

Western University
Scholarship@Western

Business and Social Enterprise

Western Heads East

2019

From Benchside to Community Research: Development of Affordable and Accessible Probiotic Foods in East Africa

Toby Le

Kathy Yu

Megha Shetty

Iman Ahmed

Yaoshen Fang

See next page for additional authors

Follow this and additional works at: <https://ir.lib.uwo.ca/whebussoc>

Authors

Toby Le, Kathy Yu, Megha Shetty, Iman Ahmed, Yaoshen Fang, Naressa Karmali, Wenjing Liu, Arnold N. Onyango, Maimuna Kanyamala, Judith Okoth, and Sharareh Hekmat

From Benchside to Community Research: Development of Affordable and Accessible Probiotic Foods in East Africa

¹Toby Le, ¹Kathy Yu, ¹Megha Shetty, ¹Iman Ahmed, ¹Yaoshen Fang, ¹Nareesa Karmali, ²Wenjing Liu, ³Arnold N. Onyango, ⁴Maimuna Kanyamala, ³Judith Okoth, ²Sharareh Hekmat. ¹Western University, London, ON, ²Brescia University College, London, ON, ³Jomo Kenyatta University of Agriculture and Technology, Juja, Kenya, ⁴Mikono Yetu, Mwanza, Tanzania

Background

- Probiotics are live microorganisms that, when ingested in adequate amounts, confer health benefits¹
- In 2004, Western Heads East brought Fiti to East Africa and trained women how to produce Fiti probiotic yogurt
- Fiti is composed of a probiotic culture, *Lactobacillus rhamnosus* GR-1, and a starter strain, *Streptococcus thermophilus* C106².
- This initiative has since empowered low-income groups to gain financial independence, particularly women
- There are currently ~250 kitchens feeding over 250,000 consumers daily in East Africa
- A challenge with accessing Fiti yoghurt is the fluctuating cost of milk and inconsistent supply of high quality milk².
- Potential solution is the consumption of Fiti through affordable non-dairy foods
- Pilot studies reveal bacterial viability of Fiti probiotics in probiotic mango juice, orange juice, pineapple juice, mango juice, and millet porridge^{3,4}
- There remains no sensory data on these products from East African populations



Research Questions

- How do individuals in Tanzania and Kenya rate different non-dairy probiotic foods?
- How do these ratings compare to probiotic yoghurt?
- How do these ratings correlate with the willingness of individuals to consume non-dairy probiotic products?

Methods

- ### Enrollment
- Adult aged >18 years
 - Study sites:
 - St. Augustine University of Tanzania
 - Jomo Kenyatta University of Agriculture and Technology
 - Juja sub-county Treasury Office
 - Mwanza, Tanzania n=140 & Juja, Kenya n=140
- ### Sample Preparation
- Fruits, millet porridge, and milk were purchased from local markets in Juja, Kenya and Mwanza, Tanzania
 - Food samples were prepared according to published methods and fermented with Fiti sachets to produce probiotic mango juice, pineapple juice, orange juice, millet porridge, and yogurt
- ### Sample Execution
- Participants rated each probiotic sample based on smell, colour, texture, appearance, taste, and overall acceptability using a 9-point hedonic scale
 - Next, participants were asked to respond to qualitative questions related to their knowledge on probiotics and sample preferences
 - Study assessments were facilitated by community members



Result 1: Quantitative Assessment

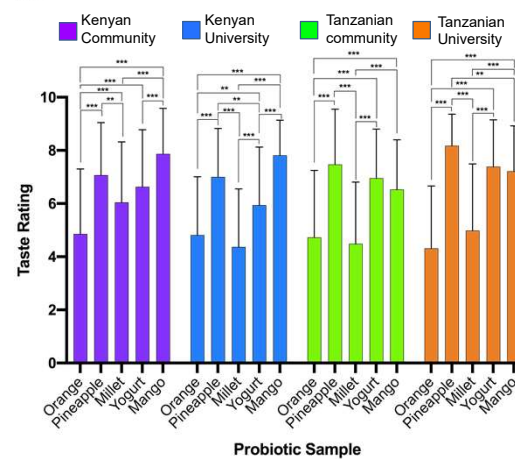


Figure 1. Hedonic scale ratings for taste of probiotic orange juice, pineapple juice, millet porridge, yogurt, and mango juice across all settings. Pairwise comparisons are indicated by brackets and asterisks with *** indicating $p < 0.01$, ** indicating $p < 0.05$, * indicating $p < 0.1$.

