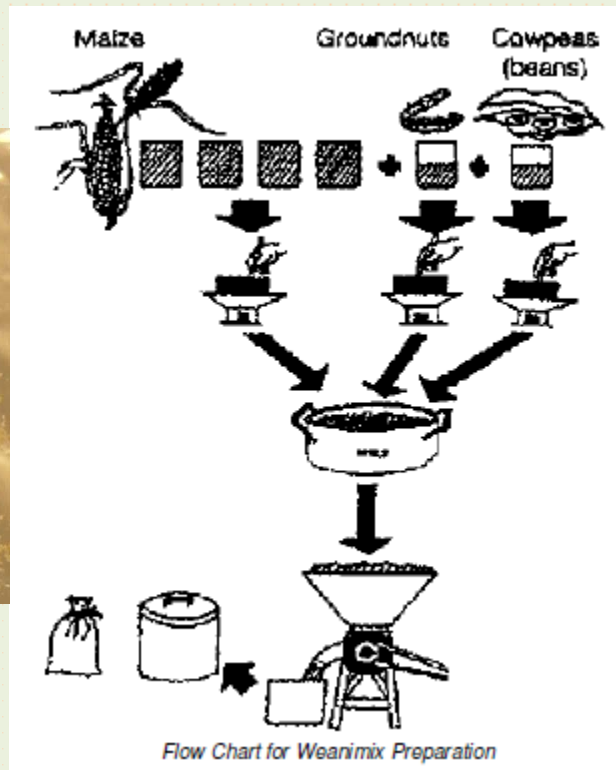
Homestead (SP, anchovy powder, soybean flour, oil and sugar)



Oven-toasted ComFa



Processing method-Weanimix



In our study,

Soybean instead of cowpea, and all ingredients were dehulled. Anchovy powder and sugar were added --
Enriched Weanimix

Source: Agble R. Effective programmes in Africa for improving nutrition: Effective programmes for improving nutrition in Ghana. *SCN News*, 1997, No. 15: 9 - 10



Physicochemical and sensory evaluation

- Simple sugars: spectrophotometry (Megazyme assay kit)
- Total dietary fibre by enzymatic-gravimetric method (Megazyme assay kit)
- Total carbohydrate and starch levels: by calculation
- Apparent viscosity: A Rapid Visco™ Analyser
- Water solubility Index: Gravimetrically.
- Sensory evaluation: consumer sensory evaluation was used to evaluate the product acceptance of the roller-dried ComFa, oven-toasted ComFa and enriched Weanimix.



Results & Discussion-Carbohydrate composition*

Complementary food	Maltose	Sucrose	Free glucose	Free fructose	Starch [§]	Total dietary fibre	Total available carbohydrate
Sweetpotato-based							
Extrusion-cooked ComFa	27.50 (2.45) ^a	10.20 (0.31) ^a	1.24 (0.04) ^b	3.07 (0.37) ^a	11.32 (1.87) ^b	10.25 (2.29) ^a	56.07 (1.97) ^a
Roller-dried ComFa	30.85 (3.84) ^a	10.53 (1.06) ^a	1.34 (0.03) ^a	2.94 (1.04) ^a	10.53 (3.70) ^b	10.57 (1.21) ^a	58.92 (0.83) ^a
Oven-toasted ComFa	25.43 (1.17) ^a	10.08 (0.43) ^a	1.40 (0.05) ^a	2.61 (0.46) ^a	13.75 (0.72) ^b	8.16 (0.77) ^{a,b}	53.28 (0.94) ^{a,b}
Maize-based							
Enriched Weanimix	1.06 (0.18) ^b	2.01 (0.12) ^b	0.07 (0.02) ^c	0.39 (0.13) ^b	46.72 (0.64) ^a	6.08 (0.44) ^b	50.25 (0.75) ^b
<i>P</i> -value	<0.0001	<0.0001	<0.0001	0.002	<0.0001	0.01	<0.0001

