**Sudan University of Science Technology**
**College of Graduate Studies**

# Influence of Season and Year of Calving , and Parity Order on the Lactation Performance of Kenana × Friesian Crossbred Dairy Cows Reared under Intensive System

# أثر موسم الولادة وسنتها الولادة و ترتيبها في إدرار اللبن في الأبقار الهجين فريزيان تحت النظام المكثف × كنانة

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**A Thesis Submitted in the Fulfillment of the Requirement for the Degree of M. Sc. in Animal Production.**

Supervisor: **Dr. Muzzamil Atta Ali.**
Co-supervisor: **Dr. Mohamed El-Tayeb Hamed.**

**March 2010 Khartoum – Sudan**

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# Dedication

This work is dedicated to:

The souls of:
My father Buony.
My mother Nyaluak.
My brother Thir.
Also to:
My wife Dr. Grace John Gatlouk.
My kids Goy, Nyaboul, Challing and Billit.
And my brother's kids.
Sabit, Deng and Nyaluak.

# Acknowledgement

From my adhering moral to thank; really I am very grateful to Dr. Muzzamil Atta Ali, the supervisor of this research; who had always been very generous to see me in his office and at home and I was very lucky to learn from him what I could never attain by myself in years.

I would also like to extend my thanks to Dr. Mohamed El-Tayeb Hamed; my co-supervisor for his on-going help and support and special thanks are due to professor Usama Elsheikh; professor Ali Saad and Dr. Mohamed Tag El-din in the department of animal production Sudan University of Science and technology. My thanks also go to father in law Rev. John Gatlouk, my nephew Mr. Dak Doup, for their great help and concern.

My warm thanks are also extended to the members and the administration staff of the Department of Animal Production – Military Cooperative Corporation "Kafori – Khartoum North" who used to show great hospitality and for allowing me to conduct my research experiment and collecting data as well.

I also need to mention the help given to me by my close friend Tarig M. Badri who took the burden of fist typing, last draft, analyzing and finalizing the research. The man is really very special; my thanks are extended to his family.

Finally, it is worth mentioning that, researchers should keep in mind that, we should always care about our relatives and friends as we care about our studies because the researcher found that such people remain faithful and close to him in sticky situations. To those kind-heart people who never ceased encouraging me under different circumstances, "secrets of struggling for survival"; I extend them my thanks and regards. Above all, God alone has wisdom, regards, and knowledge.

***Maluit Buony Deng; March 2010 Khartoum - Sudan.***

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# List of Contents


| | | Page |
|---|---|---|
| | Dedication……. | iii |
| | Acknowledgement……. | iv |
| | List of Contents……. | v |
| | List of tables…….. | vii |
| | List of figures…… | ix |
| | English abstract…… | x |
| | Arabic abstract…….. | xiii |
| 1 | **Chapter One: introduction**……. | 1 |
| 2 | **Chapter Two: Literature Review……** | 4 |
| 2.1. | Livestock and environmental aspect……. | 4 |
| 2.2. | Local breeds…….. | 5 |
| 2.3. | Crossing cattle in Sudan…….. | 6 |
| 2.4. | Crossing breed history, objective and breads…….. | 6 |
| 2.5. | Sudanese dairy breeds……... | 8 |
| 2.6. | Holstein Friesian……... | 9 |
| 2.7. | Lactation……. | 10 |
| 2.8. | Total milk yield…….. | 11 |
| 2.9. | Lactation curve……... | 14 |
| 2.10. | Factors affecting lactation curve components…… | 15 |
| 2.10.1. | Season of calving……... | 15 |
| 2.10.2. | Year of calving……... | 22 |
| 2.10.3. | Parity order……. | 24 |
| 2.11. | Morphological characteristics of udder and milk production…… | 28 |
| 2.12. | Udder shapes…….. | 30 |
| 2.13. | Udder measurements…….. | 30 |
| 2.14. | Udder dimensions…….. | 32 |
| 2.15. | Udder indicators……. | 34 |
| 3 | **Chapter three: Materials and Methods…….** | 36 |
| 3.1. | Cows housing system……. | 36 |
| 3.2. | Feeding system includes…… | 37 |
| 3.3. | Data collection and manipulation…… | 37 |
| 3.3.1. | First experiment……. | 37 |
| 3.3.2. | Statistical analysis……. | 39 |
| 3.3.3. | Second experiment……. | 39 |
| 3.3.4. | Statistical analysis…….. | 40 |
| 4 | **Chapter four: Results……..** | 41 |
| 4.1. | Milk performance…….. | 41 |
| 4.2. | Udder measurements…….. | 55 |
| 5 | **Chapter five: Discussion……..** | 65 |
| 5.1. | Total milk yield…….. | 65 |
| 5.2. | Lactation length…….. | 66 |
| 5.3. | The persistency index……. | 68 |
| 5.4. | Lactation curve components…….. | 69 |
| 5.4.1. | Initial milk yield……. | 69 |

