

## Dedication

**This work is dedicated to my  
Parents with Love and  
Respect**

## **Acknowledgement**

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**Tables of contents:**

	<b>Subject</b>	<b>Page</b>
	Dedication	I
	Acknowledgement	II
	Tables of contents	III
	List of tables	VII
List of appendices		X
	English abstract	XI

Arabic abstract	XIII
<b>Chapter One -Introduction</b>	1
1.1. Introduction	1
1.2. Research problems	3
1.3. Research objectives	3
<b>Chapter Two -Literature Review</b>	4
2.1 .The milk	4
2.2. Chemical composition of milk	5
2.3. Fermented dairy products	5
2.3.1. Yoghurt	5
2.3.2. Butter	6
2.4. Cream	6
2.5. Ghee	6
2.6. Ice cream	7
2.7. Milk powder	9
2.8. Whey	9
2.9. Cheese	9
2.9.1. The origin of cheese	10
2.9.2. Sudanese white soft cheese	12
2.9.3. Chemical composition of the Sudanese white soft cheese	13
2.9.4. Packaging of the Sudanese white soft cheese	15
2.9.5. Cheese ripening	16
2.9.6. Cheese storage	17
2.9.7. Nutritional value of cheese	17
2.10. Minerals in milk and dairy products	19
2.10.1. Calcium	19
2.10.2. Phosphorus	20
2.10.3. Sodium and Potassium (Na/K)	20
2.10.4. Magnesium	21
2.10.5. Iron	21
2.11. Vitamins in milk and dairy products	21
2.11.1. Vitamin A ( Retinol )	21
2.11.2. Vitamin D (Claciferol )	22
2.11.3. Vitamin E and K	22
2.11.4. Vitamin C (Ascorbic acid)	22
2.12. Cheese microorganisms	22
2.12.1. Yeasts and moulds	22
2.12.1.1. Yeasts	22
2.12.1.2. Moulds	24
2.12.2. Coliforms	24
2.12.3. Escherichia coli ( <i>E.coli</i> )	25
2.12.4. Lactic acid bacteria	27

2.12.4.1. Lactobacilli	27
2.12.4.2. Streptococci	28
2.12.5. <i>Staphylococcus aureus</i>	28
2.13. Cheese yield	29
2.14. Factors affecting cheese yield	30
<b>Chapter Three -Materials and Methods</b>	<b>31</b>
3.1. Materials	31
3.1.1. Source of milk	31
3.1.2. Source of cassava	31
3.1.3. Source of salt and starter	31
3.1.4. Source of rennet	31
3.1.5. Source of calcium chloride	32
3.1.6. Source of plastic buckets	32
3.2. Methods	32
3.2.1. Cheese manufacturing	32
3.2.2. Physicochemical analysis of milk and cheese	33
3.2.2.1. Total solids contents	33
3.2.2.2. Fat content	34
3.2.2.3. Crude protein	34
3.2.2.4. Ash	35
3.2.3. Biochemical procedures	35
3.2.3.1. Titratable acidity	35
3.2.3.2. Total volatile fatty acids (TVFA)	36
3.2.3.3. pH	36
3.2.4. Vitamin C and minerals content of the cheese	36
3.2.4.1. Vitamin C contents	36
3.2.4.2. Calcium, Phosphorus, Sodium and Potassium determination	37
3.2.5. Microbiological analysis	37
3.2.5. 1. Sterilization of equipments	37
3.2.5. 2. Preparation of sample dilution	37
3.2.5. 3. Preparation of media	38
3.2.5. 4. Total bacteria count	38
3.2.5. 5. Lactobacilli count	39
3.2.5. 6. Streptococci count	39
3.2.5. 7. Yeasts and moulds count	39
3.2.5. 8. Coliforms bacteria count	40
3.2.5. 9. <i>Staphylococcus aureus</i> count	41
3.2.5. 10. Cheese yield	41
3.2.5. 11. Sensory characteristics	42
3.2.5. 12. Statistical analysis	42
<b>Chapter Four - Results</b>	<b>43</b>

