Longevity traits of Shami and Holstein Cows in Syria

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Research Article

Keywords: Longevity traits, Shami cows, Holstein cows, Syria

Posted Date: July 7th, 2021

DOI: https://doi.org/10.21203/rs.3.rs-672555/v1

Abstract

This research aimed to study the effect of age at first calving (AFC) and first lactation milk yield (FLMY) on the longevity traits of Shami and Holstein cows under the Syrian environment and estimate longevity traits for both breeds. The complete records from birth to voluntary culling were collected for 569 Shami cows and 1699 Holstein cows during the period from 1982 to 2014 at two experimental stations, Ministry of Agriculture and Land Reclamation, Syria. Data were analyzed using the General Linear Model (XLSTAT, 2020). The least square means of lifespan (LS), productive life (PL), a number of calvings (NC), lifetime milk production (LMP), and lifetime daily milk production (LDMP) were 93.7±0.14 months, 63.2±34 months, 4.2±0.14, 7683±0.14 kg, 2.6±0.14 kg for Shami cows, respectively. The corresponding values for Holstein cows were: 61.9±0.14 months, 31.6±34 months, 2.6±0.14, 10246±0.14 kg, 4.4±0.14 kg, respectively. The effect of AFC was significant on all studied traits except LS trait. Whereas, FLMY effect was significant only on LMP and LDMP traits. It was concluded that Shami cows had longer LS, PL, NC traits than Holstein ones, but their LMP and DLMY were lower. Reduction of AFC for Shami and Holstein cows to less than or equals to 25 months could be a proper management policy to improve each of PL, NC, LMP and LDMY. FLMY was found as an indicator for LMP and LDMY of Shami and Holstein cows.

Introduction

Cattle play an important role in meeting the people's demand for milk and meat in Syria. During the last decades, the number of imported Holstein and crossbred cows in Syria increased and the number of local cows reduced, especially Shami cows. According to the Annual Agricultural Statistical Group (2010), the total cattle population in Syria was estimated as about one million heads and produced about 66% of the total milk consumed. However, the total number of Shami cows was 964 heads, representing about 0.1 % of the total cattle population in Syria.

Shami cows have been known as a distinct and important breed for 500 years ago or more. Mature cows were of medium size 484 kg. Shami cows showed a high genetic potential for milk yield and appeared to be the most highly developed milk producing local animal in the middle east (Brown, 1964).

Alawa (1965) reported that Shami cows are characterized by their good adaptation with local environmental conditions, and their resistance to Brucella and foot and mouth diseases, and its reduced incidence of reproductive problems such as placental retention, uterine infection and lethargy of the ovaries, and they can give birth every year. AL-Dakkak (2008) indicated that sexual maturity in the heifers of Shami cows occurs at the age of 13.33 months and weight of 250 kg.

In general, the indigenous breeds are lower in milk and meat production compared to the Holstein breed (Belay et al., 2012). However, local breeds are not only important for the conservation of genetic diversity, but also for increasing the income of small farmers, because of their long lifespan and adaptation with harsh environmental conditions (Jonkus et al., 2020).

Holstein cows had lower 40-60% milk production under tropical and subtropical environments compared to temperate conditions, this is due to the exposure of Holstein cows to the different stress factors in the adverse environments (Mekonnen et al., 2020).

The lifespan and productive life of cows are complex and essential traits for selection and genetic improvement (Kamaldinov et al., 2021), therefore, increasing productive life leads to achieving higher economic return from cows through reducing herd replacement costs and increasing both numbers of calvings and lifetime milk yield (Dallago et al., 2021).

Age at first calving (AFC) is one of the crucial factors in determining the economic income because AFC declares the beginning of a cow's productive life and it is influenced by a lot of factors such as breed, management systems, and cow health (Wu et al., 2012).

First lactation milk yield (FLMY) might reflect the production capacity in subsequent lactations of cows. Dairy cows that yielded greater FLMY may suffer from health problems which may lead to the early culling from the herd (Janus and Borkowska, 2004).

