Production of Cheese from Recombined Milk

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ABSTRACT

Preparation of cheese from recombined milk was described and compared with that of cheese made from cow milk in a completely randomized designed model. The mixture of cow milk and recombined milk at various levels 0% (A), 80% cow milk plus 20% recombined milk (B), 60% cow milk plus 40% recombined milk (C), 40% cow milk plus 60% recombined milk (D), 20% cow milk plus 80% recombined milk (E) and 0% cow milk plus 100% recombined milk (F) resulted into a product which was rated high nutritionally and organoleptically. The results revealed increasing moisture and fat contents with increasing levels of the recombined milk. The chemical composition of cheese prepared from recombined milk was significantly higher ($P<0.05$) than that made from cow milk only (A). The crude protein was significantly higher in Treatment B followed closely by Treatments C, D, E, A and F in that order. The fat percentage was highest for Treatment F and least for Treatment A (control). The ash percentage was significantly higher ($P<0.05$) in Treatment A compared to other Treatments. The organoleptic evaluation showed that cheese manufactured from 100% recombined milk was greatest in appearance, flavour and yield but with slightly low consistency. Production of cheese from recombined milk resulted in better economic of production. Treatment F with 100% recombined milk had the best revenue generated because recombined milk was cheaper and readily available than cow milk. The best result on the economic of production was Treatment F followed closely by Treatments E, D, C, B and A in that order. In conclusion, cheese prepared from recombined milk seems to be desirable or even better than cheese prepared solely from cow milk due probably to the improved appearance, aroma, fat, protein as well as the better economic of production. The simple and easy technology will enhance the production and availability of cheese in the diet of all Africans in general and Nigerians in particular, so that the therapeutic and nutritional qualities of cheese could be gained by all and sundry.

Key words: Cheese, recombined milk, nutritional and organoleptic qualities

RÉSUMÉ

La préparation du fromage du lait reconstitué a été décrite et comparée à celle du fromage fait à partir du lait de vache dans un modèle conçu complètement randomisé. Le mélange du lait de vache et du lait reconstitué à de divers niveaux 0% (A, lait de vache 80% plus 20% lait reconstitute (B), lait de vache 60% plus 40% lait reconstitué par (C), lait de vache 40% plus 60% lait reconstitué par (D), le lait de vache 20% plus 80% lait reconstitué par (E) et le lait de vache 0% plus 100% lait reconstitué par (F) a résulté dans un produit qui était haute évaluée nutritionnellement et organoleptiquement. Les résultats ont indiqué l'humidité et les teneurs en graisse croissantes avec l'augmentation des niveaux du lait reconstitué. La composition chimique du fromage préparé à partir du lait reconstitué était sensiblement plus haute ($P<0.05$) que cela faite à partir du lait de vache seulement (A). La teneur en protéine brute était sensiblement plus haute dans le traitement B suivi de près de traitements C, D, E, A et F dans cet ordre. Le pourcentage de la graisse était le plus haut pour le traitement F et mineur pour le traitement A (commande). Le pourcentage de cendre était sensiblement plus haut ($P<0.05$) dans le traitement A comparé à d'autres traitements. L'évaluation organoleptique a prouvé que le fromage construit du lait reconstitué par 100% était le plus grand dans l'aspect, la saveur et le rendement mais avec l'uniformité légèrement basse. La production du fromage du lait reconstitué a eu comme conséquence meilleur économique de la production. Le traitement F avec le lait reconstitué par 100% a eu le meilleur revenu produit parce que le lait reconstitué était meilleur marché et aisément disponible que le lait de vache. Le meilleur résultat sur l'économique de la production était le traitement F suivi de près de traitements E, D, C, B et A dans cet ordre. En conclusion, le fromage préparé à partir du lait reconstitué semble être souhaitable ou même meilleur que le fromage préparé probablement seulement à partir du lait de vache dû de l'aspect amélioré, arome, la graisse, protéine aussi bien que l'économique meilleur de la production. La technologie simple et facile augmentera la production et la disponibilité du fromage dans le régime de tous les Africains

Mots clés : Fromage, lait reconstitué, qualités alimentaires et organoleptiques

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INTRODUCTION

All over the world, the commonest dairy product is the cheese. Local cheese can be prepared by curdling already pasteurized milk with the addition of rennet on rennin or *Calotropis procera* (coagulants) at a temperature of about 45°C. Cheese is a form of preserving milk which is in excess and can also be a source of nutrients like protein, carbohydrate, lipids, minerals and vitamins (Hildreth, 1977). Cheese can be helpful in a country like Nigeria where the level of protein intake is low. Cheese can be used to replace meat or fish as a source of protein in food. It is also preferred to milk due to its easier digestibility and therapeutic value.

