sjst.scst.edu.ly

Surman Journal for Science and Technology
ISSN: Online (2790-5721) - Print (2790-5713)

مجلة صرمان للعلوم والتقنية
Vol 7, No.1.Jan – Jun. 2025
Pages: **412 ~ 418**

The impact of climate change during the seasons on the reproductive efficiency of local cows

Fathi Abolkasm[1], Meloud Alsagier [2]

[1, 2]Faculty of Agriculture, Al-Zaytuna University, Tarhuna, Libya

Aedli2010@yahoo.com[1]

Abstract

This study was conducted to determine the effect of climate changes during the seasons on the reproductive efficiency of local cattle during the period from 1992 to 1996. This study relied on the records of 502 animals. They were randomly selected from the records of the previous cattle and poultry breeding system in order to know the effect of each of the following factors: date of birth and the seasons of the year in which the insemination and birth processes took place on some traits related to the reproductive efficiency of local cattle such as age of the animal at the first insemination, age of the animal at the first birth, and the length of the pregnancy period.

Data for the studied traits were collected and appropriate statistical analysis was carried out. Breeding records were analyzed using Duncan test. The results obtained to determine the effect of season of birth and season of insemination on age at insemination, age at birth, and length of conception were highly significant at significance level ($p \leq 0.001$).

While the results for period of birth had no significant effect on gestation length, they were highly significant at the significance level ($p \leq 0.001$). They also had significant effects on age at insemination and age at birth.

Similarly, the results for period of insemination and birth had no significant effect on gestation length at the significance level ($p \leq 0.001$).

From the results obtained we note that improving management methods, providing good nutrition, a suitable environment, and selecting genetically good parents can lead to raising the level of reproductive performance of local livestock. It was observed that animals born during the first years of the study were more reproductively efficient than animals born in recent years which their reproductive efficiency has deteriorated due to the deterioration of animal welfare methods, collapsing of the poultry and cattle breeding system in recent years

Keywords: reproductive performance, date of birth, insemination period, gestation period, domestic cattle.

Submitted: 23/04/2025 *Accepted: 28/05/2025*

الملخص

يهدف أُجريت هذه الدراسة لتحديد تأثير التغيرات المناخية الموسمية على كفاءة التكاثر لدى الماشية المحلية خلال الفترة من عام 2000 إلى عام 2004. اعتمدت الدراسة على سجلات 502 حيوانًا، تم اختيارها عشوائيًا من سجلات نظام تربية الماشية والدواجن السابق، وذلك لمعرفة تأثير كل من العوامل التالية: تاريخ الميلاد، وفصول السنة التي تمت فيها عمليات التلقيح والولادة، على

SJST
sjst.scst.edu.ly
Surman Journal for Science and Technology
ISSN: Online (2790-5721) - Print (2790-5713)
مجلة صرمان للعلوم والتقنية
Vol 7, No.1.Jan – Jun. 2025
Pages: **412 ~ 418**

بعض الصفات المتعلقة بكفاءة التكاثر لدى الماشية المحلية، مثل عمر الحيوان عند أول تلقيح، وعمر الحيوان عند أول ولادة، ومدة الحمل.
جُمعت بيانات الصفات المدروسة، وأُجري تحليل إحصائي مناسب. حُللت سجلات التربية باستخدام اختبار دنكان. أظهرت النتائج التي تم الحصول عليها لتحديد تأثير موسم الولادة وموسم التلقيح على عمر التلقيح، وعمر الولادة، ومدة الحمل، دلالة إحصائية عالية عند مستوى دلالة.($p\leq 0.001$)
على الرغم من أن نتائج فترة الولادة لم يكن لها تأثير يُذكر على مدة الحمل، إلا أنها كانت ذات دلالة إحصائية عالية عند مستوى الدلالة .($p\leq 0.001$) كما كان لها تأثير ملحوظ على عمر التلقيح وعمر الولادة.
وبالمثل، لم يكن لنتائج فترة التلقيح والولادة أي تأثير يُذكر على مدة الحمل عند مستوى الدلالة.($p\leq 0.001$)
من النتائج التي تم الحصول عليها، نلاحظ أن تحسين أساليب الإدارة، وتوفير التغذية الجيدة، والبيئة المناسبة، واختيار آباء ذوي خصائص وراثية جيدة، يمكن أن يؤدي إلى رفع مستوى الأداء التناسلي للماشية المحلية. وقد لوحظ أن الحيوانات التي ولدت خلال السنوات الأولى من الدراسة كانت أكثر كفاءة تناسلية من الحيوانات التي ولدت في السنوات الأخيرة، والتي تراجعت كفاءتها التناسلية نتيجة لتدهور أساليب رعاية الحيوان، وانهيار نظام تربية الدواجن والماشية في السنوات الأخيرة.

