

Peak Milk Yield and Days to Attain Peak in Nili-Ravi Buffaloes

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ABSTRACT

Data on 2704 lactations of 993 Nili-Ravi buffaloes were analyzed to investigate the peak milk yield and days to attain it. Peak milk yield averaged 10.8 kg with an average days to peak of 48 days. Peak milk yield varied due to year, season of calving and year by season interaction but season effect did not reach statistical significance for days to peak. Lactation length and age at calving did affect peak milk yield ($P<0.01$). Phenotypic trend in the trait was negative, similar to the trend in lactation milk yield. Winter calvers generally had higher peak yield than summer calvers (11.1 ± 0.18 kg vs 10.6 ± 0.17 kg). Peak yield in first parity buffaloes averaged 9.8 ± 0.55 kg, which increased to 4th parity (11.6 ± 0.44 kg) and declined thereafter. The 3rd and 4th parity means were similar. Cows differed for both traits ($P<0.01$) with repeatability of 0.205 ± 0.023 for peak yield and 0.085 ± 0.022 for days to peak. Negative phenotypic trend in peak yield and reduction in days to peak over the years needs further studies.

Key Words: Peak milk yield; Nili-Ravi buffaloes

INTRODUCTION

Milk yield in dairy animals can be defined as average daily yield or total milk yield in a specified period such as standard lactation of 305 days or completed lactations. Yield in the month of peak production and even maximum yield on a single day, are some of the other alternatives. The maximum daily yield at any point in lactation is called peak yield. It plays an important role in shaping the lactation curve. It is reported to vary between species and breeds within species (Table I). For Nili-Ravi buffaloes, average peak

Table I. Peak yield and days to attain peak yield in different cattle and buffalo breeds in some recent studies

Buffaloes/cows	Observation	Peak yield (kg)	Reference
Murrah buffaloes	1724	8.1	Dahama & Malik (1991)
Nili buffaloes	1106	9.7-11.8	Verma & Yadav (1990)
Nili-Ravi buffaloes	1426	10.7 ²	Iqbal (1996)
Nili-Ravi buffaloes	437	11.1 ¹	Zakarriyya (1995)
Sahiwal cows	3463	8.7 ¹	Ahmed (1992)
Sahiwal cows	1227	8.4 ²	Iqbal (1996)
Surti buffaloes	550	6.5	Birader (1990)
Tharparkar cows	218	7.2 ¹	Ghaffar (1983)

¹, calculated from peak month's total yield; ², calculated from peak week's total yield

yield is around 11 kg (Zakarriyya, 1995; Iqbal, 1996) as compared to 8 kg in Murrah (Dahama & Malik, 1991) or 6.5 kg in Surti (Birader, 1990). Under the prevailing production setup, farmers usually remember the peak yield and use it for selling or buying animals. Present study investigates the behavior of peak yield and days to attain it in Nili-Ravi buffaloes.

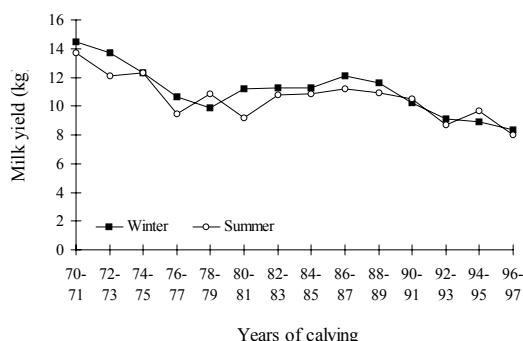
MATERIALS AND METHODS

Milk yield records of 993 Nili-Ravi buffaloes, maintained at Livestock Experiment Station, Bahadurnagar, Okara, from 1970 to 1998 were used for the present study. Minimum lactation length was at least 60 days. Errors in data entry were minimized by deleting outliers ($\pm 4\sigma$). Season of calving was defined as Summer (April to September) and Winter (October to March). Variation in peak milk yield was analyzed in a model having cow (random), year, season of calving along with their interaction, lactation duration and age at calving within parity. For days to attain peak milk yield, the model was similar but lactation length and age within parity were not included. The 28 years of calving from 1970-1998 were pooled into 14 periods/groups of two years each (1970-71, 1972-73, ...1996-97).

RESULTS AND DISCUSSION

Out of 2704 lactations having more than eight weeks of duration, 41% had 44 weeks or longer lactation length while 89% had duration of at least six months. As expected shorter lactations had lower milk yield as compared to the complete or longer lactations. Milk yield averaged 1984.4 kg with a standard deviation of 773.43 kg when information up to 44 weeks was used. Lactation length for these records averaged 266.6 days with a standard deviation of 55.15 days. Actual average lactation length of these records was 289.6 ± 82.12 days.

