YuzuncuYil University
Journal of Agricultural Sciences
(Yüzüncü Yıl Üniversitesi Tarım Bilimleri Dergisi)
https://dergipark.org.tr/en/pub/yyutbd

ISSN: 1308-7576 e-ISSN: 1308-7584

Research Article

Relationships Between Partial Milk Yield and Actual Milk Yield According to Parity in Buffaloes

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Article Info

Received: 10.10.2023
Accepted: 05.02.2024
Online published: 15.03.2024
DOI: 10.29133/yyutbd.1373681

Keywords

Anatolian Buffalo,
Lactation yield,
Partial milk yield,
Regression

Abstract: In this study, the relationships between 100-day of partial milk yield and 270-day of additive and total milk yield of buffaloes according to different parity were investigated. A total of 697 lactation records belonging to 135 heads of buffalo and seven lactations were used in the material. The relationships between the animals' 100-day partial milk yield for 270-day and total milk yield were analyzed for seven lactations. In the study, 100-day milk yield was taken as an independent variable, 270-day and total milk yields as dependent variables, and possible relationships were determined according to simple and multiple linear regression analysis methods. The average lactation period was 256.74 ± 2.61 days, the average 270-day additive milk yield was 2078 ± 65.26 litres and the average total milk yield was 1831 ± 89.57 litres. The daily average milk yields were 7.69 ± 0.11 and 7.08 ± 0.07 liters for 270-day and 100-day respectively. The correlation coefficients were calculated for each parity and calculated as 0.901 ($p < 0.01$) between the 100-day and 270-day additive yield for the general group. The simple and multiple linear regression equations were shown as [$V_{270} = 470.72 + 1.737 V_{100}$ ($R^2 = 80.2\%$)], [$V_{270} = 966.23 + 0.645 V_{100} + 0.001 V_{100}^2$ ($R^2 = 82.4\%$)] for the groups. As the parity of lactation increased, it was seen that the determination coefficients were increased. Finally, predicting the total lactation yield by using 100-day of partial milk yield has the highest accuracy.

To Cite: Soysal, M, Gürcan, E K, Özkan Ünal, E, 2024. Relationships Between Partial Milk Yield and Actual Milk Yield According to Parity in Buffaloes. *YuzuncuYil University Journal of Agricultural Sciences*, 34(1): 128-137. DOI: https://doi.org/10.29133/yyutbd.1373681

1. Introduction

There are some intensive buffalo farms in our country that carry out buffalo farming at the level of modern enterprises but in general terms, it is extensively maintained family sized small enterprise conditions. This situation causes the yield levels of our animals to be low. In recent years, with the activities of Community-Based Anatolian Buffalo Breeding Program of the General Directorate of Agricultural Research and Policies of The Ministry of Agriculture and Forestry and Buffalo Breeding Associations carried out projects in national dimensions and significant developments have been achieved in buffalo breeding for our country. The number of buffaloes in our country has increased over time. Accordingly, according to the statistics of 2023, our buffalo presence was 167 000 heads (Turkstat, 2023).

Lingna et al. (2018) showed that, monthly records as the partial yield from the data of the Dairy Herd Improvement Centre were used to estimate the 305-day milk yield with six models (Gaines, Sikka, Nelder, Wood, Dhanoa, and Hayashi) and controlled with actual records from farms. These models can be used to predict the 305-day milk yield and further assist farm management decisions and for the genetic evaluation of cattle. Singh (2022) showed that the simple linear regression of the first lactation yield on each partial milk yield can be used to predict the whole first lactation milk yield of Murrah and Nilli Ravi buffaloes. In the case of cumulative milk production, the 90-day yield showed the highest magnitude of R^2 value for the prediction of first lactation production. In another study, Jafarabadi breeds were used to predict the first lactation at 305 days. A linear regression model was fitted by incorporating all 11 monthly test day milk yield records as a partial lactation yield with different combinations to predict the standard lactation yield as early as possible Analysis carried out revealed that when all the monthly test day records (1 to 11) were incorporated in an equation to predict first lactation 305 day or less milk yield, the accuracy (R^2 value) was maximum with 97.06% (Sharma et al., 2022).

In the other studies conducted on water buffaloes, Yilmaz et al. (2023) conducted a study with a questionnaire of 98 enterprise owners rearing Anatolian water buffalo in 2015 in Igdir city of Turkey. The average daily milk yield, annual milk yield, and sales price of buffaloes milk of the enterprises were determined as 5.48±0.07 kg, 1228.56±15.60 kg/lactation, and USD 1.06 (price/per kg), respectively. Non-native buffalo insemination should not be allowed. Otherwise, it is important to emphasize that the heads rearing in each region are adapted to the region they inhabit.

