

# **The Estimation of Lactation Milk Yields Using Partial Milk Yields of Mediterranean Water Buffalo Herd Raised in Istanbul**

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## **Abstract**

The research was aimed to provide estimation of total lactation milk yields using partial milk yields of Mediterranean water buffalo in a short time. In this study, the descriptive statistics of total lactation milk yield, daily milk yield and lactation period were found as  $1694.3 \pm 428.2$  kg,  $7.2 \pm 1.3$  kg and  $232.8 \pm 40.6$  day respectively in the Mediterranean water buffalo population raised in Istanbul recently imported Italy. At the same time, the relationship between total milk yield and partial milk yield was analyzed with regression and correlation analysis. The determination coefficients were found as 0.40, 0.94 and 0.99 for 15, 210 and 300 days, respectively. Several regression equation and determination coefficient were calculated. As an example, regression equation and coefficient of determination were calculated for 60 days partial milk yield (60PMY) and total milk yield as  $[TMY=102+2,83 (60PMY)]$  and 48,9 % respectively.

**Keywords:** Mediterranean Water Buffalo, Partial Milk Yield and Total Milk Yield.

## **Introduction**

Generally, study on lactation biometry of intensive water buffalo breeding in Turkey is lower than the other species. Especially countrywide herd book network and official recording of lactation yield was on beginning stage from the improvement programme point of view in water buffalo. Recently in 2011 community based water buffalo improvement program has established. Selection program for increasing the several productive features of animals' yield are not able to reach to the expected level.

Due to the establishment of central and provincial National water buffalo breeder unions and government's supportive policies in recent years, there were important attempts about increasing the number of water buffalo and selective breeding programs. While the

number of water buffalo is about increasing in Asian continent, in our country this situation is about sharply decreasing until 2001 as of 84000 head. After applied several programs number of water buffalo is increasing again. According to 2015 TUIK's database, it was reported that total water buffalo number is 133.766 head, number of milking buffalo is 62.999 head. Water buffalo was raised very numerous in Samsun, Tokat, Amasya and Istanbul province of Turkey as 43.958 head (TUIK, 2015). Water buffalo's products are valuable for milk and meat processing. For instance, yogurt, kaymak and sausage made from buffalo milk and meat are very well-known and these products are preferred by consumers. Specially, the fat percent of water buffalo' milk is different from other species' milk fat.

Water, dry matter, fat and protein percentage in water buffalo milk have reported as 82.2%, 17.8%, 8.1% and 4.1% respectively, (Soysal and Küçük, 1996). Madad *et al.* (2013), have reported that total milk and fat yield were found 1420.5 kg and 99.8 kg in Azerbaijan buffalo, respectively. Moreover, heritability of total milk yield and fat percentage were detected as 0.14 and 0.35 and the fat percentage was found 7.01% also. Garcia *et al.* (2013), have detected the average milk yield and lactation period as 864 kg and 244 days, respectively. Muhammed (2009), also reported that the average milk yield, lactation period and fat percentage were found as 2587 liter, 322.9 days and 7.4%, in Italian water buffalo, respectively. At the same time, the first, third lactation milk yields and fat percentages of Nili Ravi, Murrah and Egyptian water buffalo were found 1854, 1654 and 1185 kg; 2396, 2056 and 1678 kg and 6.4, 6.6 and 6.5%, respectively (Mohammed A. 2009).

In order to assess the genetic capacity of farm animal as quickly, milk yield of these animals should be estimated as early age as possible rather than waiting the whole lactation completed and accurately. Therefore, the partial milk yields are used to estimate the total lactation yields. Similarly, Malhado *et al.* (2013), recommended that due to the high repeatability of milk yield, the first lactations could have used a selection criterion in animal breeding.