5.4.2. Rate of milk increase to the peak yield…….. 70
5.4.3. Rate of milk decrease from the peak yield……. 71
5.4.4. The peak yield of week…….. 72
5.4.5. The peak yield…… 73
5.4.6. The persistency of lactation curve……. 73
5.5. Udder measurements…….. 75
5.5.1. Udder Circumference……. 75
5.5.2. Udder length……... 76
5.5.3. Udder width…… 77
5.5.4. Fore udder depth…… 78
5.5.5. Hind udder depth…… 79
5.5.6. Udder capacity……... 80
5.5.7. Conclusion and recommendations……. 81
5.6 **Chapter six: References……...** 83

# List of table


| Table No. | Table title | Page |
|---|---|---|
| 1 | Early importation of exotic table to Sudan……. | 8 |
| 2 | Important frozen semen to Belgravia Diary in the Sudan…….. | 8 |
| 3 | Udder measurement of diary and dual purpose cattle…… | 29 |
| 4 | Distribution of degrees according to the shape…….. | 29 |
| 5 | Udder shape and milk productions in Holstein- Frisian dairy cows…….. | 30 |
| 6 | Udder and teats measurements (cm) in Friesian…… | 32 |
| 7 | Udder and teats measurements (cm) in Friesian (Barbary 1973)……... | 33 |
| 8 | Evaluation of udder morphological measurements…… | 33 |
| 9 | Compare the fore quarters of udder with the total production……... | 34 |
| 10 | The concentrate ration and green fodder quantity given per day per animal…….. | 37 |
| 11 | Means and coefficients of variation of milking performance of the examined cross bred cows…….. | 43 |
| 12 | Means, standard deviations and coefficients of variation for the tested components of lactation curve…… | 44 |
| 13 | Milking performance traits of the cross bred cows calved in different seasons…….. | 47 |
| 14 | The components of the lactation curve for the dry summer, winter and wet summer calvers…….. | 48 |
| 15 | Milking performance traits of the cross bred cows calved in (2000 - 2006)……. | 49 |
| 16 | The components of lactation curve for the year groups calvers of the cross bred cows…… | 50 |
| 17 | Milking performance traits of the cross bred cows of different parity orders…… | 51 |
| 18 | The components of lactation curve for the different parity order groups of crossbred cows ……... | 52 |
| 19 | Means and standard deviation of some Udder measurements of cross bred cows before and after milking at Kafori dairy farm…… | 56 |
| 20 | Udder measurements before and after milking of crossbred cows at Kafori dairy farm during early, mid and late lactation stages……. | 57 |
| 21 | Measurements capacity of Udder of crossbred cows at Kafori dairy farm during early, mid and late lactation stages……... | 58 |
| 22 | Udder measurements before and after milking of crossbred cows at | 59 |

Kafori dairy farm during morning and noon milkings……
23 Measured capacity of crossbred cows at Kafori dairy farm for morning and noon milkings…… 60
24 Udder measurements before and after milking of crossbred cows at Kafori dairy farm during first 8th parities……... 60
25 Measured capacity of crossbred cows at Kafori dairy farm for 8th parities…….. 61
26 Pooled simple regressions of produced milk volume (kg) on the examined udder measurements (cm) before milking…….. 63
27 Pooled simple regressions of produced milk volume on some of udder measurements (circumference difference, width difference, length difference and udder capacity difference)……... 63
28 Pooled multiples regressions of produced milk volume on some of udder measurements (circumference difference, width difference and length difference)…… 64