Chisowa (2023) showed the evaluation of the effect of parity on milk yield among water buffaloes and the main objective was to assess the effect of parity number on milk yield among water buffaloes which was provided at Livestock Development Trust Centre (LDTC) Agricultural Research Trust near Batoka in Southern Province of Zambia. The lactating water buffaloes were conducted to assess the effect of parity on Daily Milk Yield (DMY). The mean DMY's for the 1st, 2^{nd,} and 3rd parities were (5.06 ± 2.33 L, 8.00 ±3.23 L, and 6.89±4.00 L, respectively) as significant ($p<0.05$). The study also indicates that milk yield is influenced by parity with cows in 2nd parity showing the highest milk yield of first three parities.

Zhigao et al. (2023) investigated that this study aimed to evaluate the difference between the parity of buffalo colostrum and mature milk. Any difference was not found in mature milk composition and yield by parity affected ($p>0.05$). Observation is provided as parity affected colostrum characteristics rather than mature milk and caused subtle variations in minerals in the colostrum and mature milk of buffaloes. The purpose of this study is to investigate the relationships between 100-day of partial milk yield and 270-day of additive and total milk yield of buffaloes according to different parity. If the total lactation milk yield that the animal can give during lactation from the partial milk yield determined at an early age could be estimated this would be useful for breeding practice.

Matera et al. (2022), aim to investigate those correlations using data collected at a commercial Italian buffalo farm. It can be concluded in buffalo, as in other species, there is a strong relationship between electrical conductivity and sometic cells.

Ayad et al. (2023), aim to estimate the effect of some environmental factors on the productive and reproductive traits of Egyptian buffaloes. 2149 data were collected from dairy Menoufi buffalo, covering the period between 1999 to 2018. Year's effect of calving was found significantly higher ($p<0.001$) on test milk yield, lactation length and dry period. Its effect also important by calving season, likewise, parity had a highly significant ($p<0.0001$) effect on test milk yield, lactation length, dry period. The highest milk production has been recorded at 4th and 5th parity and then decreased. The year of calving had a highly significant ($p<0.001$) effect on all reproductive traits.

Fathy et al. (2023), investigates the effects of four groups of buffalo breed and five levels of parity on lactation yield and lactation length as productive traits. On the other hand, calving interval, dry period and days open as reproductive traits, using data from a dairy buffalo farm in Ismailia governorate. The results shows that parity, breed and their interactions showed significant ($p<0.05$) effects on productive and reproductive traits. Considering the second parity was the highest across breeds for the production traits, but the first parity was the highest for reproductive traits. Buffaloes produce more milk have poor reproductive performance, animals after the fourth parity performed parity poorly in productive and reproductive activities.

In this study, the relationships between 100-day of partial milk yield and 270-day of additive and total milk yield of buffaloes according to different parity were investigated. Considering the investigation the results are given in the article.

2. Material and Methods

The animal material of the study consisted of a total of 697 lactation records belonging to a total of 135 heads of Anatolian buffalo and seven different parity raised in Istanbul. Buffaloes are cared for in a single enterprise under the same feeding and growing conditions. Especially, the buffalo feeding is provided by roughage and also concentrate supplemented feed (maize, wheat, barley, etc.)Animals are milked with a fully automated system twice a day. Milk yield records are automatically recorded daily. Since only animal yield records were used in this research, for this reason, ethics committee approval was not required.

The relationships between 100-day of partial milk yield and 270-day of additive and total milk yield of buffaloes according to different parity were analyzed by correlation coefficients and regression analysis. Furthermore, 270 days of lactation in buffaloes is accepted as the standard lactation day. In the study, 100-day milk yield was taken as an independent variable, 270-day and total milk yields as dependent variables, and possible relationships were determined according to simple and multiple linear regression analysis methods. For each lactation parity, the determination coefficients of the obtained regression equations and the correlation coefficients between the properties considered were calculated. The determination coefficients of the regression equations obtained in the study were used to choose best linear regression equation criteria (Soysal, 2012). All statistical analyses were performed in the SPSS package program(SPSS, 2018).

3. Results

A total of 135 head buffaloes and 697 lactation records were used in the study. The buffaloes are divided into seven parity as a number of lactations. From the milk yield records obtained from the buffaloes, 100-day of additive milk yield, 270-day of additive milk yield, total milk yield, and daily average milk yields were calculated and the number of milking days was determined. Descriptive statistics of the buffaloes in terms of characteristics considered in parity and the results of the Duncan multiple comparison test are presented in Table 1 and Table 2.

