

بسم الله الرحمن الرحيم

((وإذ قال ربك للملائكة إني جاعل في الأرض خليفة . قالوا أتجعل فيها من يفسد فيها و يسفك الدماء و نحن نسبح بحمدك و نقدر لك قال إني أعلم ما لا تعلمون .))

صد

ق الله العظيم

سورة البقرة (30)

Dedication

To the soul of my father

To my mother

To my family

To Sudanese People

With my love

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Abbreviations

API	Analytical Profile Index
Aver.	Average
Bact.	Bacterial
CFU	Colony forming unit
CNS	Coagulase Negative Staphylococcus.
COBA	Colistin-Oxolinic- Blood – Agar
CP	Collection point
CPS	Coagulase Positive Staphylococcus.
C.C.	Collection centers
ELISA	Enzyme-Linked immuno Sorbent Assay
G.M.	Gazira Milk
Kh.	Khartoum
Kh. N.	Khartoum North
L-EMB	Levine Eosin Methylene Blue
MPN	Most Probable Number
MRT	Milk Ring Test
Omd.	Omderman
SCC	Somatic Cell Count
Strep.	Streptococcus
TBC	Total Bacterial Count

ABSTRACT

The study evaluated the effect of the hygienic, operational and environmental conditions on the quality of raw milk produced and consumed in Khartoum State in summer, and winter seasons, different levels of collection centers (CC) (farms or dika), collection points (CP) (markets or Sougs) and the milk delivered from the neighborhood states (Gazira State GM).

To achieve these objectives, direct farm survey was conducted to cover 300 farms distributed in seven Localities in Khartoum State. , Data were collected and analyzed. The survey results showed that the sheds construction was poor and non– hygienic, no clear water was available for drinking and / or washing. Poor farm management, animals manure was not uniformly removed which negatively affected the animal health since they eat and sleep on a wet floor covered with the manure, some grass stems and /or dirt were seen floating in the raw milk.

Four hundred nineteen four milk samples were collected from the farm collection centre (CC) collection points (cp) and Gazera milk in the mornings and at evenings, in summer as well as winter.

Physical properties tests have been conducted at the collection points to determine the color, flavor and the density. The results showed different in color due to some blood drops and showed a lot of dirt settled and/or floating in the milk.

Regarding the densities results, when using the Lactometer although 91% of the samples were within the acceptable range of 0.1024 – 0.1033.

The result of freezing point showed that, 77% of the raw milk samples were within the acceptable limits of the freezing point range (-0.518, -0.535). All collected samples were tested to determine the compositional, physical & chemical properties and the bacterial changes in the raw milk which are mostly results of some external factors such as thermal affect, manpower and hygienic conditions.

The results showed that the bacterial count of equal or less than 9×10^4 cfu /ml in winter was 35.4% compared to 19.4% in summer. That means although the acceptable range in winter is much higher than in summer but the majority of the raw milk in the state was very much below the acceptable European limits.

As for *Coliform*, 60.1% of the samples in summer and 76.9% in winter satisfy the internationally limit of acceptance which should be less than 100 cell/ml. This shows that the difference between winter and summer was statistically significant. It was found that the *Coli* form bacteria at the farm were significantly less than any other level.

55% of the collected samples were found free of the Coagulase positive *Staphylococci*. The samples that have exceeded the limits of 10^3 was found to be 16.5% in Khartoum State. *Enterococci* were found in almost 35.7% of the tested samples with different counts ranges, but still 81% of the samples in the state were within the acceptable count limit if it is considered to be 100 cell/ml.

Using the SCC applying the European Union standards for less than or equal 5×10^5 , the farm and individual cows milk within this limits were found to be 43.6% in winter and 20.9 % in summer, the samples were mainly in the range of equal to or less than 7.5×10^5 with significant Differences between the counts in winter and summer.

It was found that 74.7% of the samples were within 0.20 Titrable acidity. In winter 80.9% were within this limit. Clear significant correlation at 0.01 levels was found between SCC, acidity and TBC. Direct but not significant correlation between SCP and CPS was found.

To identify both Gram positive and negative isolates, the API Kits were used. Most of the CPS isolates were *Staphylococcus aureus*, while the majority of CNS was *Staphylococcus epidermidis* from bulk milk. Most of the isolates of *Streptococci* were *Streptococcus uberis* about 25.3% in milk and 29.4% from milker's hands swabs. Few isolates of *Corynebacterium* were recovered, *Corynebacterium Pseudotuberculosis* 37.5% and *Corynebacterium ulceran* 29.2%. Regarding the Gram negative isolates most of the isolates were *E. coli*, followed by *Enterobacter* species specially *Enterobacter cloacae* from both milk and milker's hands.

The result showed that 37.2% of the tested samples, using MRT to identify the reactors to bovine *brucellosis*, reacted positively. 33.8% reacted positive when using ELISA on milk for the same samples. The MRT sensitivity and specificity were calculated to be 78% and 83% respectively.

Applying the Alcohol test, 14 % of the samples were failed. 86% of these failed samples were clotted when applying the clotting test. The average ranges of the bulk milk composition in the state were found to be:-

- Protein 3.1- 3.3%,
- Lactose 4.1- 4.3%,
- Fat 3.1- 3.6%.

ملخص الاطروحة

إن الهدف الرئيسي من هذه الدراسة هو معرفة الجودة الصحية، التركيبية والطبيعية للالبان المنتجة والمستهلكة في ولاية الخرطوم. ومن ثم وضع مواصفات قياسية لتوصيف اللبن الخام الجيد للاستهلاك.