4.1.1. The physicochemical characteristics of the pasteurized milk, cassava powder and microbiological evaluation of cheese milk	43
4.1.2. Effect of different levels of cassava powder on the physicochemical characteristics of the white soft cheese	43
4.1.3. Effect of different levels of cassava powder on vitamin C and minerals contents of the white soft cheese	44
4.1.4. Effect of different levels of cassava powder on the microbiological characteristics of the white soft cheese	48
4.1.5. Effect of the different levels of cassava on sensory characteristics of the white soft cheese	52
4.1.6. Effect of storage period on physicochemical characteristics of the white soft cheese	52
4.1.7. Effect of storage period on vitamin C and minerals contents of the white soft cheese	53
4.1.8. Effect of storage period on microbiological characteristics of the white soft cheese	58
4.1.9. Effect of storage period on sensory characteristics of the white soft cheese	59
4.1.10. Effect of different levels of cassava powder and storage period on physicochemical characteristics of white soft cheese	62
4.1.11. Effect of different levels of cassava and storage period on vitamin C and minerals contents of the white soft cheese	66
4.1.12. Effect of different levels of cassava and storage period on microbiological characteristics of the white soft cheese	68
4.1.13. Effect of different levels of cassava powder and storage period on sensory characteristics of the white soft cheese	73
4.1.14. Effect of different levels of cassava powder on yield of the white soft cheese	77
<b>Chapter Five -Discussion</b>	<b>78</b>
5.1. Effect of different levels of cassava powder on the physicochemical characteristics of the Sudanese white cheese	78
5. 2. Effect of different levels of cassava on the vitamin C and minerals of the Sudanese white soft cheese	81
5. 3. Effect of different levels of cassava on the microbiological quality of the Sudanese white soft cheese	83
5.4. Effect of different levels of cassava on the sensory characteristics of the Sudanese white soft cheese	86
5.5. Effects of the storage period on the physicochemical characteristics of the Sudanese white soft cheese	86
5.6. Effects of the storage period on vitamin C and minerals contents of the Sudanese white soft cheese	90
5.7. Effects of the storage period on the microbiological	92

characteristics of the Sudanese white soft cheese	
5. 8. Effect of the storage period on the sensory characteristics of the Sudanese white soft cheese	96
5. 9. Effect of different levels of cassava powder and storage period on the physicochemical characteristics of the Sudanese white soft cheese	97
5. 10. Effect of different levels of cassava powder and storage period on vitamin C and minerals content of the Sudanese white soft cheese	98
5.11. Changes in the microbiological quality of the Sudanese white soft cheese as affected by cassava powder and storage period	98
5.12. Effect of different levels of cassava powder and storage on the sensory characteristics of the Sudanese white soft cheese	100
5.13. Effect of the different levels of cassava on the yield of the Sudanese white soft cheese	100
<b>Chapter Six- Conclusions and Recommendations</b>	<b>102</b>
6.1. Conclusions	102
6.2. Recommendations	103
<b>References</b>	<b>105</b>

#### List of Tables:

<b>Title</b>	<b>Page</b>
Table 1: The major differences in the chemical composition of milk of the different animal species	8

Table 2: Chemical composition of the pasteurized milk used in the study	46
Table 3: Chemical composition of the cassava powder used in the study	46
Table 4: Microbiological analysis of the pasteurized milk used in the study	46
Table 5: Effect of different levels of cassava powder on physicochemical characteristics of the Sudanese white cheese	47
Table 6: Effect of different levels of cassava powder on vitamin C and minerals contents of the Sudanese white soft cheese	49
Table 7: Effect of different levels of cassava powder on microbiological characteristics of the Sudanese white cheese	51
Table 8: Effect of different levels of cassava powder on sensory characteristics of the Sudanese white soft cheese	55
Table 9: Effect of storage period on physicochemical characteristics of the Sudanese white soft cheese	56
Table 10: Effect of the storage period on vitamin C and minerals contents of Sudanese white soft cheese	57
Table 11: Effect of the storage period on microbiological characteristics of Sudanese white soft cheese	60
Table 12: Effect of storage period on sensory characteristics of the Sudanese white soft cheese	61
Table13: Effect of different levels of cassava powder and storage period on total solids content of the Sudanese white soft cheese	63
Table14: Effect of different levels of cassava powder and storage period on fat content of the Sudanese white soft cheese	63
Table 15: Effect of different levels of cassava powder and storage period on crude protein content of Sudanese white soft cheese	63
Table 16: Effect of different levels of cassava powder and storage period on acidity content of the Sudanese white soft cheese	65
Table 17: Effect of different levels of cassava powder and storage period on pH content of the Sudanese white soft cheese	65
Table 18: Effect of different levels of cassava powder and storage period on total volatile fatty acid content of the Sudanese white soft cheese	65
Table 19: Effect of different levels of cassava powder and storage time on ash content of the Sudanese white soft cheese	67
Table 20: Effect of different levels of cassava powder and storage period on vitamin C content of the Sudanese white soft cheese	67