Table 1. Descriptive statistics and significance test results of the yield traits according to parity

Parity	100-day milk yield [L – (n)]	270-day milk yield [L –(n)]	Total milk yield [L –(n)]
1. Lactation	831.99±23.62^{c}(134)	2046.40±61.77^{b} (87)	2062.58±73.84^{a} (134)
2. Lactation	875.64±21.95^{bc}(132)	2092.13±62.95^{b}(51)	1894.43±58.15^{ab} (132)
3. Lactation	893.35±21.05^{bc}(134)	2021.57±58.94^{b}(52)	1794.18±56.87^{b}(134)
4. Lactation	874.86±22.41^{bc} (125)	1966.75±78.29^{b} (48)	1726.14±56.29^{b} (125)
5. Lactation	861.89±29.16^{bc}(93)	2230.24±96.30^{b}(33)	1669.39±75.36 ^{b} (93)
6. Lactation	937.37±39.27^{b} (55)	2223.75±172.05^{b}(16)	1743.47±95.95 ^{b} (55)
7. Lactation	1038.08±69.38^{a} (24)	2705.20±543.82^{a}(5)	1793.54±182.26^{b}(24)
General	879.14±10.11 (697)	2078.65±32.26 (292)	1831.89±27.57 (697)

Notice: Different letters in the same column constitute statistically different groups ($p < 0.05$).

Table 2. Descriptive statistic and significance test results of the yield traits according to parity

Parity	Lactation period [day – (n)]	Daily average milk yield (100-day) [L – (n)]	Daily average milk yield (270-day) [L – (n)]
1. Lactation	291.94±5.89^{a}(134)	6.98±0.17^{b} (134)	7.57±0.22^{b} (87)
2. Lactation	261.31±5.87^{b}(132)	7.19±0.14^{b}(134)	7.74±0.23^{b} (51)
3. Lactation	253.28±5.79^{bc}(134)	7.01±0.14^{b}(134)	7.48±0.21^{b}(52)
4. Lactation	249.24±5.52^{bc} (125)	6.88±0.16^{b} (125)	7.28±0.28^{b} (48)
5. Lactation	241.65±6.85^{bc}(93)	6.79±0.19^{b}(93)	8.26±0.35^{b} (33)
6. Lactation	232.41±9.14^{c} (55)	7.49±0.27^{b}(55)	8.23±0.63^{b} (16)
7. Lactation	207.79±12.91^{d} (24)	8.49±0.57^{a}(24)	10.01±2.01^{a}(24)
General	256.74±2.61 (697)	7.08±0.07 (697)	7.69±0.11 (292)

Notice: Different letters in the same column constitute statistically different groups ($p < 0.05$).

In the study, the total milk yield of buffaloes for 100-day was found as 879.14 ± 10.11, the mean total milk yield for 270-day was 2078.65 ± 32.26, and the total yield average was 1831 ± 89.27.57 liters. In addition, the average lactation period of the animals was 256.74 ± 2.61 days, the daily average milk yield of 100-day was 7.08 ± 0.07 and the daily average milk yield of 270-day was 7.69 ± 0.11 liters. When 100-day productivity of the animals was examined, it was seen that they were the seventh lactation highest (1038.08 ± 69.38) and the first lactation was the lowest (831.99 ± 23.62) in terms of parity of lactation.

When the daily and 270-day milk yield averages were compared in the study, the average of the animals during the seventh lactation was statistically different from the other number of lactation ($p < 0.05$). The correlation coefficients between the features discussed in the study were calculated separately for each parity and the results were calculated separately in Table 3- Table 6 is also presented.

Table 3. Correlation coefficients and importance test results between the traits considered according to one and second lactation

Parity 1-2	**V_{100}**	**V_{270}**	**V_{Total}**	**LP**	**DAMY**	**$DAMY_{270}$**
V_{100}	1.000	0.846**	0.710**	0.135	0.787**	0.846**
V_{270}	0.845**	1.000	0.887**	0.252*	0.949**	1.000**
V_{Total}	0.653**	0.868**	1.000	0.569**	0.852**	0.887**
LP	0.092	0.262	0.674**	1.000	0.075	0.252*
DAMY	0.823**	0.959**	0.762**	0.047	1.000	0.949**
$DAMY_{270}$	0.845**	1.000**	0.868**	0.262	0.959**	1.000

The upper side of the diagonal is the 1st lactation and the lower side is the 2nd lactation.
Notice: V100:100-day yield, V270: 270-day yield, VTotal: Total yield, LP: Lactation period (day), DAMY: Daily average milk yield, DAMY270: 270 Daily average milk yield, **: $p < 0.01$, *: $p < 0.05$.