Therefore, the main objectives of this research were 1) to study the effect of AFC and FLMY on the longevity traits of Shami and Holstein cows with considering other environmental factors, and 2) to compare the longevity traits between both breeds under the Syrian conditions.

Materials And Methods

Data collection

Data used in the present study were collected from two Syrian farms and covered 33 years (1982-2014). The first set of data was 569 complete records of Shami cows belonging to the Deir al Hajar station. The second set of data contained 1699 complete records of Holstein cows and belonging to the Fedio station. Each record contained the data of age at first calving, first lactation milk yield, lifespan, productive life, lifetime milk production, lifetime daily milk production and the number of calvings for each cow under study.

Herd management

Animals in the two farms were kept under almost the same management systems. Cows were kept under a free housing system in semi-closed sheds.

Cows were fed commercial concentrates, hay and fresh fodders whenever available. Roughages were provided to the cows twice a day.

Water was available all the time. On the first farm, Shami heifers have naturally inseminated for the first time at 18 months of age taking into account the weight of the heifer. On the second farm, Holstein heifers have artificially inseminated when they reached 13-15 months of age taking into account the heifer weight. All cows in the two farms were machine milked twice daily. Recording of milk yield was conducted twice monthly to calculate the monthly and aggregated total milk production for each cow. Holstein cows were dried for about 60 days before calving, while Shami cows were dried spontaneously. Pregnancy was detected in both breeds by rectal palpation. Cows underwent a regular vaccination program specified by the Animal Health Directorate at the Ministry of Agriculture and Land Reclamation, Syria.

Studied traits:

1. Lifespan (LS, months) = disposal date – birth date.

2. Productive life (PL, months) = disposal date – first calving date.

3. Number of calvings = total number of calvings during the productive life of a cow.

4.Lifetime milk production (LMP, kg) = cumulated total milk yield produced through the productive life of a cow.

5. Lifetime daily milk yield (LDMY, kg) = lifetime milk production/ number of days from birth to disposal for each cow.

Statistical analysis

Statistical analysis of variance was performed using the General Linear Model (GLM) of XLSTAT 2020.3.1.27 software. The statistical model was as follows:

$Y_{ijklmn} = \mu + B_i + A_j + T_k + Y_l + S_m + e_{ijklmn}$

Where:

Y_{ijklm} = the observation of the studied traits,

μ = the overall mean,

B_i = the fixed effect of i^{th} breed, (i=1, 2), where 1= Shami cows, 2= Holstein cows,

A_j = the fixed effect of j^{th} age at first calving groups, (j=1, 2, 3, 4, 5), where 1=≤ 25.4, 2= 25.5–28.5, 3= 28.6–31.7, 4= 31.8–34.7 and 5= ≥ 34.8 months,

T_k = the fixed effect of k^{th} first lactation milk yield groups, (k=1, 2, 3, 4, 5) where 1 =<800 kg, 2= 801-1606, 3= 1607-2409, 4= 2410-3229 and 5= > 3229 kg,

Y_l = the fixed effect of l^{th} year of calving groups for first lactation, (l= 1, 2, 3, 4, 5), where 1=1982-1990, 2= 1991-1995, 3= 1996-2000, 4= 2001-2005 and 5= 2006-2014,

S_m = the fixed effect of m^{th} season of first calving, (m= 1, 2, 3, 4), where 1= winter, 2= spring, 3= summer and 4= autumn, and

e_{ijklmn} = the random error assumed N I D (0, s^2 e).

The interactions among all factors studied were not significant, so we excluded the interactions from the statistical analysis model. To quantify the relationships between AFC and FLMY with the studied traits, simple correlation coefficients were estimated using the XLSTAT 2020.3.1.27 software.

Results And Discussion

1- Lifespan (LS)

Least squares means and standard errors of means for the studied traits are shown in tables (1) and (2). The results of table (1) showed that the lifespan (LS) of Shami cows was about 1.5 times that of Holstein ones, (93.7±1.81 and 61.9±2.83 months, respectively), and the difference was highly significant ($p<0.01$). This is because that Shami cows were more adapted and sustained to the Syrian environment. This result is in agreement with that of Cielava et al. (2017) who reported that Latvian local Brown cows had a lifespan of 3393.1 days longer than crossbred Holstein black and white (2862.2 days). Likewise, Gandini et al. (2007) reported that local Reggiana cows had a lifespan of 70.72 months more than that of Holstein cows (64.91 months) in Italy.

