

## Organoleptic quality of Sudanese White Soft Cheese (*Gibna bayda*) As Affected by Packaging Techniques

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### ABSTRACT

This study was aimed to investigate the effect of using different type of packing materials on the organoleptic attributes of the Sudanese white soft cheese packed in to different types of packing materials. Cheese samples were packed in to 5 different packing types, 2 metal tin and 2 plastic containers (lined and non lined with polyethylene) and petroleum gallon as a control. At the beginning of storage (15-45 days) cheese samples stored in petroleum gallon and plastic containers gained a significantly higher scores compared to metal tin container, The appearance, flavor, taste, texture and overall quality of cheese samples kept in metal tin non lined were improved significantly ( $P \leq 0.05$ ) and there were no significant ( $P \leq 0.05$ ) differences in flavor, taste and overall quality among samples kept in lined and non lined tin cans. After 45 days of storage the cheese kept in metal gallon and plastic lined with polyethylene bags were deteriorated to the extent of not being suitable to subject them to any further organoleptic evaluation assay, at the same time, The cheese samples stored in tin cans (lined and non lined) were still acceptable after 150 and 180 days of storage.

**Key words:** Sudanese cheese, packaging, storage, sensory attributes

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## INTRODUCTION

This work represent the continuation of a previous studies (Abdalla, et al., 2012, Abdalla et al 2013, Abdalla et al 2013 and El Zubeir et al 2014), which were investigated the effect of using different packing techniques on the quality of Sudanese white soft cheese *Gibna bayda*. White soft cheese represent the most popular type of cheese produced in Sudan. Cheese production in Sudan has been started by the foreign families migrated to the Sudan, and settled mainly at Ed Dueim, in the White Nile Province (El Tayeb, 1986). El-Dueim is today the most important centre for the manufacture of Jibna-beida for commercial purpose. This town alone supplies about 60% of the total cheese on the Sudanese market (Ahmed, 1987). The increase in cheese production in Sudan witnessed a retreat in packaging, as the metal containers were reused several times and sealed by soldering. However, soldering of cheese metal packages was prohibited and accordingly the packaging of cheese was changed to metal and plastic press lid containers (Idris and Alhassan, 2010). White cheese which is usually made of raw milk and without use of starter culture (Abdalla et.al 1993) and packed in to plastic containers, a practice which lead to deterioration of quality of cheese. Abdalla and Mohamed (2009) investigated the effect of vacuum packaging on chemical composition and sensory properties of white soft cheese and found that sensory properties are gradually improved throughout the storage. final acceptability of cheese is decided by its quality attributes such as flavour, taste and texture. However, Abdalla et al. (2012) concluded that, metal tin containers whether lined or non-lined would secure safety measures for Sudanese white cheese during storage for maturity. Also the use of polyethylen lined containers made either of plastic or metal was highly recommended for packaging of Sudanese white soft cheese. The objective of this study is to investigate the effect of using different types of packing techniques on organoleptic attributes of Sudanese white soft cheese during the storage period.

## MATERIALS AND METHODS

### Materials

Fresh Sudanese white soft cheese was purchased from Galaja 70 kilometers south Eldueim 350 kilomers southwest of Khartoum. packaged into 5 different type of packing, metal tin

and plastic containers (lined with polyethylene and non lined) and petroleum gallon, 2kg for each.

### **Organoleptic evaluation**

A panel of ten semi-trained panelist from Food Research Center at Shambat and college of animal production of Khartoum university were chosen to judge on the organoleptic attributes of Sudanese white cheese (appearance, flavor, taste, texture and overall acceptability) at 15, 30, 45 and 60 for cheese samples packed in to the five different containers. At 120 the judgment was done for cheese samples stored in metal (lined and none lined) and plastic non lined containers. The organoleptic evaluation of cheese samples assessed according to the ranking method described by Ihekoronye and Ngoddy (1985). Sum of ranking from each session were assessed statistically ( $P \leq 0.05$ ) for selection of more acceptable sample using sensory evaluation sheet. After 150 and 180 days of storage the test was done for cheese samples kept in metal tin containers (lined and non lined) and were assessed using paired comparison test.

### **Statistical analysis**

Data generated was subjected to Statistical Package for Social Sciences (SPSS, 1998). Means were tested using two-factor Analysis of Variance (ANOVA), and then separated using Duncan's Multiple Range Test (DMRT) according to Mead and Gurnow (1983).