# List of figures


| Figure No. | Figure title | Page |
|---|---|---|
| 1 | Udder dimensions……. | 31 |
| 2 | Lactation curves of tested season groups……. | 45 |
| 3 | Lactation curves of the examined year's groups calvers…….. | 53 |
| 4 | Lactation curves of the examined parity order groups……. | 54 |

# Abstract

Two experiments were carried out to investigate the effects of season of calving, year of calving and parity order of Kenana × Friesian crossbreed cows on milk yield and lactation curve components using the model ($y=an^{b}.e^{-cn}$). The evaluation of the udder measurements of crossbreed dairy cows in the Sudan was also aimed. The study was carried out in Kafori Military Corporation Farm for Animal Production. The first experiments concerned with milk production performance (total milk yield, lactation length, persistency index) and lactation curve components which include: initial milk yield, rate of increase to the peak yield, rate of decrease from the peak yield, the peak yield of week, the peak yield and the persistency of lactation curve. The data were extracted from the farm records of the period between 2000 to 2006 years. The records were arranged according to season of calving into summer season (March to June), wet season (July to October) and winter season (November to February). The data were also classified in to 7 year groups (one year for each group). The records were also grouped into their parity order (group) parities. The second experiment concerned with the investigation of the correlation between total milk yield and udder measurements. Cows of the farm were classified according to their number of parties (1-8 parities). The cows were also grouped in to three lactations stage groups: early lactation stage, mid lactation stage and late lactation stage. The milk yield and udder measurements were taken before and after each milking (morning and evening milkings). The parameters of udder measurement were: udder circumference, udder length, udder width, fore udder depth, hind udder depth and udder capacity. The data for the first experiment were test by 3 way analysis of variance to examine the significant of effects of year and season of calving and the cow's parity order on the milking performance traits and the lactation curve

components. The data of the second experiment were tested also by (3 way analysis) of variance to test the significance of effects of cows' parity order, the stage of lactation and time of milking on the udder measurements and milk yield. The regressions of milk yield on the different udder measurements were also tested. The mean total yield of the crossbred Kenana X Frisian was 5078.47 ± 1366.24 kg, lactation of 27% coefficient of variation. The lactation length was 389.22 ± 42.81 days of 11% coefficient of variation, the weekly peak milk yield was 151.31 ± 42.12 kg/week of 28% coefficient of variation and the persistency was 61.25 ± 9.26% of 15% coefficient of variation. The results also revealed that season and year of calving and parity order had no significant effect on all of the studied lactation performance traits and the lactation curve components except the total milk yield that was observed to increase significantly with parity order and the persistency of the lactation curve that was significantly low in the $8^{th}$ parity order. Experiment two results showed that the udder measurements were significantly higher before the morning milking than before the noon time milking. The early stage of lactation showed the highest udder measurements whereas the lowest ones were observed at the late stage of lactation groups. All of the studied udder measurements were found to increase significantly with parity order of the cows. The study concluded that the managerial system practiced in the farm relief the cow productivity from the seasonal stress; however the annual changes in these systems as well as the age of cows should be considered when evaluating the milking performance of these crossbred cows. The study also concluded that when evaluating the udder shape and measurements factors such as period between milkings, stage of lactation and cows' age should be put into consideration. It is worth mentioning that the length of the udder before milking is the most udder measurement variable with milk yields. Therefore it can be used with good

accuracy to predict milk yield. Addition of other measurement into multiple regression or use udder capacity may not add more precise prediction.