Result 2: Qualitative Assessment

Characteristic N (%)	Everyone (n = 280)	Tanzanian community (n = 70)	Tanzanian university (n = 70)	Kenyan community (n = 70)	Kenyan university (n = 70)	P-value
Age, median (IQR)	23 (21,27)	25 (23,32)	23 (22,24)	28 (23,41)	21 (20,23)	<0.01
Gender						<0.01
Female	98 (35.0)	6 (8.6)	26 (37.1)	27 (38.6)	39 (55.7)	
Male	181 (64.6)	64 (91.4)	44 (62.9)	42 (60.0)	31 (44.3)	
Would purchase Fiti orange juice						0.21
Yes	26 (9.3)	4 (5.7)	4 (5.7)	8 (11.4)	10 (14.3)	
No	254 (90.7)	66 (94.3)	66 (94.3)	62 (88.6)	60 (85.7)	
Would purchase Fiti pineapple juice						0.01
Yes	123 (43.9)	31 (44.3)	42 (60.0)	26 (37.1)	24 (34.3)	
No	157 (56.1)	39 (55.7)	28 (40.0)	44 (62.9)	46 (65.7)	
Would purchase Fiti millet porridge						<0.01
Yes	23 (8.2)	2 (2.9)	2 (2.9)	11 (15.7)	8 (11.4)	
No	257 (91.8)	68 (97.1)	68 (97.1)	59 (84.3)	62 (88.6)	
Would purchase Fiti yogurt						0.28
Yes	124 (44.3)	32 (45.7)	37 (52.9)	26 (37.1)	29 (41.4)	
No	156 (55.7)	38 (54.3)	33 (47.1)	44 (62.9)	41 (58.6)	
Would purchase Fiti mango juice						<0.01
Yes	124 (44.3)	16 (22.9)	6 (8.6)	44 (62.9)	58 (82.9)	
No	156 (55.7)	54 (77.1)	64 (91.4)	26 (37.1)	12 (17.1)	
Knowledge of probiotics						<0.01
Yes	166	37 (52.9)	52 (74.3)	16 (22.9)	61 (87.1)	
No	101	32 (45.7)	18 (25.7)	43 (61.4)	8 (11.4)	
N/A	13	1 (1.4)	0	11 (15.7)	1 (1.4)	
Awareness of Fiti health benefits						<0.01
Yes	149	40 (57.1)	53 (75.7)	20 (28.6)	36 (51.4)	
No	122	29 (41.4)	17 (24.3)	43 (61.4)	33 (47.1)	
N/A	9	1 (1.4)	0	7 (10.0)	1 (1.4)	

Table 1. Characteristics, purchasing preferences and existing knowledge of probiotics of stratified by setting.

Discussion

- Probiotic mango and pineapple juice were very well received within each setting (consistently rated the best on each measure of food quality)
- Probiotic orange juice and millet porridge are consistently rated the poorest across all settings
- Kenyan community is an area of growth for probiotic products (more efforts can be used to educate the community about probiotics and their benefits, as well as introduction of products)
- Local community members tend to have less knowledge about probiotics and its health benefits compared to university students.
 - This may be due to the exposure of university students to health knowledge and students tend to come from backgrounds with more opportunities
- Since Tanzania is the birthplace of Fiti probiotics, it is expected that there is generally a preference for probiotic products and that there is more awareness of the health benefits of probiotics
- Recommendations:
 - Use mango and pineapple juice as a viable product within these contexts
 - More educational efforts in communities about the health benefits of probiotic products

Significance

- This was the first study to measure and understand the acceptability of non-dairy probiotic products in both Kenya and Tanzania
 - The study was also the first multi-country study to be led and organized by undergraduate students at Western University
- Results from this study will help Fiti social enterprises expand their probiotic menus and provide more probiotic options
- As a result, this is not a replacement of the nutritious probiotic yogurt, but rather a probiotic alternative that is accessible and affordable to vulnerable populations
- The differences between community settings and university settings in Tanzania and Kenya (e.g. students having greater knowledge about probiotic products compared to community members) can be used to tailor health promotion efforts.

Acknowledgement

- Participants
 - Sara Yuan
 - Bob Gough
 - Jessica Cordes
 - Stephanie Huff
 - Eunice Gathoni
 - Omondi Maureen Atieno
 - Monicah Karuana Kariuki
 - Carlos Ndyetabula Frolence
 - Dada Tekla
 - Chacha Kitalo
 - Katongole Dastan
 - Edward Nakudana Jonas
 - Hamis Salum Dikongwa
-

References

- Hekmat, S et al. (2007). *Int. J. Food Sci. Technol.* 42:615-619.
- Reid, G. (2010). *Gut Microbes.* 1:411-414.
- Williams, R et al. (2016). *S. Afr. J. Anim. Sci.* 46:441.
- Stefano, E et al. (2017). *Nutrients.* 9:529.
- White, J et al. (2018). *Fermentation.* 4:27.