Ragnon and Brambilla (1957), were reported that the correlation coefficient between 70-days partial milk yield and total milk yield was found as 0.52 in cattle in Italy. However, Rendel *et al.* (1957), have found the same value as 0.80. Goodall and Sprague (1985), indicated that partial milk yields, which were obtained in the 10th week of lactation, have been more useful to estimate total lactation milk yield. Tuncel (1971), has calculated the coefficient of determination between 30-days and 150-days of monthly and partial milk yields

and total yield as 0.596 and 0.861, in Brown Swiss cattle respectively. Soysal and Küçük (1996), were noted that in order to estimate the total lactation yield from partial yield, the linear regression equation could be utilized as  $(Y=502.919+1.261X)$ , by using 180-days partial yield as (X) and total lactation yield as (Y) in Holstein cattle. On the other hand, Keskin and Boztepe (2011), have used the first lactation yield records of Holstein cattle, which were raised in a private farm in Konya. They have been found that, high and statistically significant correlation for partial lactation records and 305 days milk yield 0.701-0.979. Consequently, they reported that 305-day milk yield could be simply detected from the first 30 days of lactation records. Soysal *et al.* (2015), reported that, milk component averages were 7.92% fat, 18.19% dry matter, 5.14% lactose, 4.09% protein and 207.000 somatic cell count in Anatolian water buffalo, respectively. The relationship between total milk yield and partial milk yield was analyzed. It was found that the determination coefficient was estimated between total milk yield and partial milk records of 150 days as 0.51.

This research was aimed to investigate relationship between partial milk yields with total milk yield in Mediterranean water buffalo. At the same time, this research was compared total milk yield by means of partial milk yields. Due to partial milk yields could be detected by early lactation period. Finally, partial milk yields are used to forecast total milk yield in water buffalo.

### **Materials and Methods**

The animal material was consist of 72 head Mediterranean water buffalo recently imported from Italy and raised in a private farm in Istanbul. Whole animals were reared in similar management and feeding conditions. In the study, daily milk yield records have been used, which were obtained by measuring daily milk yield in the morning and evening from the beginning to the end of daily lactation. The animals were raised in the same conditions and all animals were selected as homogeneous groups regarding to the non-genetic factors such as age and parity as lactation number. On the other hand, lactation yield portioned 6 partial milk yield records as 15, 30, 60, 90, 150 and 240 days were collected. The correlation and regression analysis between total lactation milk yield with partial milk yields of the animals were determined and these relationships were compared with coefficient of determination ( $R^2$ ). For this, partial milk yields and total milk yields were accepted as independent variable and dependent variable, respectively. Thereby, correlation and simple regression analysis methods were used ( $Y=a+bX$ ) in present study. The model with the highest coefficient of determination was identified as the most appropriate model

(Soysal, 1993). Parameter estimates of regression equations were calculated with Statistica package programme (Statistica, 1994). Owing to significant relationships found this way, total milk yields of animal will be able to be estimated in a shorter time by using partial milk yields, without waiting for the end of the lactation.

### Results and Discussions

In present study, the average values for lactation period, total milk yield and daily milk yield were calculated 232.8 day, 1694.3 kg and 7.2 kg in animal, respectively. At the same time, the mean of partial milk yields were shown for 15- 300 days in Table. 1.

The correlation coefficients between total milk yield and partial milk yields were presented in Table 2. For instance, correlation coefficients of total milk yield with partial milk yields (30 days and 90 days) were calculated as 0.54 (P<0.01) and 0.76 (P<0.01) respectively. Also, the correlation coefficient between total milk yield and 150-day partial milk yield, has been found as (r=0.85\*\*). The regression equations and determination coefficients were presented in Table 3. The regression lines and distributions were plotted between 15, 30, 60, 90, 150 and 240 days partial milk yields with total milk yield in Figure 1.

**Table 1.** The mean and standard deviations for partial milk yields, total milk yield and lactation period.

	N	Mean ± Standard Deviation
LP	72	232,8 ± 40,6
TMY	72	1694,3 ± 428,2
DMY	72	7,2 ± 1,3
15 PMY	72	134,9 ± 32,3
30 PMY	72	280,4 ± 59,5
45 PMY	72	422,5 ± 83,3
60 PMY	72	556,7 ± 106
90 PMY	72	803,7 ± 148,6
120 PMY	72	1038,2 ± 193,6
150 PMY	72	1247 ± 234,5
180 PMY	71	1411,5 ± 274,4
210 PMY	65	1559,6 ± 313,2
240 PMY	54	1724,1 ± 317,8
270 PMY	32	1900,5 ± 309,5
300 PMY	11	1969,9 ± 333,5

TMY: Total Milk Yield, LP: Lactation Period, DMY: Daily Milk Yield, PMY: Partial Milk Yield

**Table 2.** The correlation coefficients and significance test results (15-300 days) of partial milk yields and total milk yield values.