Table 21: Effect of different levels of cassava powder and storage period on calcium content of the Sudanese white soft cheese	67
Table 22: Effect of different levels of cassava powder and storage period on phosphorous content of the Sudanese white soft cheese	68
Table 23: Effect of different levels of cassava powder and storage period on sodium content of the Sudanese white soft cheese	69
Table 24: Effect of different levels of cassava powder and storage period on potassium content of the Sudanese white soft cheese	69
Table 25: Effect of different levels of cassava powder and storage period on total bacteria count of the Sudanese white soft cheese	70
Table 26: Effect of different levels of cassava powder and storage period on lactobacilli count of the Sudanese white soft cheese	70
Table 27: Effect of different levels of cassava powder and storage period on streptococci count of the Sudanese white soft cheese	71
Table 28: Effect of different levels of cassava powder and storage period on yeasts and moulds count of the Sudanese white soft cheese	72
Table 29: Effect of different levels of cassava powder and storage period on coliforms count of the Sudanese white soft cheese	72
Table 30: Effect of different levels of cassava powder and storage period on <i>Staphylococcus aureus</i> count of the Sudanese white soft cheese	72
Table 31: Effect of different levels of cassava powder and storage period on color of the Sudanese white soft cheese	73
Table 32: Effect of different levels of cassava powder and storage period on flavor of the Sudanese white soft cheese	74
Table 33: Effect of different levels of cassava powder and storage period on texture of the Sudanese white soft cheese	75
Table 34: Effect of different levels of cassava powder and storage period on taste of the Sudanese white soft cheese	75
Table 35: Effect of different levels of cassava powder and storage period on saltiness of the Sudanese white soft cheese	76
Table 36: Effect of different levels of cassava powder and storage period on over all acceptability of the Sudanese white soft cheese	76



Table 37: Effect of different levels of cassava powder on yield of the Sudanese white soft cheese	77
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### **List of Appendices**

<b>Appendix</b>	<b>Page</b>
Appendix (I): Sensory evaluation sheet for the white cheese	129
Appendix (II): Photos	130

### **Abstract**

This study was carried out at the laboratory of Dairy Science and Technology Department, College of Animal Production Science and Technology at Sudan University of Science and Technology during the period from January to July 2013 to determine the effect of different levels of cassava powder on the physicochemical characteristics, microbiological quality, yield and sensory characteristics of the Sudanese white soft cheese during storage. One hundred and twenty liters (120 liters) of fresh cow's full cream milk was used for the production of a Sudanese white soft cheese with different levels of cassava powder (Control, 0.5, 0.75 and 1 % respectively). The milk was pasteurized at 72°C for 1 minute and then manufactured into a Sudanese white soft cheese and stored at room temperature for 90 days and examined for the physicochemical, microbiological and organoleptic quality at day 0, 30, 60 and 90 intervals.

The results indicated that total solids contents decreased significantly ( $P < 0.05$ ) with increasing levels of cassava powder, while fat, crude protein, acidity and volatile fatty acid increased significantly ( $P < 0.05$ ) with the levels of cassava powder. There were no significant effect ( $P > 0.05$ ) of cassava powder on pH and ash contents of the Sudanese

white soft cheese. The pH decreased with the levels of cassava powder, while ash increased.

Vitamin C, calcium and phosphorus increased significantly ( $P<0.05$ ) with the levels of cassava, while there were no significance effect on sodium and potassium.