الكلمات المفتاحية : *الأداء التناسلي، تاريخ الميلاد، فترة التلقيح، فترة الحمل، الماشية المحلية.*

1- Introduction

Reproductive efficiency in cattle refers to the ability of the female to ovulate, become pregnant, and produce off spring, thus achieving near-constant milk production where reproductive efficiency in males refers to their ability to fertilize with the fewest number of inseminations Zaabal,2008). Pregnancy in dairy cows after calving is a major challenge facing most dairy farmers. Dairy cows typically regain ovarian activity within 35 days after calving, while uterine contraction is completed within 50 days after calving to allow new pregnancy to occur.
Worldwide high-yielding cows are experiencing increased reproductive difficulties in conceiving within the average period after calving, resulting in lower average daily milk production. Studies have shown that 66% of dairy farms around the world face these difficulties and the risks of detecting estrus and pregnancy are among these reasons.

Poor reproductive performance rates could result to low fertility rates on milk production. A recent study showed a positive relationship between the 21-day pregnancy rate and net economic return additionally, it has been estimated that inadequate estrus detection results in a gross margin reduction of up to 20%, along with a lower pregnancy rate.
other study mentioned that first calving on 23 months, could have positive effect on the genetic factor as earlier test on bulls can take place and the younger the age at first calving, the longer the productive life (Pirlo, 2000). Swali et *al* (2006) stated that the younger the age at birth, the longer the productive life span and the age at first calving is also affected by the daily rate of increase in the body weight of the calves during the period from birth until pregnancy. the study is also mentioned that the fast-growing calves give birth for the first time approximately five months before slow-growing calves.
Age at first calving is also an important factor when estimating the cost of care in dairy herds, which witnessed a significant decrease of 18% when the age at first calving decreased from 25 to 21 months (Mohd Nor *et al.* (2013).
It was also noted that late calving cows were less profitable due to their higher maintenance costs even though they produced more milk in their first season compared to cows calving at 24 months

of age (Hermiz *et al.* (2005). Research has shown that age at first calving has a positive effect on milk income, and that the age at first calving that is most cost-effective is between 23 and 24 months. The costs of raising heifers from birth to first calving were estimated at 24, 26, 28, and 30 months (Pirlo *et al*., 2000).
In addition, a lower age at first calving increases the number of calving possible from a single cow, as Evans *et al*. (2006) found a significant effect of age at first calving on the length of a cow's productive life. it could be recommend that the reproductive performance of a herd of cows requires records that document various reproductive events, most importantly the date of birth, the dates of insemination, and then calving age, the total number of inseminations per animal, and their relationship to the year and season of birth. Herds are usually judged by the overall averages of the entire herd.

Research Problem
the effect of climate changes during the seasons on the reproductive efficiency of local cattle

Research Objectives
This research seeks to achieve the following objectives:
to know the effect of each of the following factors: date of birth and the seasons of the year in which the insemination and birth processes took place on some traits related to the reproductive efficiency of local cattle such as age of the animal at the first insemination, age of the animal at the first birth, and the length of the pregnancy period.

2- Materials and methods:
This study was conducted to determine the impact of seasonal climate changes on the reproductive efficiency of local livestock during the period from 2000 to 2004. The study relied on the records of 502 animals randomly selected from the records of the previous cattle and poultry breeding system to determine the effect of each of the following factors: The date of birth and the seasons of the year in which the insemination and birth processes took place depend on some characteristics specific to the reproductive efficiency of local cattle, namely the age of the animal at the first insemination, the age of the animal at the first birth, and the length of the gestation period.

The study relied on records from previous cattle and poultry breeding establishments, including the following information: (animal number - father - mother - date of birth - date of first insemination - inseminated calf - date of second insemination - date of birth).
The months of the year were distributed into their seasons in their natural order according to the date of birth of each cow.
The total number of studied records was (502) animal records during the period from 2000 to 2004 to study the age at first birth of the subject of the study, which included all records, distributed over the years of the study, and were given symbols from (1-5) as shown in Table No. (1).
Also, winter includes the months (12, 1, 2), and is symbolized by the symbol A, spring includes the months (3, 4, 5), and is symbolized by the symbol B, summer includes the months (6, 7, 8), and is symbolized by the symbol C, and autumn includes the months (9, 10, 11), and is symbolized by the symbol D. As shown in Table No. (2)

sjst.scst.edu.ly
Surman Journal for Science and Technology
ISSN: Online (2790-5721) - Print (2790-5713)
مجلة صرمان للعلوم والتقنية
Vol 7, No.1.Jan – Jun. 2025
Pages: **412 ~ 418**

Table (1): shows the distribution of animals (records) according to years.

