



Smoking of Milk Containers Improved Microbiological and Organoleptic Quality of Fermented Milk

Alemayehu Tadesse¹, Veerle Fievez², Frans Smeulders³, Bruno Goddeeris⁴, Jozef Deckers⁵, Nigsti Hailemariam¹, Mark Breusers⁶

¹Mekelle University, Animal, Rangeland and Wildlife Sciences, Ethiopia; ²Ghent University, Animal Production (Lanupro), Belgium; ³Green Watt, Biogas Plants Fitting Your Wastes, Belgium; ⁴KU Leuven, Biosystems, Division Gene Technology, Belgium; ⁵KU Leuven, Earth and Environmental Sciences, Belgium; ⁶KU Leuven, Faculty of Social Sciences, IARA, Belgium

Introduction

Smoking of milk vessels with splinters of different tree species is a commonly used milk preservation method in Ethiopia. Smoking of milk containers imparts desirable aroma to milk and milk products and reduced the microbial load of milk. However, the interaction effect of smoking chips types and storage(fermentation) period on microbiological and organoleptic quality of fermented milk is not well studied. Therefore, this study was conducted to examine fumigating of milk containers by smoking using wood from one of the three following tree species (*Acacia etbaica*, *Olea europaea ssp. cuspidata* and *Cadia purpurea* vs. a non-smoked control) on biochemical, microbiological and organoleptic quality of milk, traditionally fermented for 0, 48, 96 or 144 hours.

Materials and methods

A plastic milk container of 1.2 liter capacity was fumigated by inverting it over smoking chips of 5 g of the specific tree species until the smoke died out (about 2–3 minutes). About 700 ml of milk were stored in this container at ambient room temperature of 24±0.8 °C for 0,48,96 and 144 hours fermentation period.

The change in pH, titratable acidity (TA%), standard plate count (SPC) and coliform count (CC) of the fermented milk from each treatment was determined. Organoleptic quality parameters (aroma, flavor, appearance and overall acceptance) of the fermented milk were evaluated by 10 panelists based on a 5 point hedonic scale (5=like extremely, 4=like moderately, 3=neither like nor dislike, 2=dislike moderately or 1=dislike extremely).



Fig1. Fumigating of milk container with smoking chips

Results

1. Microbiological qualities

An interaction effect of container smoking and fermentation period ($p < 0.05$) was observed for TA, SPC and CC values.