The effect of age at first calving (AFC) on LS was not significant. It ranged between 77 months for cows calved of AFC ≥ 34.8 and 79.7 months for those of AFC ≤25.4 months (Table 1). This is in line with Mészáros et al. (2008) on Slovak Pinzgau cows. On the contrary, Cooke et al. (2013) indicated that cows calved early at less than 26 months had the highest LS of Holstein Friesian in the UK. Valchev et al (2020) reported that Holstein cows calved for the first time at less than 24 months had the littlest LS (6.11 years), and the cows calved for the first time between 34-36 months had the longest LS (7.36 years) in Bulgaria. The authors explained that inappropriate nutrition of young heifers leads to insufficient body development for conception at an earlier age (14-15 months).

The LS wasn't affected significantly by the first lactation milk yield (FLMY) (Table 1). This is in agreement with Brzozowski et al. (2003) on Polish cows. Otherwise, Jankowska et al. (2014) in Poland demonstrated that Holstein Friesian cows produced from 5000 to 10000 kg in the first lactation had a higher LS (5.25 years) compared to 4.95 and 4.43 years of cows produced milk in the first lactation less than 5000 kg and more than 10000 kg, respectively. They explained that cows that produced high milk had fertility problems, so they were culled early and their lifespan was short.

Table (1) indicated that the effect of the year of calving for the first lactation on LS was highly significant ($p<0.01$). The LS decreased with progressed years of calving. This could be due to differences in management policy over years. Similar results were found by Sawa and Bogucki, (2010) in Polish Holstein Friesian cows.

The effect of the season of first calving on LS was not significant (Table 1). This may be attributed to the resemblance of feedstuffs in their quality and quantity as well as may be due to the uniform management practices between different seasons. This result is in accordance with Salem and Hammoud (2019) of Friesian cows in Egypt.

Table 1. Least square means (LSM±SE) of lifespan (LS), productive life (PL), and number of calvings (NC)

Classification[1]	Lifespan (LS) (month)	Productive life (PL) (month)	Number of calvings (NC)
Breed	**	**	**
Shami	93.7^{b}±1.81	63.2^{b}±1.81	4.2^{b}±0.12
Holstein	61.9^{a}±2.83	31.6^{a}±2.83	2.6^{a}±0.19
Age at first calving groups (month)	**NS**	**	**
≤25.4	79.7^{a}±2.70	55.5^{c}±2.70	3.9^{c}±0.19
25.5-28.5	76.9^{a}±1.98	49.6^{b}±1.98	3.5^{b}±0.14
28.6-31.7	78.1^{a}±1.88	48.2^{b}±1.88	3.4^{b}±0.13
31.8-34.7	77.3^{a}±2.28	44.1^{a}±2.28	3.2^{ba}±0.16
≥ 34.8	77^{a}±2.27	39.6^{a}±2.27	3^{a}±0.16
First lactation milk yield groups (kg)	**NS**	**NS**	**NS**
≤800	78.8^{a}±6.16	48.3^{a}±6.16	3.6^{a}±0.42
801-1606	81.1^{a}±2.72	50.8^{a}±2.72	3.8^{a}±0.19
1607-2409	75^{a}±2.16	44.5^{a}±2.16	3.2^{a}±0.15
2410-3229	76.7^{a}±2.36	46.9^{a}±2.36	3.3^{a}±0.16
> 3229	77.5^{a}±3.27	46.5^{a}±3.27	3.1^{a}±0.22
Year of calving (groups)	**	**	**
1982-1990	83.9^{d}±2.07	53.7^{d}±2.07	3.7^{c}±0.14
1991-1995	82.5^{dc}±2.15	52.1^{dc}±2.15	3.7^{c}±0.15
1996-2000	78.5^{cb}±2.19	47.9^{cb}±2.19	3.6^{cb}±0.15
2001-2005	77.6^{b}±2.02	47.2^{b}±2.02	3.3^{b}±0.14
2006-2014	66.6^{a}±2.07	36.1^{a}±2.07	2.6^{a}±0.14
Season of first calving	**NS**	**NS**	**NS**
Winter	76.9^{a}±2.03	46.5^{a}±2.03	3.4^{a}±0.14
Spring	77.6^{a}±1.97	47.6^{a}±1.98	3.3^{a}±0.14