	15	30	45	60	90	120	150	180	210	240	270	300	TMY
30	0.94**												
45	0.86**	0.97**											
60	0.78**	0.91**	0.97**										
90	0.668**	0.82**	0.91**	0.97**									
120	0.61**	0.75**	0.86**	0.93**	0.97**								
150	0.57**	0.71**	0.82**	0.89**	0.95**	0.98**							
180	0.52**	0.66**	0.78**	0.85**	0.92**	0.97**	0.98**						
210	0.57**	0.71**	0.80**	0.87**	0.93**	0.96**	0.98**	0.99**					
240	0.54**	0.65**	0.74**	0.82**	0.88**	0.93**	0.95**	0.97**	0.98**				
270	0.61**	0.73**	0.78**	0.83**	0.87**	0.92**	0.94**	0.96**	0.97**	0.98**			
300	0.31	0.49	0.53	0.68*	0.76**	0.87**	0.90**	0.93**	0.95**	0.96**	0.98**		
TMY	0.40**	0.54**	0.69**	0.69**	0.76**	0.82**	0.85**	0.91**	0.94**	0.96**	0.97**	0.99**	1

\*: P<0.05, \*\*:P<0.01, TMY: Total Milk Yield

In this study, the means of lactation period and total milk yield were estimated as  $232,8 \pm 40,6$  days and  $1694,3 \pm 428,2$  kg. The relationships between total milk yield and partial milk yield were researched. The coefficient of determination was found as 48.9 % between total milk yield and partial milk yields of 60 days.

**Table 3.** Regression equations ( $Y = a + bX$ ), and determination coefficients for 15-300 days (partial milk yields as independent variables and total milk yield values as dependent values).

Partial Yields According to Days	Regression Equation ( $Y=a+bX$ )	Coefficient of Determination ( $R^2$ ) %
TMY=a+b (15PMY)	TMY=958+5,39 (15PMY)	16,5
TMY=a+b (30PMY)	TMY=593+3,88 (30PMY)	29,1
TMY=a+b (45PMY)	TMY=289+3,29 (45PMY)	40,9
TMY=a+b (60PMY)	TMY=102+2,83 (60PMY)	48,9
TMY=a+b (90PMY)	TMY=-109+2,22 (90PMY)	59,2
TMY=a+b (120PMY)	TMY=-217+1,82 (120PMY)	67,7
TMY=a+b (150PMY)	TMY=-282+1,57 (150PMY)	73,5
TMY=a+b (180PMY)	TMY=-323+1,42 (180PMY)	82,7
TMY=a+b (210PMY)	TMY=-295+1,28 (210PMY)	89,8
TMY=a+b (240PMY)	TMY=-192+1,15 (240PMY)	92,9
TMY=a+b (270PMY)	TMY=-136+1,09 (270PMY)	95,3
TMY=a+b (300PMY)	TMY=-127+1,07 (300PMY)	98,6