Table 4. Correlation coefficients and significance test results between the traits considered according to third and fourth lactation

Parity 3-4	**V_{100}**	**V_{270}**	**V_{Total}**	**LP**	**DAMY**	**$DAMY_{270}$**
V_{100}	1.000	0.905**	0.759**	0.206	0.898**	0.905**
V_{270}	0.962**	1.000	0.918**	0.389**	0.952**	1.000**
V_{Toplam}	0.873**	0.940**	1.000	0.711**	0.775**	0.918**
LP	0.053	0.137	0.428**	1.000	0.118	0.389**
DAMY	0.947**	0.976**	0.891**	0.002	1.000	0.952**
$DAMY_{270}$	0.962**	1.000**	0.940**	0.137	0.976**	1.000

The upper side of the diagonal is the 3rd lactation and the lower side is the 4th lactation.
Notice: V100:100-day yield, V270: 270-day yield, VTotal: Total yield, LP: Lactation period (day), DAMY: Daily average milk yield, DAMY270: 270 Daily average milk yield, **: $p < 0.01$, *: $p < 0.05$.

Table 5. Correlation coefficients and significance test results between the traits considered according to the fifth and sixth lactation

Parity 5-6	**V_{100}**	**V_{270}**	**V_{Total}**	**LP**	**DAMY**	**$DAMY_{270}$**
V_{100}	1.000	0.969**	0.932**	0.156	0.962**	0.969**
V_{270}	0.976**	1.000	0.981**	0.259	0.979**	1.000**
V_{Toplam}	0.959**	0.989**	1.000	0.430*	0.930**	0.981**
LP	0.061	0.073	0.204	1.000	0.080	0.259
DAMY	0.960**	0.986**	0.957**	0.085	1.000	0.979**
$DAMY_{270}$	0.976**	1.000**	0.989**	0.073	0.986**	1.000

The upper side of the diagonal is the 5th lactation and the lower side is the 6th lactation.
Notice: V100:100-day yield, V270: 270-day yield, VTotal: Total yield, LP: Lactation period (day), DAMY: Daily average milk yield, DAMY270: 270 Daily average milk yield, **: $p < 0.01$, *: $p < 0.05$.

Table 6. Correlation coefficients and significance test results between the traits considered in seventh lactation and overall lactation

Parity 7-Overall	V_{100}	V_{270}	V_{Total}	**LP**	**DAMY**	$DAMY_{270}$
V_{100}	1.000	0.992**	0.991**	0.257	0.993**	0.992**
V_{270}	0.901**	1.000	1.000**	0.320	0.999**	1.000**
V_{Toplam}	0.749**	0.902**	1.000	0.325	0.999**	1.000**
LP	0.068	0.204**	0.541**	1.000	0.288	0.320
DAMY	0.864**	0.962**	0.847**	0.028	1.000	0.999**
$DAMY_{270}$	0.901**	1.000**	0.902**	0.204	0.962**	1.000

The upper side of the diagonal is the 7th lactation and the lower side is the overall lactation.
Notice: V100:100-day yield, V270: 270-day yield, VTotal: Total yield, LP: Lactation period (day), DAMY: Daily average milk yield, DAMY270: 270 daily average milk yield, **: $p < 0.01$, *: $p < 0.05$.

When the correlation coefficients were evaluated over the general data in the study, the correlation coefficients between 100-day yield and 270-day additive yield and total yield were found to be 0.901 and 0.749, respectively, and the relationship between 270-day yield and total yield was found to be 0.902. When all lactations were examined, it was seen that there was a high and significant relationship between 100-day of yield and subsequent yields.

In the study, regression equations were created that allow the estimation of 270-day of additive milk yield and total milk yield by linear regression analysis by using 100-day of yield recording. In addition to the regression equations, the concordance of the equations was also compared by giving the determination coefficients. The regression equations were calculated separately and eventually overall for each lactation number and presented in Table 7 and Table 8.

Table 7. Regression equations and determination coefficients showing the relationship between partial milk yield (100-day of milk yield) and 270-day milk yield for each parity