## **RESULTS AND DISCUSSION**

Tables 1 to 6 show changes of the organoleptic properties (appearance, flavor, taste, texture, overall acceptability) of Sudanese white soft cheese during the storage period (from 15 days up to 180 days) as affected by the type of packing. At 15 days storage (Table 1), the appearance of the cheese samples was significantly ( $P \leq 0.05$ ) affected by the type of packing, the appearance, flavor, taste, texture

and overall acceptability of cheese samples kept in metal gallon were significantly ( $P \leq 0.05$ ), superior to those stored in metal tin and plastic containers, On the other hand, the samples kept in non lined metal tin containers obtained the poorest ranks. The significantly higher ranks of cheese samples stored in metal gallon were correlated with their higher acidity, Robinson (1983) reported that production of cheese depends on fermentation of the lactose

by lactic acid bacteria to form lactic acid which imparts a fresh acid flavor to cheese, promote texture formation also produce trace of flavorful aroma compounds.

**Table 1: Organoleptic quality of Sudanese white soft cheese stored for 15 days as affected by type of packing**

Type of Packing	Sum of ranks*				
	Appearance	Flavour	Taste	Texture	Overall acceptability
MT	45 <sup>c</sup>	42 <sup>c</sup>	42 <sup>c</sup>	42 <sup>c</sup>	45 <sup>c</sup>
LMT	48 <sup>c</sup>	33 <sup>b</sup>	42 <sup>c</sup>	39 <sup>b</sup>	33 <sup>b</sup>
P	27 <sup>b</sup>	12 <sup>a</sup>	21 <sup>b</sup>	21 <sup>b</sup>	18 <sup>a</sup>
PL	18 <sup>a</sup>	33 <sup>b</sup>	27 <sup>b</sup>	2 <sup>b</sup>	24 <sup>b</sup>
MG	10 <sup>a</sup>	15 <sup>a</sup>	12 <sup>a</sup>	12 <sup>a</sup>	15 <sup>a</sup>

Any two sum of ranks having different superscript letter(s) in each column differ significantly ( $P \leq 0.05$ )

MT = Metal tin

MTL = Metal tin lined with polyethylene bags

P = Plastic

PL = Plastic lined with polyethylene bags

MG = Metal gallon

After 30 days storage (Table 2) the appearance, flavor, taste, texture and overall acceptability of cheese samples kept in metal tin improved gradually whereas the organoleptic quality of samples kept in metal tin lined with polyethylene bags were still inferior compare to the other samples.

At 45 days storage (Table 3) the appearance, flavor, taste, texture and overall quality of cheese samples kept in metal tin non lined were improved significantly ( $P \leq 0.05$ ) and there were no significant ( $P \leq 0.05$ ) differences in flavor, taste and overall quality among samples kept in lined and non lined tin cans. The flavor, taste and overall acceptability of cheese stored in metal gallon and plastic non lined containers decreased significantly ( $P \leq 0.05$ ) as the acidity increased, which could be attributed to the fact that, the high acid curd provide

suitable conditions for moulds growth resulting in flavour and textural deterioration including softening (Robinson, 1983).

**Table 2: Organoleptic quality of Sudanese white soft cheese stored for 30 days as affected by type of packing**

Type of Packing	Sum of ranks*				
	Appearance	Flavour	Taste	Texture	Overall acceptability
MT	27 <sup>b</sup>	33 <sup>b</sup>	36 <sup>b</sup>	21 <sup>b</sup>	36 <sup>b</sup>
LMT	45 <sup>c</sup>	42 <sup>c</sup>	42 <sup>c</sup>	45 <sup>c</sup>	45 <sup>c</sup>
P	21 <sup>b</sup>	15 <sup>a</sup>	18 <sup>a</sup>	33 <sup>b</sup>	15 <sup>a</sup>
PL	21 <sup>b</sup>	30 <sup>b</sup>	24 <sup>b</sup>	27 <sup>b</sup>	21 <sup>b</sup>
MG	21 <sup>b</sup>	15 <sup>a</sup>	15 <sup>a</sup>	21 <sup>b</sup>	18 <sup>a</sup>

Any two sum of ranks having different superscript letter(s) in each column differ significantly ( $P \leq 0.05$ ).

**Table 3: Organoleptic quality of Sudanese white soft cheese stored for 45 days as affected by type of packing**

Type of Packing	Sum of ranks*				
	Appearance	Flavour	Taste	Texture	Overall acceptability
MT	18 <sup>a</sup>	18 <sup>a</sup>	18 <sup>a</sup>	14 <sup>a</sup>	16 <sup>a</sup>
LMT	18 <sup>b</sup>	12 <sup>a</sup>	12 <sup>a</sup>	22 <sup>b</sup>	14 <sup>b</sup>
P	46 <sup>c</sup>	40 <sup>b</sup>	44 <sup>c</sup>	24 <sup>b</sup>	36 <sup>b</sup>
PL	36 <sup>b</sup>	38 <sup>b</sup>	44 <sup>c</sup>	22 <sup>b</sup>	28 <sup>b</sup>
MG	32 <sup>b</sup>	42 <sup>c</sup>	30 <sup>b</sup>	22 <sup>b</sup>	28 <sup>b</sup>

Any two sum of ranks having different superscript letter(s) in each column differ significantly ( $P \leq 0.05$ ).