There were significance effect ( $P<0.05$ ) by the levels of cassava on total bacteria count, lactobacilli, streptococci, yeasts and moulds and *Staphylococcus aureus*, while there was no significance effect on coliforms. The total bacteria count and coliforms increased with the levels of cassava, while lactobacilli, streptococci, yeasts and moulds and *Staphylococcus aureus* were decreased.

The yield of the Sudanese white soft cheese was affected by the addition of different levels of cassava powder to milk. The yield increased with the addition of cassava powder. The yield of the cheese made from milk with 1 % cassava was the highest (17.78 %) while the lowest one was recorded by the cheese made from milk without cassava (15.93 %).

The organoleptic quality of cheese revealed that there were significance effect ( $P<0.05$ ) of cassava powder on color, texture and saltiness, while there were no significance effect on flavor, taste and over all acceptability.

The results also indicated that there were significant effect ( $P<0.05$ ) of the storage period on total solids, fat, protein, titratable acidity, pH and volatile fatty acids, while there was no significant variations on the ash content. Total solids, titratable acidity, volatile fatty acid increased with the storage period, while fat, crude protein and pH decreased.

Vitamin C, calcium, phosphorus sodium and potassium decreased significantly ( $P<0.05$ ) with storage period.

The total bacteria count increased significantly ( $P<0.05$ ) with the storage period up to day 60 and then decreased, while lactobacilli, streptococci, coliforms and *Staphylococcus aureus* were significantly ( $P<0.05$ ) decreased with the storage period from the beginning up to the end. Yeasts and moulds significantly ( $P<0.05$ ) increased with the storage period from day 0 up to day 90.

All the sensory characteristics of the white cheese were significantly ( $P<0.05$ ) affected by the storage period. Results showed that the best values for color, flavor, texture, taste and over all acceptability were obtained at the first day (day zero) of the storage period, while the highest value for the saltiness was recorded at the day 30. The color of the cheese decreased from the day zero up to the end of the storage (day 90). The flavor scores reduced from the day zero up to day 60 and then increased

again at the day 90 of the storage. The lowest value for texture and taste were recorded at the day 30 of the storage. The saltiness increased at the day 30 and then decreased again up to the end of the storage period. The over all acceptability reduced by the storage period from day zero up to the day 60 and then increased again at the day 90. The best over all acceptability was recorded at day zero, while the lowest one was at the day 30.

#### ملخص البحث

أجريت هذه الدراسة بمعمل تكنولوجيا الألبان بكلية علوم وتكنولوجيا الإنتاج الحيواني بجامعة السودان للعلوم والتكنولوجيا في الفترة من يناير إلى يوليو 2013 بهدف تقييم تأثير المستويات المختلفة من بدرة الكسافا علي الصفات الفيزيوكيميائية ، الجودة المايكروبيولوجية ، الإنتاجية والتقييم الحسي للجبنة السودانية البيضاء الطرية أثناء فترة التخزين. في هذه التجربة تم استخدام مائة وعشرون لترا (120 لتر) من لبن البقر الكامل الدسم. أجريت أربعة معاملات , المعاملة الأولى صنعت فيها الجبنة دون إضافة بدرة الكسافا, في المعاملات الثانية والثالثة والرابعة استخدمت هذه المستويات من بدرة الكسافا 0.5% ، 0.75% و 1% (علي التوالي لكل من المعاملات الثلاث). تم بسترة اللبن لدرجة حرارة 72 درجة مئوية لمدة دقيقة وبرد لدرجة حرارة 42 درجة مئوية ومن ثم أضيفت بادئ الزبادى بنسبة 1% بعدها أضيفت حبوب الجبنة (حبة لكل 50 لتر لبن) عند درجة حرارة 40 درجة مئوية وصنعت اللبن إلي جبنة بيضاء وخزنت العينات في درجة حرارة الغرفة لمدة 90 يوماً وتم إجراء التحاليل في اليوم (0 ، 30 ، 60، و 90 (علي التوالي).