Parity	**Simple linear regression equation (Y=a+bx) (R^2%)**	**Quadratic regression equation ($Y=a+b_1X+b_2X^2$) (R^2%)**
1. Lactation	V_{270}=447.91+2.22V_{100} (50.4	V_{270}=2352.62-2.740V_{100} + 0.003V_{100}^2 (61.9)
2. Lactation	V_{270}=781.62+1.46V_{100} (76.4)	V_{270}=1103.68 + 0.339V_{100} + 0.001V_{100}^2 (80.3)
3. Lactation	V_{270}=496.81+1.625V_{100} (81.8)	V_{270}=1162.10+ 0.159V_{100} + 0.001V_{100}^2 (83.5)
4. Lactation	V_{270}=256.35+1.829V_{100} (63.3)	V_{270}=673.78+ 0.869V_{100} + 0.001V_{100}^2 (63.8)
5. Lactation	V_{270}=187.19+1.952V_{100} (93.9)	V_{270}=322.58+ 1.699V_{100} + 0.0001V_{100}^2 (93.9)
6. Lactation	V_{270}=211.97+1.950V_{100} (95.3)	V_{270}=442.42+ 1.525V_{100} + 0.0001V_{100}^2 (95.4)
7. Lactation	V_{270}=-461.67+2.458V_{100} (98.5)	V_{270}=2177.13-1.31V_{100} + 0.001V_{100}^2 (98.8)
Overall	V_{270}=470.72+1.737V_{100} (80.2)	V_{270}=966.23+0.645V_{100} + 0.001V_{100}^2 (82.4)

Notice: V100:100-day yield, V270: 270-day yield, Y: Dependent variable, X: Independent variable, b: Regression coefficient, a: Intercept, $Y=a+b_1X_1$: Regression equation, R^2: Coefficient of determination.

The animals' 100-day yield (V_{100}) and 270-day (V_{270}) additive milk yield were evaluated for each lactation number by simple and multiple linear regression equations. The general group was determined as [V_{270}=470.72+1.737V_{100} (R^2 = 80.2%)] and [V_{270}= 966.23 + 0.645 V_{100} + 0.001V_{100}^2 (R^2 = 82.4%)] regardless of parity. All possible relationships for each lactation number are presented in the form of tables.

As the lactation number of the animals increased, it was seen that the determination coefficients of the regression equations also increased. Between the two models used in regression equations, the determination coefficients of the quadratic model were found to be approximately 1-2% higher than the simple linear model.

Table 8. Regression equations and determination coefficients showing the relationship between partial milk yield (100-day of milk yield) and total milk yield for each parity

Parity	Simple linear regression equation (Y=a+bx) (R^2 %)	Quadratic regression equation ($Y=a+b_1X+b_2X^2$) (R^2%)
1- Lactation	V_{tot}=125.08+2.32V_{100} (52.5%)	V_{tot}=1556.43-1.512V_{100} + 0.002V_{100}^2 (59.0%)
2- Lactation	V_{tot}=331.38+1.78V_{100} (45.4%)	V_{tot}=1041.41-0.202V_{100} + 0.001V_{100}^2 (49.2%)
3- Lactation	V_{tot}=-130.25+2.15V_{100} (63.6%)	V_{tot}=-248.04+2.42V_{100} + 0.000V_{100}^2 (63.6%)
4- Lactation	V_{tot}=-100.51+2.08V_{100} (69.1%)	V_{tot}=-673.37+3.44V_{100} + 0.0001V_{100}^2 (70.2%)
5- Lactation	V_{tot}=-324.08+2.31V_{100} (80.1%)	V_{tot}=-151.06+1.91V_{100} + 0.0001V_{100}^2 (80.2%)
6- Lactation	V_{tot}=-214.17+2.08V_{100} (73.1%)	V_{tot}=-49.270+1.75V_{100} + 0.0001V_{100}^2 (73.2%)
7- Lactation	V_{tot}=-700.03+2.40V_{100} (83.6%)	V_{tot}=-69.603+1.00V_{100} + 0.001V_{100}^2 (85.7%)
Overall	V_{tot}=25.790+2.054V_{100} (56.8%)	V_{tot}=437.37+1.076V_{100} + 0.001V_{100}^2 (57.6%)

Notice: V100:100-day yield, Vtot: Total yield, Y: Dependent variable, X: Independent variable, b: Regression coefficient, a: Intercept, Y=a+b1X1: Regression equation, R2: Coefficient of determination.

The comparison of observed milk yield (270-day and total) with expected milk yields according to linear and quadratic models are presented in Figure 1 and Figure 2 according to parity for each animal respectively.