b: regression coefficient, a: intercept, PMY: Partial Milk Yield

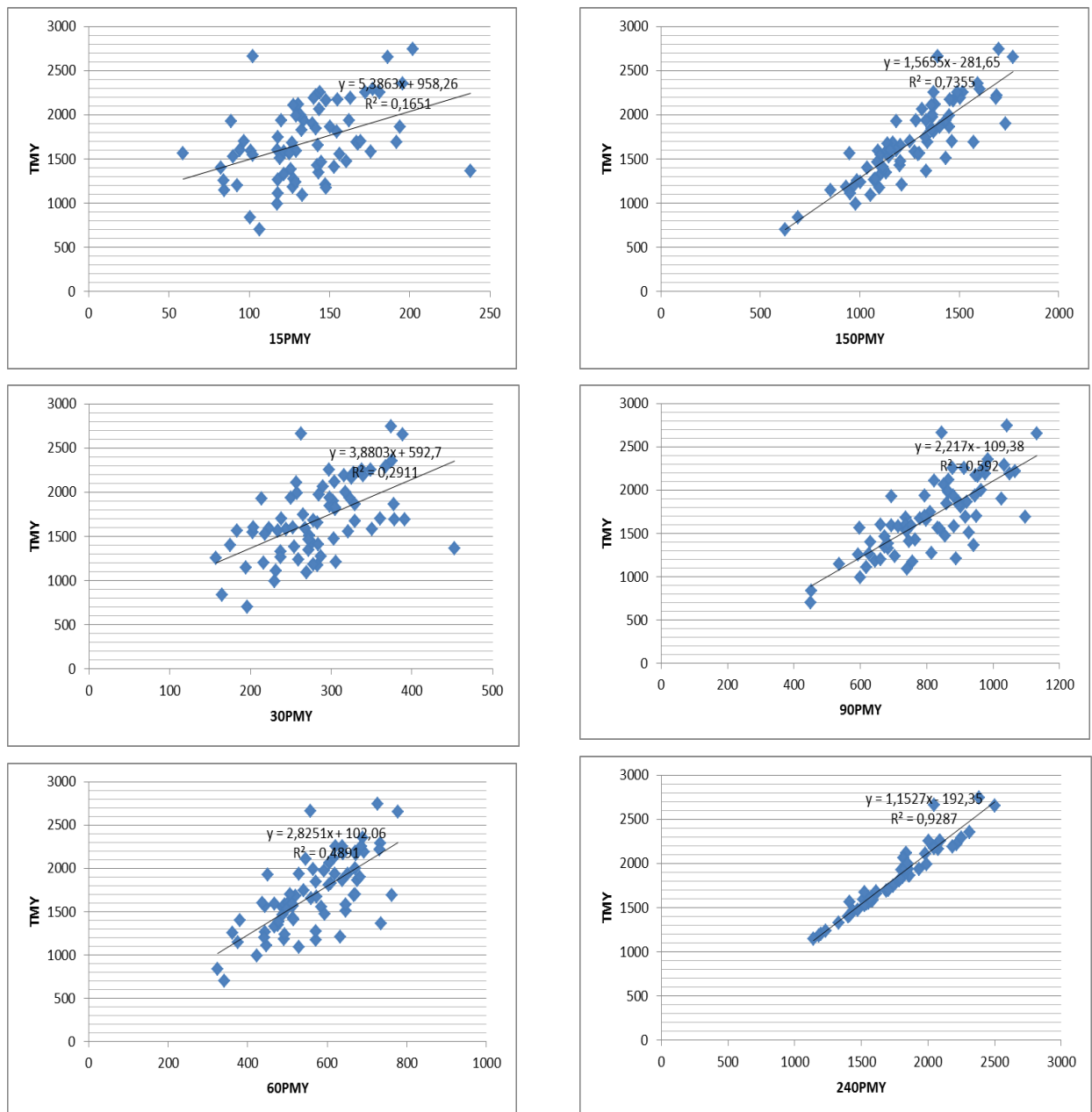


Figure 1. Distributions and the regression lines between 15, 30, 60, 90, 150 and 240 days partial milk yield with total milk yield.

Ragnon and Brambilla (1957), reported that the correlation coefficient of 70-day partial milk yield and total milk yield was found to be 0.52 in Holstein cattle in Italy. Rendel *et al.* (1957) have found the same value as 0.80. On the other hand, Goodall and Sprague (1985) have indicated that partial milk yields from the 10th week of lactation, were more efficient to estimate total lactation in comparison to other periods. The coefficient of determination between 30 and 150 days partial milk yields and total milk yield were calculated as 0.596 and 0.86, respectively (Tuncel, 1971). Keskin and Boztepe (2011), stated

that, from the first 30-day partial lactation records, 305-day milk yield could be easily detected in Holstein cattle. Soysal *et al.* (2015), reported that the relationship between total milk yield and partial milk yield was analyzed in Anatolian water buffalo. It was found that the determination coefficient was estimated between total milk yield and partial milk yields of 30 and 150 days as 0.43 and 0.51 respectively. The relationship between total milk yield and partial milk yields was analyzed, In present study, 15-300 days of determination coefficients between partial milk yields and total milk yields, have been found to be between 16.5 and 98.6 % in Mediterranean water buffalo.

Finally, this research was compared total milk yield by means of partial milk yields. Thus, partial milk yields are used to forecast total milk yield formerly in water buffalo.

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