Summer	78.6^{a}±1.96	47.2^{a}±1.96	3.4^{a}±0.13
Autumn	78.1^{a}±1.98	48.2^{a}±1.96	3.4^{a}±0.14

1=within each classification, means not followed by same letter differ significantly;

Number of records = 2268; * * (p<0.01); NS = not significant.

2- Productive Life (PL)

It could be observed from table (1) that the productive life (PL) of Shami cows was twice that of Holstein ones (63.2±1.81 and 31.6±2.83 months, respectively), and the difference was highly significant (p< 0.01).

A similar finding was reported by Gandini et al. (2007) who found that the PL of local Reggiana cows was 47.92 months, greater than that of Holstein cows (37.90 months) in Italy. The authors explained that the Reggiana breed showed higher evident signs of estrus than the Holstein breed. Zhang et al (2021) reported that the PL of Chinese Holstein cows was short (27 months). The authors attributed that to many reasons such as a downtrend of genetic merit on longevity traits, no direct selection for longevity and, the intensive selection for milk yield traits that had negative genetic correlations with the longevity traits.

The effect of AFC on PL was highly significant (p< 0.01). The PL was decreased with progressing AFC. Cows calved at less than or equal 25.4 months had the longest PL (55.5 months), while the cows calved lately (more than or equal 34.8 months) had the shortest PL (39.6 months) (Table 1). This is because of cows that calved at early age began their productive life earlier which resulting in longer their productive life than cows that calved lately. Moreover, it might be attributed to that, cows with older ages at first calving afflicted from a reduction in fertility performance and less milk yield, and therefore, they have more susceptible to culling and have a shorter productive life (Nilforooshan and Edriss, 2004). The current finding agrees with Kučević et al. (2020) on Holstein cows in Serbia. On the other side, Adamczyk et al. (2017) reported that the PL of cows that calved before 24 months at the first time had a lower PL (5.4 years) than those calved at more than 31 months (5.9 years) in Holstein-Friesian cows. Valchev et al. (2020) reported that Holstein cows in Bulgaria calved for the first time at less than 24 months or more than 37 months, had the littlest PL (4.03 and 3.9 months, respectively) while cows calved for the first time between 28 and 30 months had the greatest PL (4.84 months). The authors explained that heifers at this age have mature and healthy bodies for life.

The effect of the FLMY on the PL was not significant (Table 1). This result agreed with the finding of Brzozowski et al. (2003) on Polish cows. On the contrary, Januś and Borkowska (2012) pointed out that increasing milk yield in the first lactation led to reducing the PL of Holstein Friesian cows in Poland. The authors attributed that to the negative correlation between milk production and fertility traits, so cows that produced high milk production at first lactation suffered from reproductive problems and culled early.

The effect of the year of calving on PL was highly significant (p< 0.01). The longest PL was 53.7 months for cows calved during the period from 1982 to 1990 and the shortest one was 36.1 months for cows calved during the period from 2006 to 2014. This may be due to differences in management conditions over years. Singh et al. (2018) obtained the same results on crossbred Frieswal cows (Friesian × Sahiwal) in India.

The PL was not affected significantly by the season of the first calving (Table 1), which is in accordance with Kučević et al. (2020) on Holstein cows in Serbia.

3- Number of calvings (NC)

Table 1 showed that the Shami cows delivered 4.2 calvings compared with 2.6 calvings for Holstein cows during their lifespan. This is because the productive life of Shami cows was twice that of Holstein ones. This result agreed with that of O'Sullivan et al. (2020) who found positive correlations between longevity and the number of calving traits of Irish Holstein Friesian cows. Zhang et al. (2021) indicated that the intensive selection for milk production, led to decreased productive life (27 months) and the number of calving (2.7), because of the negative genetic correlations between the longevity parameters and milk production of Chinese Holstein cows.