بإضافة المستويات ( $P<0.05$ ) أظهرت الدراسة بأن الجوامد الكلية تناقصت معنوياً كل من الدهون ، البروتين ( $P<0.05$ ) المختلفة من بدرة الكسافا ، بينما تزايدت معنوياً الخام ، الحموضة و الأحماض الدهنية الطيارة. لم يتأثر كل من الأس الهيدروجيني والرماد بالمستويات المختلفة من بدرة الكسافا حيث تناقص الأس الهيدروجيني بينما زادت نسبة الرماد بزيادة نسب بدرة الكسافا ( زادت من  $0.53\pm 4.53$  في الجبن المصنعة دون إضافة بدرة الكسافا لتبلغ  $8.46\pm 6.38$  في الجبن المصنعة من 1% كسافا ).

بمستويا ( $P<0.05$ ) زادت قيم كل من فيتامين ج ، الكالسيوم و الفسفور بصورة معنوية . بدرة الكسافا بينما لم يتأثر معنوياً كل من الصوديوم والبوتاسيوم

لمستويات الكسافا المختلفة علي كل من العدد الكلي ( $P<0.05$ ) كانت هناك تأثير معنوي للبكتيريا ، بكتيريا حامض اللاكتيك ، الخمائر والفطريات والمكورات العنقودية الذهبية بينما لم تتأثر البكتيريا القولونية بمستويات الكسافا. زاد العدد الكلي للبكتيريا والبكتيريا القولونية بزيادة مستويات الكسافا بينما تناقصت كل من اللاكتوباسلاي ، الإستربتوكوكاي ، الخمائر والفطريات والمكورات العنقودية الذهبية بمستويات الكسافا.

تأثرت إنتاجية الجبن بالنسب المختلفة للكسافا حيث تزايدت الإنتاجية بزيادة نسب بدة الكسافا حيث سجلت الجبن المصنوع من اللبن المضاف إليها نسبة (1%) من بدة الكسافا أعلى إنتاجية (17.78%) بينما سجلت الجبن المصنوع من لبن بدون بدة الكسافا أقل إنتاجية (15.93%).

علي كل من اللون ، القوام ( $P<0.05$ ) أثرت النسب المختلفة من بدة الكسافا معنويا والملوحة بينما لم تتأثر الرائحة ، الطعم والقبول العام. سجلت الجبن المصنوع من اللبن الغير مضاف إليها بدة الكسافا أعلى القيم بالنسبة للون ، القوام ، الطعم والقبول العام. بينما سجلت الجبن المصنوع من (0.5%) أعلى القيم لكل من الرائحة والملوحة.

علي كل من المواد ( $P<0.05$ ) أوضحت الدراسة كذلك بأن فترة التخزين أثرت معنويا الصلابة الكلية ، الدهن ، البروتين ، الحموضة ، رقم الأس الهيدروجيني والأحماض الدهنية الطيارة بينما لم يتأثر الرماد. زاد كل من المواد الصلبة الكلية ، الحموضة والأحماض الدهنية الطيارة بتقدم فترة التخزين بينما تناقص الدهن ، البروتين الخام والأس الهيدروجيني.

كل من فتامين ج ، الكالسيوم ، ( $P<0.05$ ) بتقدم فترة التخزين تناقصت بصورة معنوية . الفسفور ، الصوديوم والبوتاسيوم .

بتقدم فترة التخزين حتي اليوم 60 من ثم ( $P<0.05$ ) تزايد العدد الكلي للبكتيريا معنويا كل من اللاكتوباسلاي ، ( $P<0.05$ ) تناقص ، بينما تناقصت بصورة معنوية الإستربتوكوكاي ، البكتيريا القولونية والبكتيريا العنقودية الذهبية من اليوم الأول بتقدم فترة ( $P<0.05$ ) وحتى نهاية فترة التخزين. تزايدت الخمائر والفطريات معنويا التخزين.

بتقدم فترة التخزين. أظهرت ( $P<0.05$ ) تأثرت كل الخواص الحسية للجبن معنويا النتائج بأن أفضل القيم للون ، الرائحة ، القوام ، الطعم والقبول العام تم تسجيلها في

اليوم الأول من التخزين ، بينما أعلى القيم للملوحة قد تم تسجيلها في اليوم 30 من فترة التخزين .