

EFFECT OF MORINGA LEAF EXTRACT ON THE PHYSICOCHEMICAL AND ORGANOLEPTIC PROPERTIES OF WHOLE COW MILK YOGHURT

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ABSTRACT

The experiment was conducted to determine the effect of fermentation time (3 and 12 hours) and inclusion levels (0, 6 and 8%) of Moringa leaf extract on the physicochemical and organoleptic properties of whole cow milk yoghurt. The experiment was conducted using 2x3 factorial arrangements in a completely randomized design. Samples of the yoghurt fortified with Moringa leaf extract and the control were analyzed for proximate composition, mineral and sensory characteristics. The result of the proximate analysis indicated that total solids, protein and titratable acidity were decreased as soaking time increased. While pH has high value for 6% level of inclusion and low for 8%, fat increased with increase in soaking time. The results of the mineral analysis recorded no significant difference among the major elements. However, among the trace element copper and manganese were significantly ($p > 0.05$) affected. The result of the sensory evaluation indicated that flavor, color, consistency, texture, and overall acceptability were significantly ($p > 0.05$) affected by 6% level of Moringa leaf extract inclusion rate. It was concluded that fortification with 6% moringa leaf extract inclusion in whole cow milk yoghurt was accepted by consumers while the 8% inclusion rate contained the highest nutrient levels.

Key words: Fermentation, Moringa, Yoghurt.

INTRODUCTION

Yoghurt is a popular fermented drink, generally made from milk. It is well known and liked by people in the world. It contains probiotic bacteria that proven can improve digestive process by providing necessary microflora and can inhibit the growth of pathogenic bacteria in the digestive tract. It is also useful to help people with lactose intolerance, prevent diarrhea, reduce the risk of cancer or tumor in the digestive tract and other organs, and reduce cholesterol in the blood (Afrowall, 2010). Innovation of yoghurt ingredient is very important with the aim for providing a variety nutritional and flavored value in yoghurt to make it more attractive to consumers, both children and adults to consume yoghurt. Innovation of yoghurt can be obtained by utilizing ingredient that has highly nutritious and not yet widely used in the surrounding environment, one of which is *Moringa oleifera* (moringa) leaves extract.

MATERIALS AND METHOD

Experimental Design

The experiment was conducted using 2X3 factorial arrangement in a completely randomized design. Soaking time (3 and 12 hours) and inclusion levels of Moringa leaf extract (0%, 6% and 8%) made the treatments and replications.

Yoghurt Production

The yoghurt was manufactured according to the international standards of yoghurt manufacture IDF (1987) standards. The milk was homogenized and heated to 90°C for 3 min for pasteurization, then to 45°C. It is then inoculated with 2.5 percent of a mixed lactic starter (2:1 *Streptococcus salivarius* ssp. *thermophilus* and *Lactobacillus delbrueckii* ssp. *bulgaricus*). The inoculated milk was incubated to 45°C until a pH of 4.4 was attained in approximately 4 hours. When the pH end point was achieved, the yoghurts were cooled at 6°C, stored at the same temperature during all period of post-acidification.

Physicochemical Analysis

The stored yoghurt samples were analyzed for proximate composition of titratable acidity, total protein, total fats, total solid, pH and mineral (ash) according to the procedure by AOAC (2005).

Sensory Analysis

Yoghurt sample were evaluated for flavor, color, consistency, texture and overall acceptability by panel of 35 people.

Results and Discussion

Table 1 Proximate composition of whole cow milk yoghurt fortified with Moringa leaf extract

MLE %	0%	6%		8%		LS	LSD
Component		3hr	12hr	3hr	12hr		
Ash	0.70	1.13	0.67	0.85	0.65	*	0.050
TS	61.00	50.40	40.00	56.10	56.50	NS	0.965
Fat	2.40	3.72	3.90	4.10	4.14	*	0.050
Protein	3.17	2.79	2.52	2.94	2.84	*	0.050
TA	0.38	0.39	0.36	0.38	0.37	NS	0.056
pH	4.60	3.27	3.40	3.73	3.60	NS	0.087

*(P > 0.05%), NS = no significant, TS = total solid, TA = Titratable acidity, MLE = Moringa leaf extract.

Table 2 Effect of Moringa leaf extract inclusion rate and soaking time on the mineral composition of whole cow milk yoghurt in centigram

MLE %	0%	6%		8%		LS	LSD
Minerals		3hrs	12hrs	3hrs	12hrs		
Major Minerals							
Deci/mg							
Mg	8.90	9.50	18.63	15.70	19.30	NS	0.905
Na	73.82	82.80	88.10	86.02	87.70	NS	1.617
Ca	43.01	60.72	68.31	68.31	75.36	NS	0.5177
P	17.30	19.93	19.93	20.04	21.72	NS	1.005

NS = no significance, MLE = Moringa leaf extract, LSD = least l significant difference, LS = level of significance.

Table 3 Organoleptic properties of whole cow milk yoghurt fortified with Moringa leaf extract at different soaking time.

MLE %	0%	6%		8%		LS	LSD
Property		3hrs	12hr	3hrs	12hrs		
Flavour	4	2.94	2.39	3.67	3.83	NS	0.0694
Colour	3	2.71	4.97	3.81	4.00	**	0.0303
Consistency	2	3.43	3.94	3.50	5.33	NS	0.48
Texture	4.3	2.93	3.94	3.60	5.97	NS	0.054
OA	2	2.93	3.94	3.60	5.17	*	0.050

OA = Overall Acceptability, ***(P < 0.05), *(P > 0.05) NS = no significance.

Proximate Composition of Cow Milk Yoghurt

The pH range of whole cow milk yoghurt fortified with Moringa leaf extract was 3.4 to 4.6 which was within the range of 4.1 reported by Fadela *et al.* (2009). The protein was (2.52 to 3.17%) which was slightly higher than the protein of 1.8% reported by Rasic & Kurmann, (1978) and may be due to addition of Moringa leaf extract which has protein of 1.8mg/L Booth, (1988).The total solids ranged from 40 – 61% which was much higher than the value of 18 – 20% reported by Muhammad *et al.*

(2009), this could be possibly due to difference in concentration of additive especially thickener. The ash ranged from 0.7 to 1.13% which was within the range to the values of 0.7 to 1.6% reported by Muhammad *et al.* (2009). Fat content ranged from 2.4 to 4.14 which were slightly higher than the value reported by (O'Connor, 1995). Titratable acidity was similar to the value reported by Donia *et al.* (2012).

Mineral Composition

The values of calcium and magnesium (75.36dec. and 19.30dec. making 673.8mg and 215.1mg respectively) were also in agreement with the findings of Imran *et al.* (2008) 680±79.8 and 205±22.1mg. However, the value of sodium was higher than that reported by Imran *et al.* (2008). This was attributed to the inclusion of moringa leaf extract in the current study. Phosphorus recorded in this study 21.72dec (217.2mg) concurred with the findings of Lucey and Fox, 203mg (1993).

Sensory Evaluation

The result of the sensory evaluation of the whole cow milk yoghurt fortified with moringa leaf extract at different soaking time revealed similar trend as the 8% inclusion rate was favored with respect to flavor, consistency and overall acceptability except color which 6% was favoured.

CONCLUSION:

It was concluded that while the 8% Moringa leaf inclusion rate in whole cow milk yogurt contained more nutrients, the 6% Moringa yoghurt was accepted more by the sensory evaluation panelists. This was attributed to the bitterness of the product at higher level of moringa leaf inclusion rate.

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