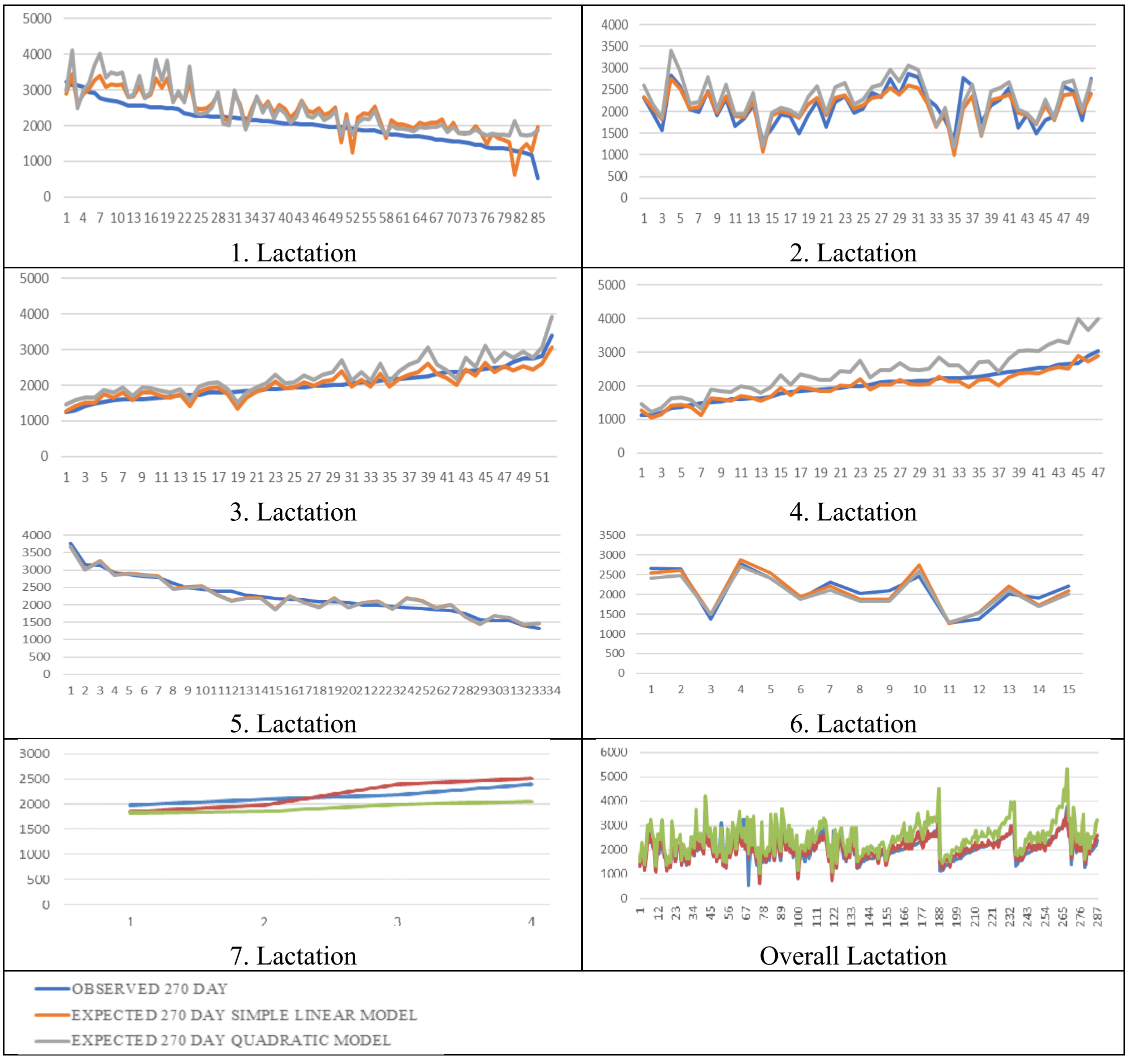

Figure 1. Comparison of 270-day observed milk yield and expected milk yield (estimated by 100-day partial yield as independent variable) according to simple linear and quadratic models according to parity for each animal. Notice: The numbers given on the x-axis are animal numbers and milk yields are given y-axis.