أجريت هذه الدراسة بقسم الانتاج الحيواني بكلية الدراسات الزراعية بجامعة السودان للعلوم والتكنولوجيا تم عمل مسح لعدد 300 مزرعة موزعة على 7 محليات , بعد جمع المعلومات وتحليلها أوضحت أن الحظائر غير صحية , لا توجد مياه شرب نظيفة, المزارع تفتقر للإدارة الجيدة , الحليب يتم داخل الحظيرة فى نفس مكان الأكل, الرعاية البيطرية غير متوفرة دائما.

تم جمع 419 عينة البان من مناطق الولاية الثلاث, خلال فصلي الشتاء والصيف و 209 خذعة من ايادي الحلابين.

الاختبارات الفيزيائية أجريت فى وقت أخذ العينات لمعزفة اللون والطعم والكثافة حيث اوضحت النتائج ان 4% من العينات بها لون أصفر بينما 5% من العينات بها رائحة مختلفة وباستخدام اللاكيتوميتر وجد ان 91% فى الحد المسموح به للكثافة.

باجراء اختبار درجة التجمد كانت 77% من عينات اللبن فى الحد المسموح به وكان متوسط درجة حرارة اللبن الموزع في ولاية الخرطوم 27.9-34.2 درجة مئوية, خلال فصلي الشتاء والصيف على التوالي.

كانت هنالك 93.8% عينة سالبة لاختبار الكحول و 92.5% كانت سالبة لاختبار الغليان.

أوضح العد البكتيري الكامل ان 35.4% من العينات تقع داخل الحدود المسموح بها في دول الاتحاد الاوربي (4×10^9), خلال فصل الشتاء بينما 19.4% فقط خلال فصل الصيف تقع داخل هذه الحدود, اي ان اكثرية العينات تقع خارج الحدود المسموح بها في دول الاتحاد الاوربي . اما بالنسبة للبكتريا المعوية فإن الحد المسموح عالميا هو اقل من 100 خلية/ مل . نجد ان 60.1% من العينات في فصل الصيف و 76.9% خلال فصل الشتاء تقع ضمن هذه الحدود, وان هنالك فرقا معنويا بمستوى معنوي 0.05. بين العدد الكلي للبكتريا المعوية في عينات الصيف و الشتاء, و وجد ايضا ان اللبن الخام فى مناطق التجميع(الأسواق) اكثر تلوثا بالبكتريا المعوية إذ أن 63.6% من هذا البن يقع ضمن المعيار العالمي خلال فصل الشتاء و 56.8 خلال فصل الصيف.

اما بالنسبة لعدد العنقوديات موجبة التخمر(CPS) فإن نسبة العينات التي تتجاوز العدد البكتيري فيها 10^3 هو 16.9% في الشتاء مقارنة مع 24.5% فى الصيف وايضا وجد أن نسبة حليب الأسواق هو 19.5% مقارنة ب 18.4% في حليب المزارع(مجمعات الألبان).

اما بالنسبة للسبحيات المعوية (Enterococci) فان 72.9% من العينات بها عدد اقل من 100 خلية/مل، وهي النسبة المسموح بتواجدها في الحليب الخام.

اختبار العد المجهرى للخلايا الجسمية (SCC) اوضح ان 34.3% من العينات خلال فصل الشتاء، و 28.1% خلال فصل الصيف، بها أقل من 5 وهو الحد المسموح به في دول الاتحاد الاوربي . و بالتحليل الاحصائي وجد ان هنالك فرقا معنويا بين العد الصيفي و الشتوي للخلايا الجسمية في الحليب الخام.

في اختبار حموضة اللبن وجد ان 47% من عينات الحليب الخام لا تتجاوز حموضتها 0.20 (حمض اللاكتيك) فى الشتاء و 45.8% فى الصيف.

من الناحية الاحصائية وجد ان هنالك ارتباطا معنويا (0.05) بين العدد الكلي للخلايا الجسمية (SCC) ، و الحموضة، والعد الكلي للبكتريا (TBC). وارتباط معنوي مباشر بين العد الكلي للبكتريا و العنقوديات موجبة التخمر (CPS) بينما لم يكن هنالك ارتباط معنوي بين العنقوديات موجبة التخمر (CPS) و العد الكلي للبكتريا. تم استعمال API Kits للتعرف على انواع البكتريا المعزولة. وجد أن غالبية العنقوديات موجبة التخمر (CPS) هي من نوع العنقودية الذهبية S.aureas بينما غالبية العنقوديات سالبة التخمر CNS هي من العنقودية Epidrmidis.

بالنسبة للمسبحيات التي تم عزلها من الحليب الخام و من ايادي الحلابين فأن الغالبية كان Strept. Uberis. تم عزل والتعرف على عدد بسيط من الوتديات كانت غالبيتها C.pseudotuberculosis.

اما بالنسبة للبكتريا سالبة صبغة غرام فأن غالبية البكتريا المتعرف عليها كانت القولونية (E. Coli) تليها المعوية حيث شكلت (Enterocloacae) النسبة الاكبر من المعويات المعزولة من كل من الحليب الخام و من ايادي الحلابين.

تم اختيار مضادات الاجسام للبروسيليا في كل من الحليب و مصل الدم باستعمال اختبار حلقة اللبن حيث كانت 37.2% من العينات موجبة، بينما كانت 33.8% منها موجبة لاختبار (ELISA).

كانت هنالك 93.8% عينة سالبة لاختبار الكحول و 92.5% كانت سالبة لاختبار الغليان.

القيمة التركيبية للحليب الخام في الولاية كانت ضمن التركيبة العالمية حيث كان البروتين 3.1-3.3 والدهون 3.1-3.6 بينما نسبة سكر اللبن 4.1-4.3.

في ختام الدراسة تم اقتراح بعض التوصيات التي تساعد على تحسين جودة الالبان في الولاية.

