

## Quality Characterization of Kitoza, a Malagasy Meat Product

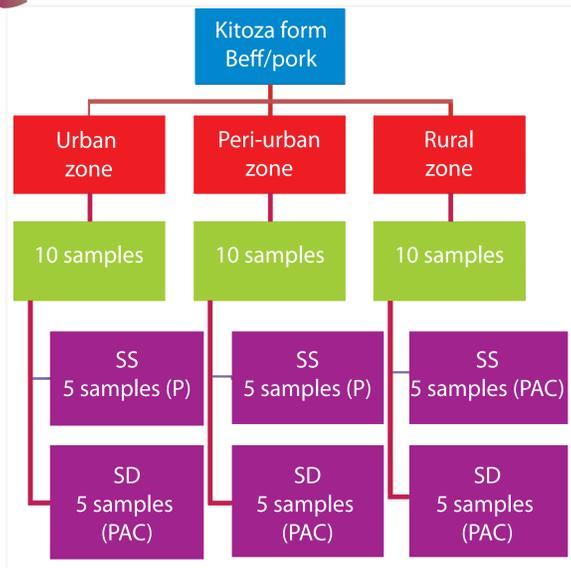
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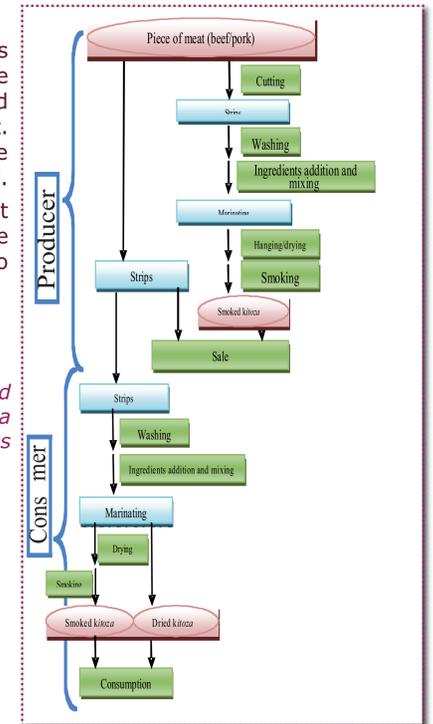


For the Malagasy, zebu (or beef) is bred to produce meat for consumption. The beef is subjected to diverse preparation and/or preservation techniques. These range from the production of kitoza (strips of dried/smoked meat) to that of « varanga » (fried shredded meat) and of « jaka » (meat preserved in fat). In Sakalava countries (west of Madagascar) and/or Tsimihety (north), one finds « maskita », which corresponds more or less with kitoza in the process of sun drying or smoking by fire in the hearth [1, 2, 3].

Kitoza is a traditional Malagasy dish. It consists of meat strips 20 to 50 cm long and 2 to 4 cm wide, salted and then dried and/or smoked. Previously, it was considered to be a royal dish. As there was only one market day per week, one method of preserving the meat was to let it dry and produce kitoza. Currently, this dish still holds a place of choice in the household menu in Madagascar and its consumption has increased because of its ready availability on local market. With the evolution of food technology, some producers now make smoked kitoza, but it is also homemade from fresh raw meat. In all cases, the biochemical and microbiological quality of kitoza is not controlled. Within the framework of AFTER (African Food Tradition Revisited by Research), a project which aims at improving the quality and safety of African traditional food, 60 samples (30 beef, 30 pork) of kitoza were analyzed from physico-chemical and microbiological point of view. They were collected in Antananarivo and included 15 salted/smoked kitoza and 15 salted/dried kitoza for each type of meat. Quality attributes and manufacturing process were also deduced from survey conducted amongst producers, retailers and consumers of kitoza.



*Distribution and number of analyzed samples of Kitoza* (SS: Salted/smoked; SD: Salted/dried; PAC: Producer for self-consumption; P: producer)



*Salted/smoked and salted/dried kitoza manufacturing process*

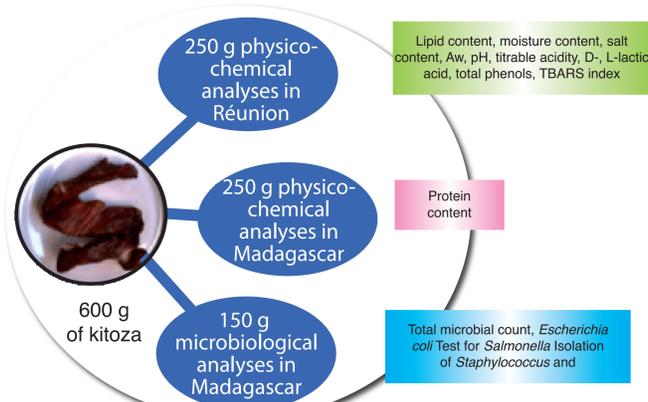


Salted/dried kitoza



Salted/smoked kitoza

The 60 samples were collected taking into account the variability due to animal species (beef or pork), collection areas (urban, peri-urban or rural), manufacturing processes (salted/smoked or salted/dried) and types of transformers (producer, producer for self-consumption).