AFC affected significantly the NC (p<0.01). It was to be reduced with increasing age at first calving. The highest value of NC (3.9 calvings) was for cows calved at less than or equal to 25.4 months for the first time, and the lowest value (3 calvings) was found for cows calved at more than or equal to 34.8 months for the first time (Table 1). This is because of cows that delivered at lower AFC had longer PL and consequently more NC than cows that calved lately. Similar results were found by Eastham *et al.,* (2018) and Sawa et al. (2018) on Holstein Friesian cows in UK and Poland, respectively. The authors found that the reduction of age at first calving had a positive impact on reproductive performance which resulting in more NC throughout the productive life.

The effect of FLMY on the NC was not significant (Table 1). This result was consistent with Sawa and Krezel-Czopek (2009) in Polish Holstein Friesian cows. On contrary to our finding, Sawa and Bogucki (2017) found a significant effect for FLMY on NC in Holstein Friesian cows. The authors concluded that cows produced 7001-9000 kg milk in their first lactation had the highest NC (3.09) compared to cows that yielded greater than 11000 kg milk which had the lowest NC (2.30). The authors attributed this to the negative genetic correlation between milk production and fertility traits.

Year of calving had a highly significant effect on the NC. The NC was the lowest (2.6) during the period from 2006 to 2014 compared to other periods (Table 1). This effect could be attributed to changes in environment and management conditions over years. The significant effect of the year of calving on NC was also recorded by Singh et al. (2018) on Frieswal cows in India. The effect of the season of first calving on the NC was not significant. This is in agreement with Salem and Hammoud (2019) on Friesian cows in Egypt.

4- Lifetime milk production (LMP)

Despite of Shami cows had a longer lifespan than Holstein ones (about, 1.5 times), results in table (2) showed Holstein cows produced lifetime milk production (LMP) greater significantly ($p<0.01$) than that of Shami ones by about 33 %. This could be due to the genetic differences between the two diverse breeds. This result agreed with Cielava et al. (2017) who reported that Holstein black and white cows produced LMP (37916.4 kg) higher than Latvian local Brown and crossbred Latvian Brown cows (35188.6 and 34407.9 kg, respectively) in Latvia.

Table (2) indicated that cows calved early at an age less or equal to 25.4 months, produced LMP greater significantly ($p<0.01$) than cows calved lately. This might be attributed to cows that calved at an early age had longer productive life than those cows that calved at age lately, so their LMP was higher. This result agreed with that of Sawa et al. (2018) who reported that Holstein Friesian in Poland calved at an age early between (22.1-26 months) had LMP (more than 25 000 kg) higher than cows calved at an age more than 32 months (19095 kg). The authors explained that cows calved at age more than 28 months had udder diseases and their milk yield was low, therefore those cows culled early. Hutchison et al. (2017) demonstrated that LMP of cows that calved for the first time at less than 24 months was (25184 kg) higher than cows that calved at the first time at more than 30 months (20783 kg). Otherwise, Kučević et al. (2020) reported that the age at first calving had no significant effect on LMP on Holstein cows in Serbia.

This study showed that the LMP was increased by increasing the first lactation milk yield (FLMY), where cows that produced higher than 3229 kg milk yield in their first lactation scored LMP equals to 12243 kg compared to 7725 kg for cows that produced less than or equal 800 kg in the first lactation (Table 2). As a result, FLMY could be used as a predictor tool for LMP of a cow. Tekerli and Kocak (2009) reached to close conclusion for Holstein cows under subtropical conditions.

Table (2) indicated that the effect of the year of calving on LMP was significant. It was the lowest (7476 kg) during the period from 2006 to 2014 compared to other periods. This attributed to differences in management policy and environmental conditions over years. The current results were supported by those of Manzi et al. (2020) on Ankole cow and Ankole crossbreds cows of Rwanda. However, the effect of the season of first calving on LMP wasn't significant (Table 2). This result agreed with that of Berihulay and Mekasha (2016) on Holstein Friesian cows in Ethiopia.