Reconstituted milk is used in the manufacturing of some Egyptian dairy products (Abdel Baky *et al.*, 1987). The dairy products manufactured from reconstituted milk often show lower quality compared with those made from fresh milk (Abdel Baky et al., 1987). Hamdy et al., (1972) reported increased wheying off, poor consistency and flat flavour of dairy product (cheese) manufactured from reconstituted skim milk (RSM) while Ahmed et al. (1978) tried to improve on the quality of Zanadi cheese made from fresh buffaloe milk using whey protein. The thrust of this study was to evaluate the nutritional, organoleptic and economic properties of cheese made from mixture of fresh and recombined milk or recombined milk alone.

MATERIALS AND METHODS

Preparation of the West African Soft Cheese (Warakansrt)

West African Soft Cheese was prepared according to the method described by Belewu and Aina (2000). Briefly, Treatment A consists of cheese prepared from fresh cow milk using vegetable rennet. Fresh cow milk was heated slowly (50°C) in a pot while a vegetable rennet extract of Sodom apple (*Calotropis procera*) which is commonly found in the tropics and subtropics was added. The mudar plant contains calotropin enzyme which curdles the milk (ILCA, 1988). The extract is obtained by crushing the leaves and stem of *Calotropis procera* plant and then rinsed in calabash with milk. The mixture of the juice and milk was strained into warm milk with constant stirring and heating. Coagulation begins within 12 -20 minutes after adding the coagulant. The curd was boiled for 20 minutes to inactivate the plant enzyme and facilitate expulsion of the whey after which the curd was strained through a small conical raffia basket which gave the cheese a conical shape. The cheese was kept in the whey as preservative. The cheese produced has similar consistency as Mozzarella cheese.

Treatments B, C,D and E consist cheeses prepared from a mixture of fresh cow milk and dried powdered (cowbell) milk at various ratios of 80:20; 60:40,40:60 and 20:80 while treatment F is made up of 100% powdered dried milk. The mixture was achieved by adding 130g of powdered milk to water to obtained 1litre of milk. 50cl of the resulting mixture was used to prepare 100g of cheese following the same procedure as in the case of Treatment A. Samples were taken for nutritional and organoleptic evaluation.

ANALYSIS

The moisture content, ash, crude protein and titrable acidity were determined according to the method prescribed by Ling (1963). Fat content was by the method described by AOAC (1985). All data collected were subjected to Analysis of variance of completely randomized design model while treatment means were separated by Duncan (1955)

Multiple Range Test.

Organoleptic evaluation.

The cheese samples were organoleptically examined as described by Hamdy *et al.* (1972). The examined score points for appearance, consistency and flavour were 15, 35 and 50 respectively (Abdel *et al.*, 1987).

RESULTS AND DISCUSSION

It is obvious from Table 2 that West African soft

Table 1: Preparation of Cheese from Fresh & Recombined Milk

	Treatments					
Content %	**A**	**B**	**C**	**D**	**E**	**F**
Cow milk	100	80	60	40	20	0
Recombined milk (cowbell)	0	20	40	60	80	100

Table 2: Chemical Properties of West African Soft Cheese made from Recombined milk

Chemical Properties (%)	Added Recombined Milk (%)						
	0	20	40	60	80	100	±SEM
Moisture	39.92^{a}	41.52^{a}	42.13^{a}	47.58^{b}	50.87^{c}	48.82^{b}	5.36*
Crude protein	12.32^{a}	13.95^{b}	13.66^{b}	13.49^{b}	12.99^{a}	12.05^{a}	1.64*
Fat	25.02^{a}	27.75^{a}	30.17^{b}	31.09^{b}	34.31^{b}	36.88^{c}	3.17*
Ash	4.42^{a}	4.24^{a}	4.04^{ad}	4.00^{ad}	3.69^{cd}	3.63^{cd}	0.152*
Titrable acidity	0.17	0.17	0.17	0.17	0.16	0.16	0.003 NS

NS = Not significant

a, b, c, d, e and f Means followed by different superscripts are significant different ($P<0.05$)

Table3: Organoleptic Properties of West African Soft Cheese made from Recombined Milk