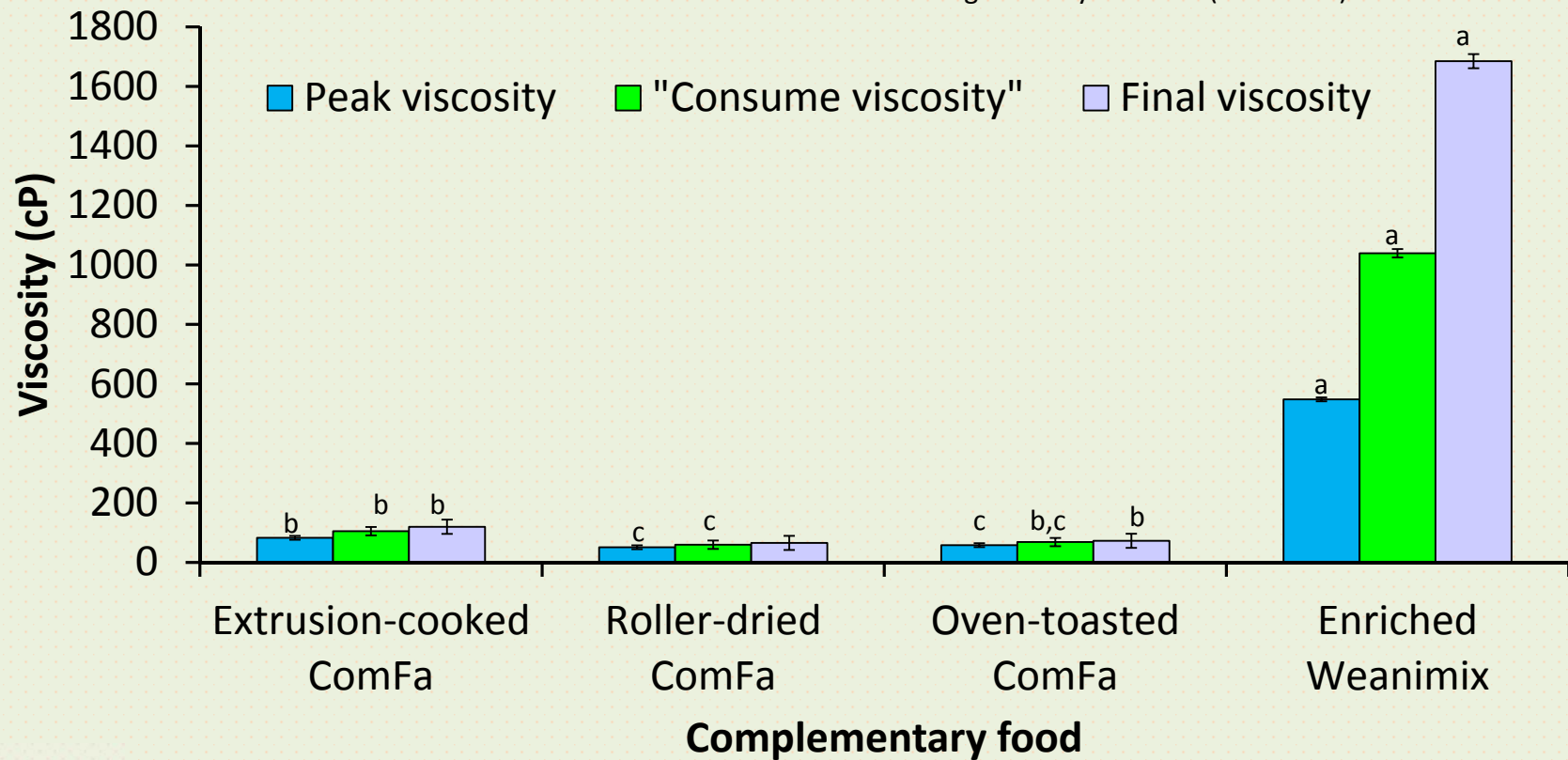
*Value is mean (standard deviation) of triplicate; values with the same superscript letter in a column are not significantly different ($P > 0.05$)

[§]Starch=total available carbohydrate minus sum of maltose, sucrose, free glucose and free fructose; the starch content for extrusion-cooked ComFa and roller-dried ComFa was corrected for approximately 3 g/100 g of lactose from skim milk powder used as an ingredient