Table 2. Least square means (LSM±SE) of lifetime milk production (LMP) and lifetime daily milk yield (LDMY) in kilogram.

Classification[1]	Lifetime milk production(LMP) (kg)	Lifetime daily milk yield (LDMY) (kg)
Breed	**	**
Shami	$7683^{a}\pm602.53$	$2.6^{a}\pm0.15$
Holstein	$10246^{b}\pm941.82$	$4.4^{b}\pm0.24$
Age at first calving groups (month)	**	**
≤25.4	$10876^{c}\pm897.98$	$4.3^{d}\pm0.230$
25.5-28.5	$9467^{cb}\pm658.01$	$3.8^{c}\pm0.169$
28.6-31.7	$8957^{ba}\pm626.14$	$3.5^{b}\pm0.160$
31.8-34.7	$7898^{a}\pm757.10$	$3^{a}\pm0.194$
≥ 34.8	$7623^{a}\pm754.16$	$2.9^{a}\pm0.193$
First lactation milk yield groups (kg)	**	**
≤800	$7725^{a}\pm2047.34$	$2.4^{a}\pm0.524$
801-1606	$8473^{ba}\pm904.78$	$3.2^{a}\pm0.232$
1607-2409	$7063^{a}\pm718.83$	$3^{a}\pm0.184$
2410-3229	$9318^{b}\pm783.98$	$3.8^{b}\pm0.201$
> 3229	$12243^{c}\pm1088.60$	$5.1^{c}\pm0.279$
Year of calving (groups)	**	NS
1982-1990	$9134^{b}\pm689.12$	$3.4^{a}\pm0.177$
1991-1995	$9707^{b}\pm715.45$	$3.5^{a}\pm0.183$
1996-2000	$9603^{b}\pm726.92$	$3.6^{a}\pm0.186$
2001-2005	$8901^{b}\pm671.32$	$3.6^{a}\pm0.172$
2006-2014	$7476^{a}\pm688.21$	$3.4^{a}\pm0.176$
Season of first calving	NS	NS
Winter	$9386^{a}\pm673.48$	$3.7^{a}\pm0.173$
Spring	$8810^{a}\pm657.19$	$3.4^{a}\pm0.168$

Summer	8602^{a}±656.59	3.4^{a}±0.168
Autumn	9059^{a}±650.66	3.5^{a}±0.167

1=within each classification, means not followed by same letter differ significantly;

Number of records = 2268; * * (p<0.01); NS = not significant.

5- Lifetime daily milk yield (LDMY)

Results in Table (2) indicated that lifetime daily milk yield (LDMY) of Holstein cows was significantly (p<0.01) higher than that of Shami ones (4.4±0.24 vs. 2.6±0.15 kg). This is due to Shami cows had a longer lifespan but simultaneously lower lifetime milk production than that of Holstein ones. This result agreed with Cielava et al. (2017) who reported that Holstein black and white cows produced LDMY (13.2 kg) higher than that of Latvian local Brown cows (10.4 kg) in Latvia.

AFC affected significantly LDMY (p<0.01). Cows that calved early produced LDMY significantly more than those calved lately. Cows calved at age ≤25.4 months for the first time produced 4.3 kg LDMY compared with 2.9 kg for those calved at age ≥ 34.8 months. The result demonstrated the positive relationship between AFC, PL, LMP and LDMY. Cows that calved at lower AFC had an opportunity to achieve longer PL and higher LMP and consequently higher LDMY. This result agreed with that of Sawa et al. (2018) who reported that Holstein Friesian in Poland that calved early at an age between 24.1-26 months had higher LDMY (21.9 kg) than those calved at an age more than 32 months (19.5 kg). Eastham et al. (2018) found that dairy cows in UK with AFC around 22 months had LDMY (15.2 kg) more than those with AFC at 36 months (12.8 kg). Otherwise, Salem and Hammoud (2019) reported that AFC had no significant effect on LDMY of Friesian cows in Egypt.