Symbol	Number of animals	year
1	101	2000
2	91	2001
3	100	2002
4	108	2003
total	500	

Table (2): shows the first vaccination according to the months in each season.

Symbol	Number	Months	season
A	106	2-1-12	Winter
B	146	5-4-3	Spring
C	122	8-7-6	Summer
D	128	11-10-9	Autumn

3 - Experimental design and statistical analysis:

The data obtained from this experiment were analyzed using the statistical analysis program (SAS, 2004), and the design used in the experiment was based on the completely randomized design (CRD) in a one-factorial experiment

$Yij = \mu + Ti + Eij$

Where: Yij = the characteristic to be measured (response) μ = overall mean effect. Ti = treatment effect. Eij = experimental or random error.

4 - Results and Discussion

After conducting statistical analysis of the data, it was found that the effects of each of: year and season of birth, and year and season of insemination, had highly significant effects on the studied traits, and the interactions between year and season were significant ($p<0.001$), as well as the interaction, while the interactions between the other factors were not significant

he results obtained showed the effects as follows:

1. **The effect of the season of birth on the age at first birth:** 1

Period of birth was highly significant ($p<0.001$) on age at first calving, which is consistent with the findings of Ben Gara *et al*. (2009) in a study on dairy cows and Osman *et al*. (2013) in a study on local cows in Egypt, but differs from the findings of (Abd-Almagid 2009) in a study on cows in Pakistan. The average age at first birth in winter was 3.9 ± 846 days, and in autumn 871 ± 4.4 days, and it was close to equality between spring and summer 854 ± 4.9 days, 855 ± 4.6 days, respectively, as in Table (3) and This may be attributed to the fact that calves born in the fall and winter reach weaning age at times when green fodder is available and the temperature is suitable, and thus reach the appropriate weights for insemination more quickly than those born in the spring and summer, which are affected by heat stress, as their feed consumption rate decreases.

sjst.scst.edu.ly
Surman Journal for Science and Technology
ISSN: Online (2790-5721) - Print (2790-5713)
مجلة صرمان للعلوم والتقنية
Vol 7, No.1.Jan – Jun. 2025
Pages: **412 ~ 418**

Table (3): shows the effect of season of birth on age at first birth

The range	Standard deviation	Average age at birth	Number of animal	Attributes
1128-630	84.979	3.9 ±846 b	100	Winter
1236-635	90.172	4.9 ± 854 b	136	Spring
1211-608	95.84	4.6 ±855 b	130	Summer
1150-706	90.24	4.4±871a	136	Autumn

Dissimilar letters indicate significant differences at (p>0.001).

2- The effect of the season of birth on the age at first insemination:

It is clear from the results shown in Table (4) that the season of birth has a highly significant effect at (p<0.001) on the age at first insemination, and this is consistent with what was concluded by (Bakir, et al., 2009) in a study on local cows. The difference was highly significant between winter and other seasons, which confirms that calves born in winter reach the appropriate weights for insemination more quickly than calves born in hot seasons. Benefiting from the low temperature of the weather, which increases the animal's activity and its ability to eat, in addition to reaching the weaning age in the spring, benefiting from the green grass and moderate weather, it reaches the appropriate weight during the first six months of birth. While calves born in other seasons are deferred as they are affected by heat stress and lack of green pastures.

The results in Table (4) show that the pollination season has a significant effect (p<0.001) on the average age at the first pollination, as the autumn season was significant with the rest of the seasons, and the average age at the first insemination for the autumn season was 561 ± 4.2 days, an increase of about 10 days compared to the other seasons, while the other seasons were close to being equal in the average age at first pollination, as it was 557 ± 4.3 days for summer, 553 ± 4.4 days for spring, and 556 ± 3.3 days for winter, This is due to the difference between the various administrative policies during the study years.