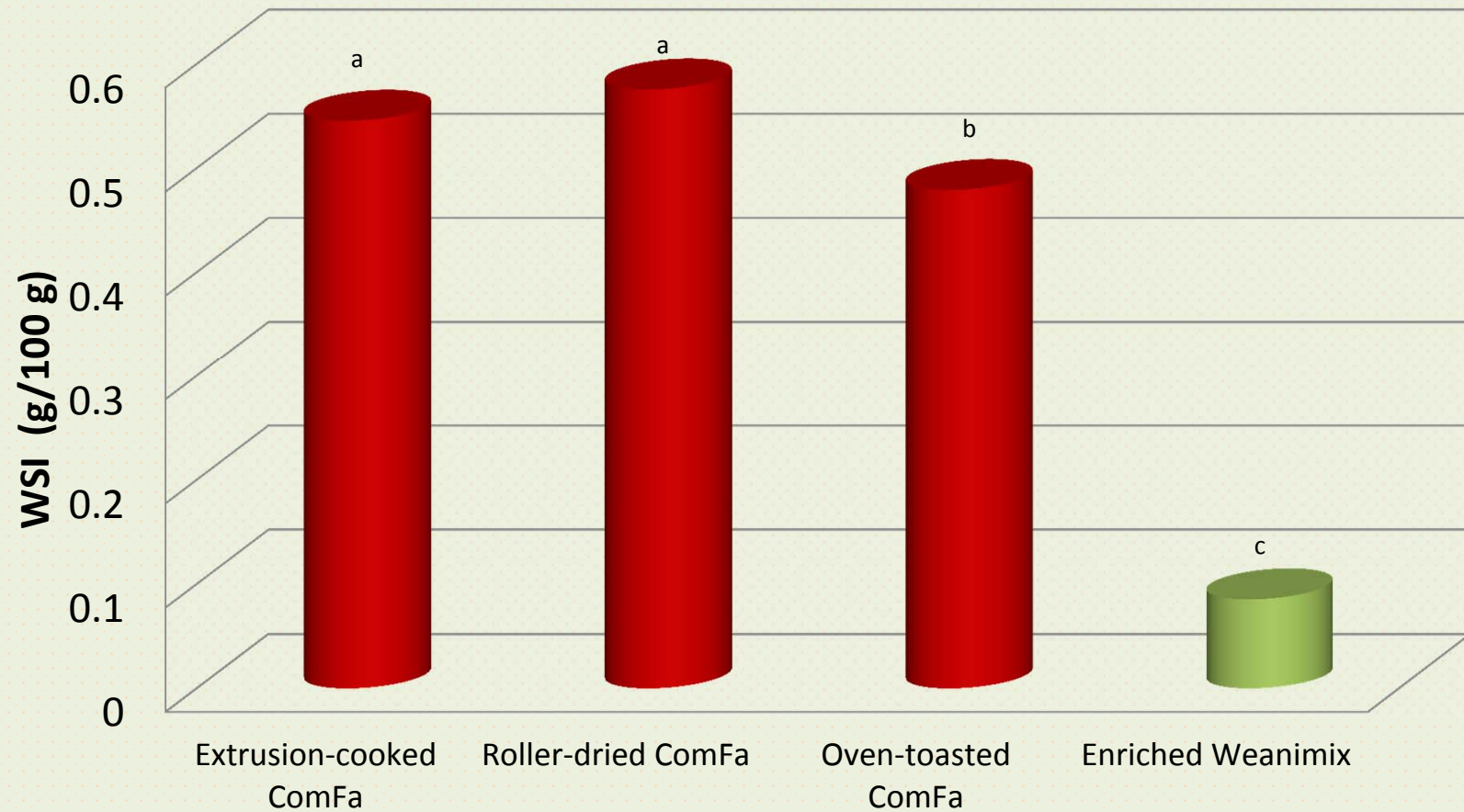


Results & Discussion- Apparent Viscosity

Bar with different letter per each variable for the complementary foods was significantly different ($P < 0.0001$)