Peak yield averaged 10.8 ± 0.16 kg and varied ($P<0.01$) due to buffaloes, year, season of calving and their interaction as well as for lactation length and age at calving (Table II). Phenotypic trend in the trait was

Fig. 1. Phenotypic trend in Peak milk yield of Nili-Ravi buffaloes calving winter and summer

negative (Fig. 1), similar to the lactation milk yield with Winter calvers generally having higher peak yield as compared to the summer calvers. Least squares means for Winter and Summer seasons of calving were 11.1 ± 0.18 and 10.6 ± 0.17 kg, respectively. Peak yield averaged 9.8 ± 0.55 kg for first parity buffaloes, increased to 4th parity and declined thereafter (Table III). Third and 4th parity means were statistically similar suggesting that pattern in this trait was similar to lactation milk yield. Longer lactations had a higher peak yield similar to the lactation milk yield pattern. Cows differed significantly for this trait and the repeatability of the trait was 0.205 ± 0.023 (Table II).

Table II. F-values from analysis of variance for various factors affecting peak milk yield and days to peak

Source of variation	Peak yield		Days to peak	
	d.f	F-value	d.f	F-value
Cow (random)	992	-	992	-
Year group	13	9.36**	13	2.57**
Season	1	10.06**	1	0.01 ^{NS}
Year group * Season	13	2.26**	13	2.69**
Weeks in milk	36	2.71**	-	-
Age within parity	34	3.65**	-	-
Error	1614		1684	

** Significant ($P < .01$); ^{NS} Non significant

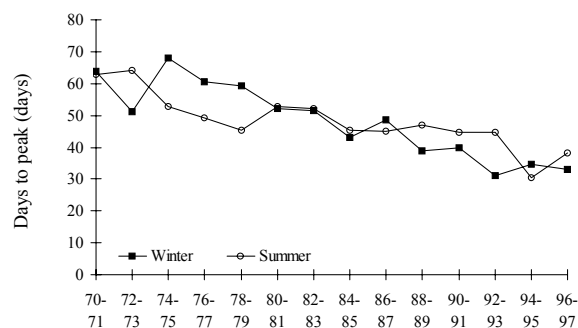
Few studies are available on buffaloes where peak yield has been reported. Zakariyya (1995) reported that Nili-Ravi buffaloes ($n=258$) peaked in the second month of calving with an average daily peak yield of 11.3 kg. Dahama and Malik (1991) reported that peak yield in Indian buffaloes was 8.1 ± 0.28 kg. Season effect was non-significant but age at calving had a significant effect on the trait. Mansour *et al.* (1992) reported that average peak yield (through a non-linear model) in Egyptian buffaloes was 6.4 kg with season of calving significantly affecting the trait. Peeva *et al.* (1988) reported that Bulgarian, Murrah and their crossbreds peaked in second month of calving with peak yield ranging from 5.4 to 8.1

kg. Chhikara *et al.* (1998) reported that for 169 Murrah buffaloes peak yield was 11 ± 0.15 kg which was obtained in 63 days. The mean values of the present study are higher than most of the reports in the literature as was the lactation milk yield for a comparable lactation length.

Table III. Least squares means (\pm SE) of peak milk yield by parity

Parity	N	LS mean (kg)
1	705	9.8 ± 0.55
2	561	11.1 ± 0.49
3	457	11.5 ± 0.44
4	348	11.6 ± 0.44
5	248	11.0 ± 0.48
6	164	10.8 ± 0.55
7	108	10.3 ± 0.62
8	113	10.4 ± 0.72

Days to attain peak milk yield averaged 48.2 ± 0.66 days. Most of the effects included in the model did not affect the trait except for cow effect ($P < 0.05$) and year by season of calving interaction ($P < 0.01$) (Table II). The reduced model thus had year and season of calving and their interaction. Repeatability of the trait was 0.085 ± 0.022 . Phenotypic trend in the trait was negative (Fig. 2). Winter calvers had longer days to peak for some of the earlier years but too less time to attain peak as compared to Summer calvers, in the recent years. Difference between 1970-71 (63.2 days) and 1996-97 (35.6 days) was 28 days which is quite high.

Fig. 2. Phenotypic trend in days to peak for Nili-Ravi buffaloes calving winter and summer

Lactation curves in different breeds of buffalo vary in their shape and so does the days to attain peak. Mansour *et al.* (1992) modeled lactation curves of Egyptian buffaloes and reported that days to peak averaged 71. Metry *et al.* (1994) on the other hand reported that Egyptian buffaloes peaked at the 1st, 5th, 6th and 7th periods (14 days each) for lactations of different duration. Buffaloes peak towards the end of second month of lactation or in the start of 3rd month of lactation

(Zakariyya, 1995; Khan & Gondal, 1996; Chhikara *et al.*, 1998). This was true when overall average is considered. But for the recent years, buffaloes attained peak yield too earlier than the previous years. Distribution of parities across different years was checked and no significant deviation was observed in the data set used. The negative phenotypic trend in peak milk yield and days to attain peak needs thorough investigation to exclude the possibility of erroneous recording at the farm.

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