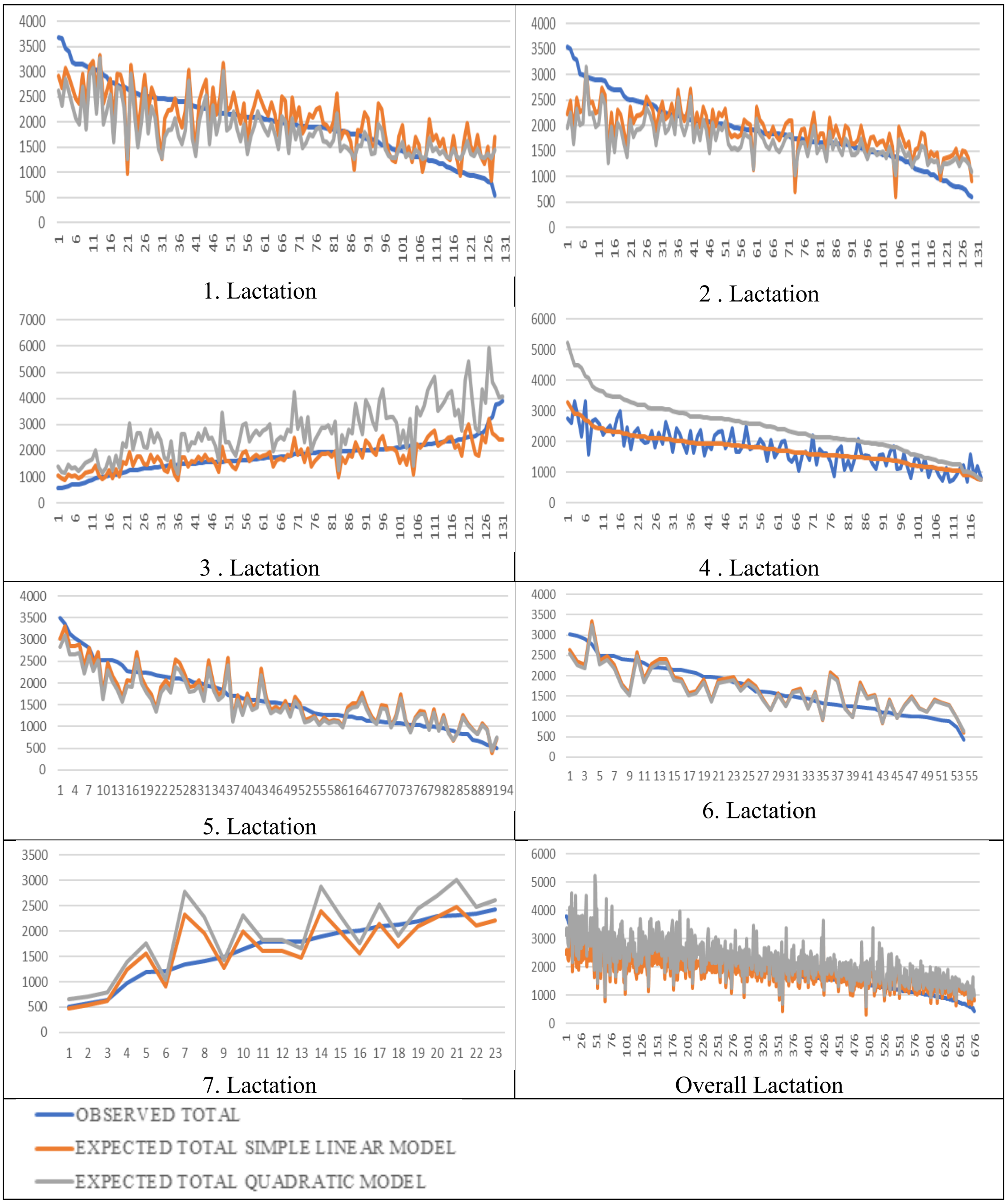

Figure 2. Comparison of observed total milk yield and expected total milk yield (estimated by 100-day partial yield as independent variable) according to simple linear and quadratic models according to parity for each animal. Notice: The numbers given on the x-axis are animal numbers and milk yields are given y-axis.

4. Discussion

In this study, the total milk yield of buffaloes for 100-day was found as 879.14 ± 10.11, the mean total milk yield for 270-day was 2078.65 ± 32.26, and the total yield average was 1831 ± 89.27.57 liters. In addition, the average lactation period of the animals was 256.74 ± 2.61 days, the daily average milk yield of 100-day was 7.08 ± 0.07 and the daily average milk yield of 270-day was 7.69 ± 0.11 liters. When the 100-day productivity of the animals was examined, it was seen that they were the seventh lactation highest (1038.08 ± 69.38) and the first lactation was the lowest (831.99 ± 23.62) in terms of parity of lactation.

In another study, Muhammad (2009) found the first lactation milk yields in Nili Ravi, Murrah, and Egyptian buffaloes as 1854, 1654, and 1185 kg respectively, and the 3rd lactation milk yields as 2396, 2056, and 1678 kg, respectively. Madad et al. reported that the total milk yield of buffaloes with 2327 first lactation records in buffaloes raised in Azerbaijan in 2013 was 1420 kg, the fat yield was 99.8 kg and the fat percentage was 7%.

Similarly, Garcia et al. (2013) reported that the lactation period of the buffaloes they studied in 2013 was 240 days and the lactation yield of 244 days was 864 kg. Malhado et al. (2013) reported that the lactation period of buffaloes was 252 days and the average yield was 1546 kg. In the studies carried out, it has been pointed out that the selection to be made according to the first lactation yields in general will be accurate and without waiting for subsequent lactations.