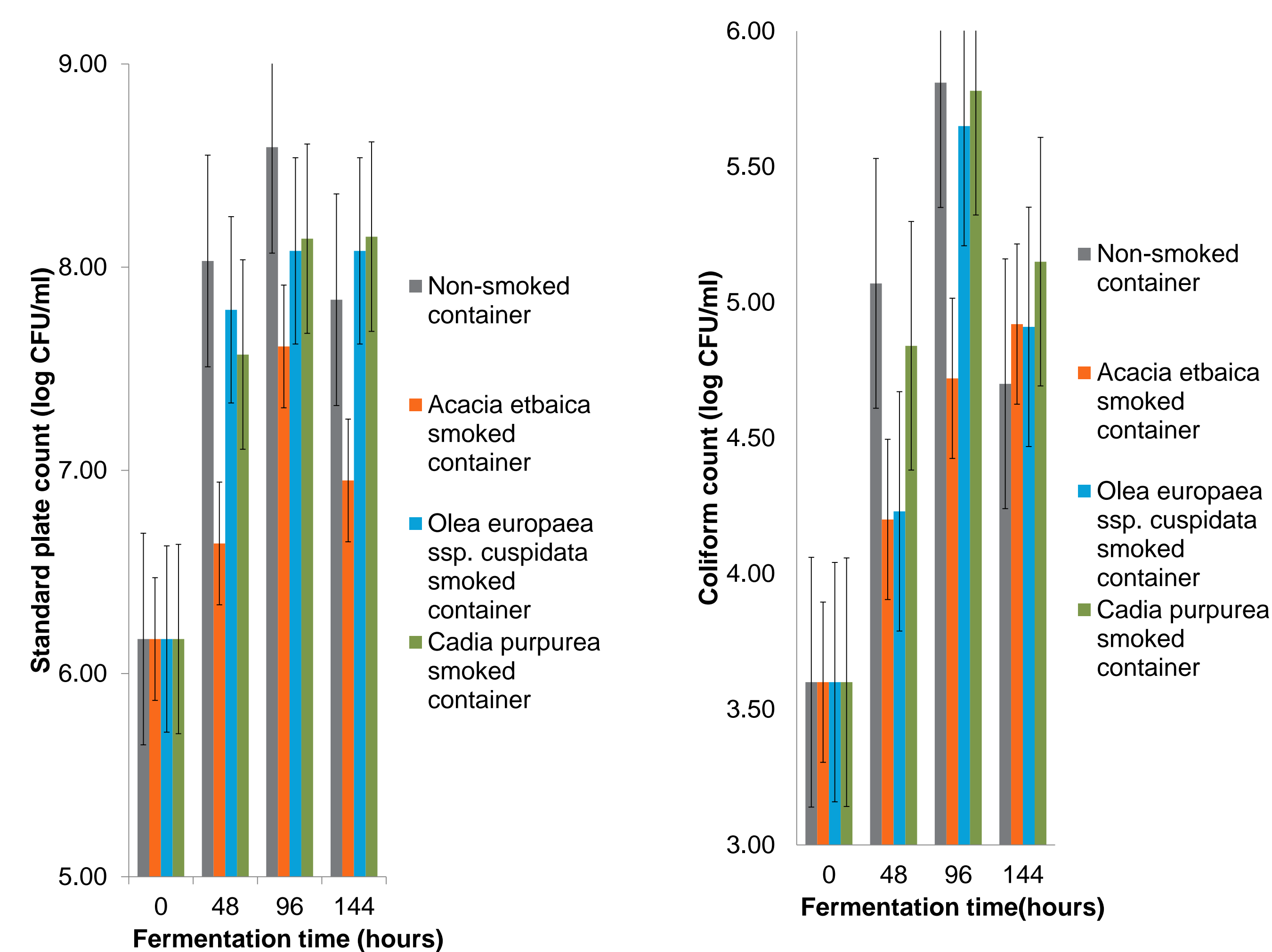


Fig 2. Standard plate count of fermented milk in non-smoked and smoked milk containers

Fig 3. Coliform count of fermented milk in non-smoked and smoked milk containers

SPC and CC values tended to increase till 96 hour fermentation period in all treatment groups and slightly reduced thereafter. The SPC of milk samples stored in the smoked containers ranged between 6.84–7.53 log CFUml⁻¹ as compared to non-smoked container (7.66 log CFUml⁻¹).

SPC and CC in milk fermented for 48 and 96 hour stored in a container smoked with *Acacia etbaica* were reduced by 1.39 and 0.87 log CFU; and 0.98 and 1.09 log CFU as compared to their respective values in the non-smoked containers, respectively.

2. Organoleptic qualities

Table 1. Organoleptic qualities of traditionally fermented milk

Types of milk container used for storage/fermentation	Aroma	Flavor	Appearance	Overall acceptance
Non-smoked container	3.4	2.9 ^b	3.10 ^b	3.3 ^b
<i>Acacia etbaica</i> smoked container	3.97	3.6 ^{ab}	3.77 ^a	3.97 ^a
<i>Olea europaea ssp. cuspidata</i> smoked container	3.83	3.7 ^a	3.70 ^a	3.80 ^a
<i>Cadia purpurea</i> smoked container	3.93	3.4 ^{ab}	3.93 ^a	3.80 ^a
SEM	0.164	0.182	0.143	0.139
p-value	0.06	0.014	0.001	0.006

^{a b} = means in a column with different superscripts are significantly different ($p < 0.05$), SEM = Standard error of mean