This study pointed out that LDMY increased by increasing the first lactation milk yield (FLMY). Cows that produced greater than 3229 kg milk yield in their first lactation had LDMY equals 5.1 kg. Whereas, cows that produced lower than 800 kg milk yield in their first lactation had LDMY equals 2.4 kg (Table 2). Based on the current finding, FLMY could be used as an effective tool to predict LDMY of a cow throughout its productive life. Sawa and Krezel-Czopek (2009) reached almost the same conclusion.

The results of the present study indicated the effect of the year of calving on LDMY was not significant (Table 2). This result disagreed with Berihulay and Mekasha (2016) on Holstein Friesian cows in Ethiopia. Also, the effect of the season of first calving on LDMY was not significant (Table 2), which is in accordance with that reported by Kučević et al. (2020) on Holstein cows in Serbia.

Correlation Coefficients

The estimated values of correlation coefficients between each of AFC and FLMY with LS, PL, LMP and LDMY are shown in Table (3). The calculated correlation coefficients between AFC and each of LS (0.166) and PL (0.042) were positive and highly significant (p<0.01). Also, a low positive correlation between AFC and NC was recorded (0.038); however, it was not statistically significant. On the other side, highly significant negative correlations were estimated between AFC and each of LMP and LDMY (-0.217 and -0.364, respectively). The current results were in accordance with those of Sawa et al. (2018) who estimated a highly significant positive correlation between AFC and LS (0.062) in Polish Holstein Friesian cattle. As well as, the authors found negative and highly significant correlations between AFC and each of LMP (-0.11) and LDMY (-0.09). However, contrary to our finding, the authors recorded highly significant negative correlations between AFC and each of PL (-0.08) and NC (-0.098).

The estimated values of correlation coefficients between FLMY and each of LS, PL and NC were negative and showed a highly significant (p<0.01) inverse relationship among each other. Otherwise, Sawa and Krezel-Czopek (2009) recorded significant positive correlations between FLMY and LS (0.22), PL (0.22) and NC (0.10) in Holstein-Friesian cattle. On the other side, the current estimated values of correlation coefficients between FLMY and each of LMP (0.390) and LDMY (0.685) showed a highly significant (p<0.01) positive relationship between them. Similar trend was observed by Teke and Murat (2013) who found a significant positive correlation between FLMY and LMP (0.12). Likewise, Sawa and Krezel-Czopek (2009) found a positive relationship between FLMY and each of LMP (0.45) and LDMY (0.62).

Table 3. Correlation Coefficients between each of age at first calving and first lactation milk yield with longevity traits

Longevity traits	Lifespan (LS, month)	Productive life (PL, month)	Number of calvings (NC)	Lifetime milk production (LMP, kg)	Lifetime daily milk yield (LDMY, kg)
Age at first calving (AFC, month)	**0.166****	**0.042****	0.038 NS	**-0.217****	**-0.364****
First lactation milk yield (FLMY, kg)	**-0.360****	**-0.334****	**-0.339****	**0.390****	**0.685****

Number of records = 2268; * * (p<0.01); NS = not significant.

Conclusion

It could be concluded from this study that Shami cows had a longer lifespan, productive life and number of calvings than those of Holstein ones under the Syrian conditions. Shami cows were found as promising local genetic resources that should be exposure to genetic improvement for their productive and reproductive performance.

Declarations

Acknowledgements

The authors are grateful to the Institute of International Education's Scholar Rescue Fund (IIE-SRF) for their financial support to the first author and providing necessary facilities for conducting this work.

Declarations

Funding The research work was funded by Institute of International Education's Scholar Rescue Fund (IIE-SRF).

Conflicts of interest The authors declare no competing interest

Availability of data and material Data will be provided by corresponding author on

reasonable request

Authors' contributions O. Almasri designed the study. S. Abou-Bakr reviewed and revised the manuscript. M. A. M. Ibrahim and Mohamed A. A. Awad analyzed the data. O. Almasri and Mohamed A. A. Awad wrote the manuscript. All authors read and approved the final manuscript.

Ethics approval The study did not involve animal handling.

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