Soysal et al. (2015) reported that the average lactation length of Anatolian buffaloes raised in Istanbul in 2015 was 216.6 days, the average lactation yield was 1360 kg and the average daily milk yield was 6.26 kg.

In this study, the correlation coefficients were evaluated over the general data in the study, the correlation coefficients between 100-day yield and 270-day additive yield and total yield were found to be 0.901 and 0.749, respectively, and the relationship between 270-day yield and total yield was found to be 0.902.

In another study, Soysal et al. (2015) reported the correlation coefficient between 30-day additive yield and total yield ($r = 0.74$, $p<0.01$), the correlation coefficient between 90-day additive yield and total yield ($r = 0.88$, $p<0.01$), and the correlation coefficient between 180-day additive yield and total yield ($r = 0.94$, $p<0.01$). The researchers suggested that partial yield records could be used accurately to predict the total milk yield of buffaloes early.

In this study, regression equations were created that allow the estimation of 270-day of additive milk yield and total milk yield by linear regression analysis by using 100 day of yield recording. The animals' 100-day yield (V_{100}) and 270-day (V_{270}) additive milk yield were evaluated for each lactation number by simple and multiple linear regression equations. To the general group, the coefficient of determination was determined as($R^2 = 80.2\%$) and ($R^2 = 82.4\%$) regardless of parity.

Elmaghraby (2009) studied regression equations for predicting 305-day milk yield by simple linear equations using individual monthly milk yield and multiple linear regression equations using the maximum coefficient of determination (R^2) as criteria for choosing the best among variables. Among the equations of simple linear regression for predicting 305-day milk yield from individual monthly milk yield, the best single–month prediction model was for three-month partial milk yield ($R^2 = 0.49$). Predictability declined afterward with the advancing month of lactation.

Sahoo et al. (2019) examined the relationship between partial milk yield and of weekly test day period. The best single, two, three, and four test day combinations were selected for the prediction of 305-day milk yield based on adjusted coefficient of determination(R^2) values. It was concluded that the 305-day milk yield can be predicted as early as the 153rd day of lactation and this day can be used for early genetic evaluation of Murrah sires.

Rana et al. (2020) used the data of the first lactation bimonthly test day milk yield records of Murrah buffaloes. The study compared the conventional and computational methods for prediction of first lactation milk yield which could be used for early selection of the animals. The first lactation 305-day milk yield was observed to be best estimated by Multiple Linear Regression (MLR), followed by Artificial Neural Network (ANN) and Centering Date Method (CDM). Early prediction of 305 Day Milk yield using bimonthly test day milk yield (BTDY- 2 (65th day), BTDY-3 (125th day), and BTDY-4 (185th day) gave higher accuracy (85.29%). Evaluation of the sires and dam based on early test day yields would eventually result in reduced cost incurred on milk records, reduced generation interval, and increased response to selection. If selection is to be made for the milk yield of an animal in animal husbandry, the earlier the milk yield of that animal can be determined, the decision is made to improve milk yield. It is possible to make such a choice by taking advantage of partial yield records before the total lactation yields of the animals are completed with regression analysis methods.

Chaudhari et al (2022) studied predicting standard lactation milk yield by simple regression equation from weekly, fortnightly, and monthly, individual and cumulative part yield in Jafarabadi buffalo. They revealed that correlation coefficients between 305-day milk yield and different weekly (1st to 20th week), fortnightly (1st to 5th fortnight), and monthly (1st to 5th month), individual and cumulative part lactations were positive and significant ($p<0.01$) and showed an increasing trend with the advancement of lactation.

Finally, all lactations were examined, and it was seen that there was a high and significant relationship between 100-day of yield and subsequent yields. As the lactation number of the animals increased, it was seen that the determination coefficients of the regression equations also increased. In addition to, the two models used in regression equations, the determination coefficients of the quadratic model were found to be approximately 1-2% higher than the simple linear model.

Conclusion

In this study, the relationships between 100-day of partial milk yield and 270-day of additive and total milk yield of buffaloes according to different lactation numbers were investigated. If the total lactation milk yield that the animal can give during lactation from the partial milk yield determined at an early age can be estimated, this will be useful for breeding practice. In general, as the lactation number of the buffaloes increased, the determination coefficients of the regression equations increased and between the two models used in the regression equations, As a result, it was seen that benefiting from 100 day of partial milk yield would be accurate and useful in predicting the milk yield of the animal before the animals finished their lactation period. As a result, it has been seen that partial yield records can be used to effectively estimate total lactation milk yield of the animal.

Acknowledgements

We thank the private enterprise for permission to use the yield records used in this study.

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