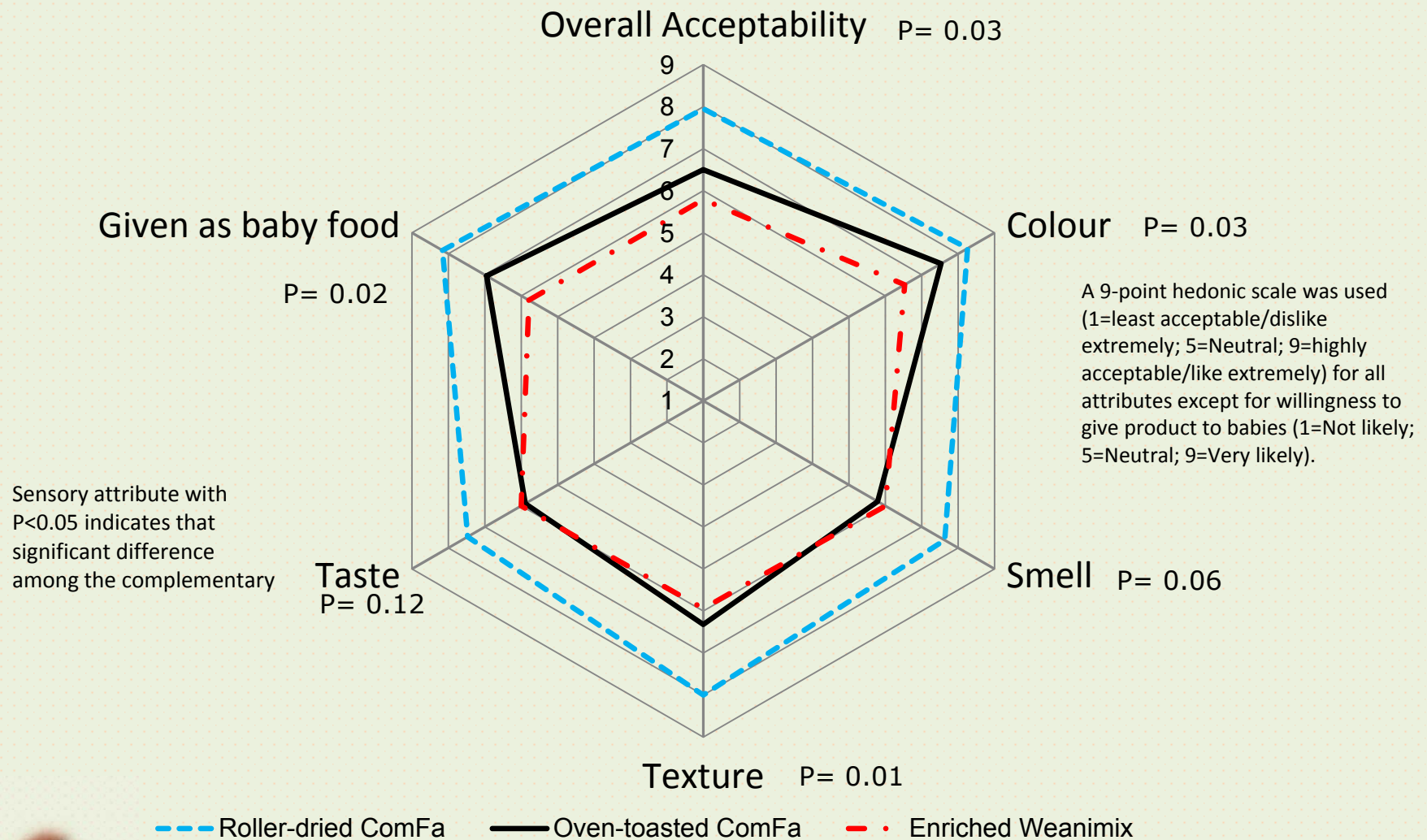
Results & Discussion-WSI



Bars with different letter was significantly different (P <0.0001)



Results & Discussion- Product liking



Limitations

- Cream-fleshed sweetpotato is lower in β -carotene compared to the orange-fleshed varieties
- The flour preparation significantly increases the processing time of the ComFa products as sweetpotato has low dry matter
- Ascorbic acid totally degraded during processing of the sweetpotato flour



Conclusion

- The sweetpotato-based formulations had a higher sugar to starch ratio than the maize-based complementary food
 - lower apparent viscosity
 - higher WSI
 - less “energy and nutrient thinning”
- The scores of the consumer preference given by the infant caregivers indicated highest liking for roller-dried ComFa, followed by the oven-toasted ComFa, and lastly, the enriched Weanimix



Concluding remarks

- These findings, combined with the relatively low phytate and high vitamin A levels, and the low phytate: mineral ratio suggest that the use of sweetpotato in complementary food **should be encouraged** as it has potential to have significant nutritional benefit in low-income countries
- **BUT** there is a need for efficacy trial



Just for laughs

MY VEHICLE PAPERS ARE
IN ORDER. SO, AS A **LAW-
ABIDING CITIZEN**, I'M
NOT GOING TO GIVE YOU
A KOBO!



WITH A STICKER THAT
SAYS "**I'M CHEERFUL
GIVER**" ON YOUR CAR?
YOU'RE UNDER ARREST
FOR **MISLEADING THE
PUBLIC!**



In beautiful New Zealand



Asanteni