After 60 days storage (Table 4) the appearance of cheese stored in tin lined, were still superior in comparison to the other type of containers. The cheese samples kept in metal gallon and plastic lined with polyethylene bags were the poorest in appearance, flavor, taste, texture and overall acceptability and had been deteriorated to the extent of not being suitable to subject them to any further organoleptic evaluation assay. Osman (2005) stated that, Sudanese White cheese is usually packed in plastic containers, a practice which leads to deterioration of its quality. Tobcu and Saldamli (2006) attributed the deterioration of Turkish white cheese to further hydrolysis of proteins at later stages of ripening due to proteolytic agents on protein, which contributes to cheese off flavors and abnormal texture.

**Table 4: Organoleptic quality of Sudanese white soft cheese stored for 60 days as affected by type of packing**

Type of Packing	Sum of ranks*				
	Appearance	Flavour	Taste	Texture	Overall acceptability
MT	20 <sup>b</sup>	15 <sup>a</sup>	15 <sup>a</sup>	27 <sup>b</sup>	75 <sup>d</sup>
LMT	12 <sup>a</sup>	17 <sup>a</sup>	17 <sup>a</sup>	20 <sup>b</sup>	15 <sup>a</sup>
P	37 <sup>b</sup>	32 <sup>b</sup>	32 <sup>b</sup>	45 <sup>c</sup>	37 <sup>b</sup>
PL	32 <sup>b</sup>	47 <sup>c</sup>	41 <sup>c</sup>	45 <sup>c</sup>	47 <sup>c</sup>
MG	47 <sup>c</sup>	42.5 <sup>c</sup>	47 <sup>c</sup>	52 <sup>c</sup>	47 <sup>c</sup>

Any two sum of ranks having different superscript letter(s) in each column differ significantly ( $P \leq 0.05$ ).

After 120 days of storage table 5 shows that, the appearance of samples stored in lined metal tin was significantly ( $P \leq 0.05$ ) superior in comparison to other containers. The poor ranking in flavor, taste, texture and overall acceptability were obtained by the cheese kept in plastic containers, with no significant ( $P \leq 0.05$ ) difference in the flavor, taste and overall acceptability of cheese kept in metal tin lined and non lined with polyethylene. The cheese samples stored in tin cans (lined and non lined) were still acceptable after 150 and 180 days storage (table 6). At 150 days storage the appearance, flavor, taste and overall acceptability of

cheese samples stored in lined metal tin were significantly ( $P \leq 0.05$ ) superior compared to those kept in tin non lined container. The appearance and taste of cheese were superior compared to those kept in tin non lined samples, but there was no difference in their overall acceptability.

**Table 5: Organoleptic quality of Sudanese white soft cheese stored for 120 days as affected by type of packing.**

Type of Packing	Sum of ranks*				
	Appearance	Flavour	Taste	Texture	Overall acceptability
MT	21 <sup>b</sup>	11 <sup>a</sup>	17 <sup>b</sup>	11 <sup>a</sup>	12 <sup>a</sup>
LMT	14 <sup>a</sup>	19 <sup>a</sup>	15 <sup>b</sup>	25 <sup>b</sup>	11 <sup>a</sup>
P	23 <sup>b</sup>	25 <sup>b</sup>	26 <sup>c</sup>	25 <sup>c</sup>	26 <sup>c</sup>
PL	D	D	D	D	D
MG	D	D	D	D	D

Any two sum of ranks having different superscript letter(s) in each column differ significantly ( $P \leq 0.05$ ), D = Deteriorate.

**Table 6: Organoleptic quality of Sudanese white soft cheese stored for 150 and 180 days using paired comparison test (% acceptability)**

Type of packing	% Acceptability									
	150 days storage					180 days storage				
	Appearance	Flavour	Taste	Texture	Overall acceptability	Appearance	Flavour	Taste	Texture	Overall acceptability
M.T	40	40	40	60	40	75	25	75	50	50
LMT	60	60	60	40	60	25	75	25	50	50

MT= Metal tin, MTL = Metal tin lined with polyethylene bags

## CONCLUSION

Earlier deterioration in cheese samples as a result of microbiological activity, or features beyond desirable or acceptable levels is associated with storage in non lined plastic containers and metallic gallons. metal tin containers whether lined or non-lined would secure safety measures for white soft cheese during storage for maturity or for exportation purposes.

## RECOMMENDATION

Sudanese white soft cheese must be packed in lined containers made either of plastic or metal depending on desired shelflife or whether the cheese would be made for local or export consumption. Suitable food grade lining material such as polyethylene can be used for such purpose.

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