Properties (%)	Added Recombined Milk (%)						
	0	20	40	60	80	100	±SEM
Appearance	(15) 10.89^{a}	17.5^{b}	18.35^{a}	20.00^{b}	21.00^{e}	21.65^{f}	±0.13
Consistency	(35) 29.4^{a}	29.33^{a}	28.35^{b}	28.00^{d}	27.51^{bc}	27.65^{c}	±3.5
Flavour	(50) 38.8^{a}	29.70^{b}	40.40^{c}	42.10^{b}	45.00^{e}	46.50^{f}	±0.16
Total	**(100) 79.09**	**76.63**	**87.10**	**90.10**	**93.51**	**95.80**	-

a, b, c, d, e and f Means values along the same row with different superscripts differ ($P<0.05$)

cheese made from recombined milk contained more protein (20 – 80%) while at 100%, the protein content was similar to that of the control (Treatment A). The protein content of the West African soft cheese was increased by 5.4 to 13.23% compared with the control (Treatment A). While the moisture content of the cheese made from the recombined milk was higher than the control (Treatment A).

The addition of the recombined milk to the cow milk enhanced the fat content as the inclusion levels (20, 40, 60, 80 and 100%) increased. The ash content decreased slightly ($P<0.05$) as the inclusion levels of the recombined milk increased from 0 – 100%.

The value of the titrable acidity was between 0.16 and 0.17, however the results are similar among treatments.

ORGANOLEPTIC PROPERTIES

Scoring of the flavour, consistency and appearance are shown in Table 3. The West African soft cheese made from recombined milk was characterized with better appearance, and flavour compared with the control (Treatment A). While the consistency decreased as the inclusion levels of the recombined milk increased in the cheese.

ECONOMIC ANALYSIS

The relative cost of the different cheeses are presented in Table 4. The cost of producing 1kg of the

Table 4: Relative cost of West African Soft Cheese prepared from recombined milk.

	Treatments					
	A	B	C	D	E	F
Cost of 1Kg cheese ($)	1.79	1.44	1.46	1.47	1.49	1.50
Cost (% of control)	100	80.8	81.60	82.40	83.20	84.00
Cheese yield (Kg/100Kg milk)	10.6	21.60	32.68	43.72	54.76	65.80
Revenue ($)	15.45	31.49	47.64	63.73	79.82	95.92

Current selling price ($/Kg cheese)

various cheeses were: $1.44, $1.46, $1.47, $1.49 and $1.50 of the cost of reference cheese (treatment A) in cheeses 20, 40, 60, 80 and 100% recombined milk respectively. The relative cost of the cheeses (Table 4) suggest an average of 3.2% on cheese per kg from including 100% of recombined (powdered) milk in preparation of such cheese. Thus, while the levels of powdered milk appear as good as the reference cheese from the point of view of nutritional and organoleptic properties. Revenue from the sales of the cheese followed same trend of magnitude as the yield of cheese with Treatment, F (100% recombined milk) having highest revenue yield.

DISCUSSION

The increasing crude protein and moisture content are similar to the results of Abdel Bakey *et al.* (1987) who used whey protein and reconstituted milk. While the increasing water content as the reconstituted milk was increasingly added may be due probably to the high water holding capacity of the recombined milk. The slight progressive decrease in the ash content (Treatments A – F) could probably be due to the addition of the recombined milk. However, the value fell within the range reported in literature (Abdel Bakey *et al.* , 1981).

The value of the titrable acidity reported herein was contrary to the report of Abdel Bakey *et al.* (1987). The variation could probably be due to the addition of whey protein used in their study.

The better result obtained for the organoleptic properties was in support of the results of Abdu Dawood *et al.* (1977) and Abdel Bakey *et al.* (1981) and (1987). However, the result was in contrast to the result of Hamdy *et al.* (1972) who reported increased whey off, poor consistency and flat flavour of the prepared cheese. The poor organoleptic results obtained by these authors could be due to the utilization of reconstituted skim milk in the manufacturing of such cheese.

CONCLUSION AND APPLICATIONS

The result of this study showed that West African Soft Cheese could be prepared solely from recombined milk or a mixture of various levels of recombined milk and fresh cow milk without compromising the nutrient content.

The insufficient number and skewed distribution of cow in West African sub-regions couple with scarce availability of fresh cow milk could be solved since recombined powdered milks are readily available in the market

By embracing recombined milk as a substitute to cow milk in cheese making will help in solving the problem of protein malnutrition which has been a major public health problem over the years in Africa..

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