Table (4): shows the effect of season of birth on age at first birth

The range	Standard deviation	Average age a frist insemintion	Number of animal	Attributes
792-355	67.15	a 3.3 ± 557	100	Winter
872-354	75.87	a 4.4 ±556	136	Spring
859-295	80.37	a 4.3 ± 553	130	Summer
873-395	76.27	b 4.2 ± 561	136	Autumn

Dissimilar letters indicate significant differences at (p>0.001).

sjst.scst.edu.ly
Surman Journal for Science and Technology
ISSN: Online (2790-5721) - Print (2790-5713)
مجلة صرمان للعلوم والتقنية
Vol 7, No.1.Jan – Jun. 2025
Pages: **412 ~ 418**

3- The effect of different seasons during the period of pregnancy

The season of birth and the season of insemination had no effect on the average length of the gestation period, as shown in Table (5). The overall average for this trait was 0.281 ± 276.12 days, with a standard deviation of 10.37 days, and within a range of 241-343 days there were no significant differences. shows the differences between the average length of pregnancy distributed across the years of birth. This is consistent with all similar studies mentioned above.

Table (5): shows the effect of season of birth on age at first birth

The range	Standard deviation	Average length of pregnancy	Number of animal	Attributes
312-241	7.88	[a] 0.39 ± 276.02	100	Winter
343-242	9.79	[a] 0.57 ± 275.90	136	Spring
334-242	10.11	[a] 0.55 ± 276.54	130	Summer
342-241	12.14	[a] 0.74 ± 275.72	136	Autumn

Dissimilar letters indicate significant differences at (p>0.001).

5 – Conclusion

The results obtained revealed a highly significant effect of climate changes during the different seasons of the year on temperature, day length, and its relationship with light, as well as wind, which makes animals vary in many different reproductive traits, only a portion of which were studied in this study. Many other traits were not addressed in this study. Good management is considered the basis for improving the reproductive efficiency of local cattle, so that the timing of birth, as well as the time of insemination and birth, are controlled in a manner consistent with the results obtained from this study and previous studies.

We therefore advise breeders to consult specialists in the field of animal production to determine the appropriate timetable for each trait related to the reproductive efficiency of local livestock.

6- References

[1] - Abd-Almagid, M.A. (2007). Some studies on the Performance of Holstein-Friesian Cattle in Khartoum State. M .S. Thesis in Animal Production, University of Khartoum.Sudan

[2] Bakir, G. and Cilek, S. (2009). A Research on Reproductive Traits of Holstein Cattle Reared at Tahirova State Farm in Balikesir Province in Turky. Journal of Animal and Veterinary Advances, 8(11): 2383-2387.

[3] Ben Gara, A.; Bouraoui, R.; Rekik, B.; Hammami, H. and Rouissi, H. (2009). Optimal age at first calving for improved milk yield and length of productive life in tunisian holstein cows. amercan-Eurasian journal of agronomy, 2(3): 162-167

[4] Evans, R.D.; Wallace, M.; Garrick, D.J.; Dillon, P.; Berry, D.P. and Olori, V. (2006). Effects of calving age, breed fraction and month of calving on calving interval and survival across parities in Irish spring-calving dairy cows. Livestock Science, 100: 216–230.

[5] Hermiz, N.H.; Juma, K.H.; Khalaf, S.S. and Aldoori, T. (2005). Genetic parameters of production, reproduction and growth traits of Holstein cowes. Dirasat, Agricultural Sciences (32): 157-162 .

[6] Mohd Nor, N.; Steeneveld, W.; van Werven, T.; Mourits, M.C. and Hogeveen, H. (2013). First-calving age and first-lactation milk production on Dutch dairy farms. Journal of Dairy Science, 96(2): 981–992.

[7] Osman, M.M.; El-Bayomi, K.M. and Moawed, S.A. (2013). Genetic and Non-genetic Factors Affecting some Productive and Reproductive Traits in Holstein-Friesian Dairy Cows Raised in Egypt for the First Two Lactations. SCVMJ, XVIII (1): 99-113.

[8] Pirlo, G.; Miglior, F. and Speroni, M. (2000). Effect of Age at First Calving on Production Traits and on Difference Between Milk Yield Returns and Rearing Costs in Italian Holsteins. Journal of Dairy Science, 83(3): 603-608..

[9 Swali, A. and Wathes, D.C. (2006). Influence of the dam and sire on size at birth and subsequent growth, milk production and fertility in dairy heifers. Science Direct Theriogenology, 66: 1173-1184.

[10] Zaabal, M.M. and Ahmed, W.M. (2008). Monitoring of some reproductive parameters in local Egyption Friesian cows with emphasis on the use of immunogenetic analysis for evaluation of fertility. Global Journal of Molecular sciences, 3(1): 21-26. [11] Kreyszig, E. (2011). Advanced engineering mathematics (10th ed.). Wiley.