# ملخص الاطروحة

اجريت هذه الدراسة لاختبار تأثير موسم الولاده، سنة الولاده و رقم الولده على خصائص انتاج اللبن و مكونات منحنى الادرار لابقار الهجين (كنانه x فريزيان) باستخدام النموذج الرياضي ($y=an^b.e^{-cn}$). هدفت الدراسة ايضا لتقييم قياسات الضرع وعلاقتها بادرار اللبن. في هذه الدراسة اجريت تجربتين في مزرعة المؤسسة التعاونية العسكرية للإنتاج الحيواني. كانت التجربة الأولى معنية بأداء إنتاج الحليب (الكمية الكلية للبن المنتج ، وطول مدة الحليب ، ومؤشر مثابرة الانتاج) ومكونات منحنى الادرار والتي تشمل: إدرار الحليب الابتدائي ، ومعدل زيادة الانتاج إلى الذروة ، ومعدل انخفاض الانتاج من الذروة ،اسبوع ذروة الانتاج، وكمية الانتاج عند الذروة ومدى مثابرة ذروة منحنى الادرار. استخدمت سجلات إنتاج اللبن الأسبوعية للفترة بين 2000 – 2006 . رتبت بيانات الانتاج وفقا لموسم ولادة البقرة (صيف و خريف و شتاء) كما قسمت البيانات حسب سنة الولادة الى ثمانية مجموعات ايضا قسمت هذه السجلات حسب ترتيب الولدة الى ثمانية (1 – 8 ولدات) مجموعات. .كانت التجربة الثانية معنية بدراسة العلاقة بين كمية الادرار وقياسات الضرع. وفيها تم تقسيم الابقار الموجودة في المزرعة الى ثلاثة مجموعات حسب مرحلة الحليب (مبكره، متوسطه و متاخره). كما قسمت ايضا الى حسب ترتيب الولدة الي 8 مجموعات.تم جمع بيانات انتاج اللبن وقياسات الضرع (محيط الضرع ، وطول الضرع ، وعرض الضرع ، وعمق الضرع الامامي ، وعمق الضرع الخلفي وسعة الضرع) قبل وبعد حلبتي الصباح الظهر. من أجل التجربة الاولى استخدم تحليل التيباين ثلاثي الطريق لاختبار معنوية آثار سنة وموسم الولادة وترتيب الولدة صفات أداء الادرار ومكونات منحنى الادرار. بيانات التجربة الثانية تم اختبارها أيضا بتحليل التباين ثلاثي الطريق لاختبار معنوية آثار ترتيب الولدة ومرحلة الادرار ووقت الحليب على قياسات الضرع وانتاج اللبن. كما تم اختبار انحدارات انتاج اللبن علي قياسات الضرع المختلفة. كانت قيم انتاج اللبن الكلى وطول فترة الادرار وكمية الانتاج الاسبوعي عند الذروة و نسبة مثابرة الادرار 5078.47 ± 1366.24 كجم ب 27 ٪ معامل اختلاف ، 398.22 ± 42.81 ايام 11 ٪ معامل اختلاف و 151.31 ± 42.12 كجم / الأسبوع ب 28 ٪ معامل اختلاف و 61.25 ± 9.26 % ب 15 ٪ معامل الاختلاف على التوالى. وأظهرت النتائج ان موسم وسنة الولادة وترتيب الولدة لم يكن لها تأثير معنوي على جميع صفات أداء الادرار ومكونات منحنى االادرار باستثناء الانتاج الكلي للبن الذي لوحظ زيادته المعنوية مع ترتيب الولدة ومثابرة منحنى الادرارالتي كانت منخفضة معنويا في ابقار مجموعة الولدة الثامنة. أظهرت نتائج التجربة الثانية ان قياسات الضرع أعلى معنويا قبل حلبة الصباح من قبل حلبة الظهر. في مرحلة الانتاج مبكرة كانت قياسات الضرع الأعلى معنويا في حين الاكثر انخفاضا لوحظت في المرحلة المتأخرة من الادرار. كل القياسات الضرع التي درست تزيد معنويا مع زيادة ترتيب الولدة. وخلصت الدراسة إلى أن نظام الرعاية الذي يمارس في المزرعة يحمي إنتاجية البقرة من الإجهاد الموسمي ، إلا أن التغيرات السنوية في هذه النظم ، فضلا عن عمر الأبقار ينبغي أخذها في الاعتبار عند تقييم أداء هذه الأبقار الهجين. وخلصت الدراسة أيضا أنه عندما تقييم شكل الضرع وقياساته عوامل

مثل الفترة بين الحلبتين ، ومرحلة الادرار وعمر الابقار ينبغي أن توضع في الاعتبار. و الجدير بالذكر أن طول الضرع قبل الحلب هو أكثر قياسات الضرع تغيرا مع كمية الادرار لذا يمكن استخدامه بدقة جيدة للتنبؤ بكمية الادرار. إضافة قياس أخر في انحدار متعدد أو استخدام سعة الضرع قد لا يضيف دقة أكثر للتنبؤ .