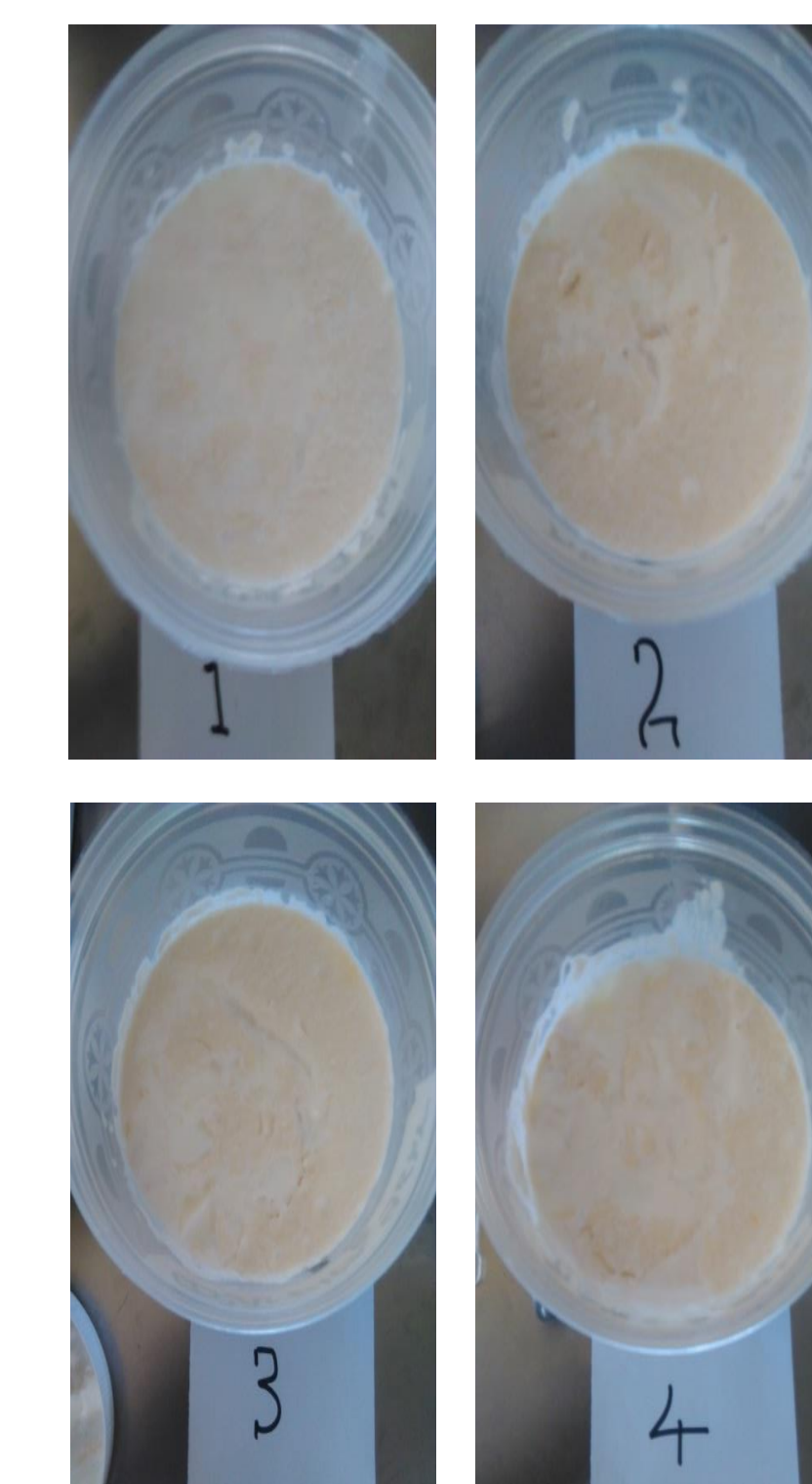


Fig 4. Appearance of fermented milk after 96 hours of fermentation in non-smoked and smoked containers

1= Non smoked container, 2= *Acacia etbaica* smoked container, 3= *Olea europaea* smoked container, 4= *Cadia purpurea* smoked container

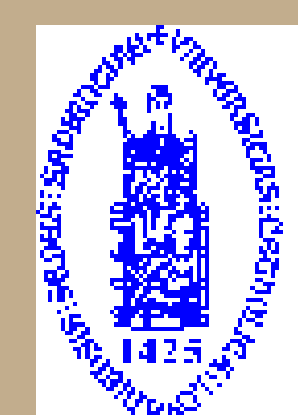
Flavor, appearance and overall acceptance scored better in smoked as compared to non-smoked containers

Conclusion

- Smoking of milk containers effectively reduced microbial growth and resulted better acceptance for organoleptic parameters as compared to non-smoked containers.
- Acacia etbaica* smoked containers resulted lower microbial counts in fermented milk as compared to the other smoking chips and further studies are needed to investigate the phytochemicals contents of this tree species.

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