*Distribution of sample analyses*



Metal sheet smoking oven kitoza

Opening the aeration

### Results of microbiological analyses

Germs	Beef kitoza		Pork kitoza	
	Salted/smoked (Mean +/- SD)	Salted/dried (Mean +/- SD)	Salted/smoked (Mean +/- SD)	Salted/dried (Mean +/- SD)
FAMT (log ufc/g)	6,8 ± 0,9	8,1 ± 0,5	9,3 ± 1,0	9,6 ± 0,9
Escherichia coli (log ufc/g)	<0,7 (n=12) 1,8 ± 1,1 (n=3)	<0,7 (n=7) 2,3 ± 1,1 (n=8)	1,0 ± 0,7	3,8 ± 1,3
Salmonella	absent	absent	absent	absent

Microbiological analyses showed that the organisms of alteration and hygiene indicators (FAMT) were significantly increased in salted/dried kitoza in comparison with salted/smoked beef and pork kitoza. The concentration of Escherichia coli was satisfactory for salted/smoked beef kitoza but a frequent contamination was noticed for salted/dried pork kitoza. No pathogenic organism (Salmonella) was detected for the two types of kitoza.

- REFERENCES
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### Quality attributes required of Kitoza

Actors	Colour	Consistency/Texture	Taste	Hygienic quality
Producers	Golden/brown	Tender/dry	Smoked	
Retailers	Golden/brown	Tender/dry	Smoked	Presentation in bags and/or in window Cleanliness of the shop
Consumers	Golden/brown/red	Tender/dry	Dry or smoked	Cleanliness

### Results of physicochemical analyses

Parameters	Beef kitoza		Pork kitoza	
	Salted/smoked (Mean +/- SD)	Salted/dried (Mean +/- SD)	Salted/smoked (Mean +/- SD)	Salted/dried (Mean +/- SD)
Lipid content (g/100g)	8,1 ± 4,8	13,0 ± 5,1	17,4 ± 2,0	18,9 ± 8,3
Protein content (g/100g)	22,4 ± 21,4	27,9 ± 26,2	40,0 ± 7,1	41,3 ± 10,9
Moisture content (g/100g)	49,4 ± 9,0	34,6 ± 8,3	51,2 ± 1,9	31,1 ± 2,1
Salt content (g/100g)	2,99 ± 1,14	3,52 ± 1,23	2,6 ± 1,1	4,2 ± 1,76
Aw	0,929 ± 0,050	0,861 ± 0,056	0,96 ± 0,02	0,83 ± 0,07
pH	5,88 ± 0,20	5,70 ± 0,20	6,09 ± 0,54	6,48 ± 0,30
Titrable acidity (meq/100g)	11,4 ± 2,2	12,4 ± 3,2	9,7 ± 4,1	10,2 ± 3,0
D-lactic acid (g/100g)	0,057 ± 0,109	0,132 ± 0,187	0,138 ± 0,17	0,140 ± 0,15
L-lactic acid (g/100g)	1,18 ± 0,17	1,46 ± 0,44	0,34 ± 0,32	0,13 ± 0,15
Total phenols	2,30 ± 1,44	0,30 ± 0,40	3,25 ± 1,98	0,45 ± 0,36
TBARS indices (mg/kg)	2,14 ± 3,29	4,64 ± 3,72	0,7 ± 0,8	6,50 ± 3,5



Drum smoking oven

Opening the aeration

Heat source



Brick smoking oven

Opening the aeration

From a physicochemical point of view, the mean of lipid and protein contents of kitoza for beef and pork indicated that they had interesting nutritional characteristics. Moisture was high for smoked kitoza and intermediate for dried beef and pork kitoza [4]. The Aw was average for beef and pork. Salt content was not very high except for dried pork kitoza. Kitoza had higher water content and Aw, lower salt content than other traditional salted/dried/smoked meat product [5, 6]. The high pH value indicated that it was not a fermented food but some samples have some contents in lactic acid D- near to the fermented meat products. For beef kitoza, it was probably due to spontaneous fermentation. Some differences appeared between salted/dried kitoza and salted/smoked kitoza: their TBARS index showed that the first was more oxidized. Salted/smoked kitoza could be classified in the category of enough smoked products but not salted/dried one [7].

