ENVIRONMENTAL FACTORS AFFECTING PERSISTENCY OF LACTATION AND PEAK MILK YIELD IN NILI-RAVI, BUFFALOES

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Data on 437 lactation records of Nili-Ravi buffalo maintained from 1978-93 at Livestock Experiment Station, University of Agriculture, Faisalabad were used to study the influence of various facrtors on persistency of lactation and peak milk yied. Persistency oflactation and peak milk yield averaged 91.31 ± 0.55 kg and 239.15 ± 7.74 kg, respectivley. This study showed that persistency and peak milk yield differed significantly in buffaloes calving in different years and seasons. Buffalo calvng during hot humid were more persistent (92.80 ± 0.52) thant he buffaloes calving in other seasons of the year. The highest peak milk yield (249.53 ± 8.10 kg) was obtained during hot dry months. The persistecy of lactation was significantly correlated with lenth og lactation. Lactation number had non-significant effect on presistency of lactation as well as on peak milk yield.

INTRODUCTION

Buffalo occupies an important place in the dairy set up of the country. The annual value of products contributed by this species is more than that contributed by cattle, sheep and goat put together. Buffalo occupies key position in the rural set up of the country particularly for the farmers with small holding and non farm house-holds,

The productive and reproductive traits in buffaloes are influenced by numerous genetic and environmental factors. Persistency of lactation is one of the main factor controlling the total milk production in dairy animals. Persistency of lactation is the degree with which rate of milk flow is maintained with the advancement of lactation. Large variations in the presistency of dairy animals of ten lead to uneconomical dairy farming. The present study was planed to estimate the extent of some of the factors affecting the persistency of lactation and peak milk yield in Nili-Ravi buffalo. The findings of this study would be useful in determining the productive potential of the buffalo and plan of feeding during different season of year.

MATERIALS AND METHODS

Data on 437 lactation records of Nili-Ravi buffalo maintained from 1978-93 at Livestock Experiment Station, University of Agriculture, Faisalabad were used in the present study. Normal lactation of 180 days or longer durations were included in the analysis. Lactations affected by disease or resulting from premature birth were excluded from the study. The course of each lactation was divided into 3D-days intervals. Average monthly yields based on all lactations were depicted for acertaining the trend of lactation curve. Presistency index for each lactation was worked out by the numerical expression given by Ludwick and Petersen (1943). The persistency value calculated for each lactation was expressed in percentage.

Average monthly milk yield of all the lactations were used to draw a lacation curve. Seasonal variation in the lactation curve was

studied from records scattered over a period of 16 years from 1978 to 1993. The year was divided into following five seasons for this purpose.

a) Winter (S I)   November-January
b) Spring *(52)*   February-April
c) Hot dry *(53)*   May-June
d) Hot humid *(54)* July-August
e) Autumn *(55)*   September-October

The effect of year and season of calving, length of lactation, lactation number and duration to attained peak yield on persistency of lactation was studied. Least-Squre Analysis method described by Harvey (1960) was used to analyze the data for studying these effects on persistency of lactation.

RESULTS AND DISCUSSION

The arithmetic (unadjusted) means, least squre means and coefficient of variation for various lactation parameters in Nili-Ravi buffaloes as obtained from the analysis of data are presented in Table-I. The 305-day milk yield averaged 1730.02 ± 47.48 kg. It ranged from 807.8 - 2912.2 kg with a coefficient of variation of 16.62%. Persistency of lactation was averaged 91.31 ± 0.55 kg. It ranged from 80.26 to 99.96 kg with a coefficient of variation as 3.42%. The peak milk yield

A) INFLUENCE OF VARIOUS FACTORS ON PERSISTENCY OF LACTATION

1. Year and Season of Calving: The mean value for persistency of lactation for buffaloes calving in different years and seasons have been given in Table-2. The persistency of milk yield in buffaloes calving during different years showed variation and ranged from 89.06 ± 1.25 to 93.75 ± 0.71 % with the average of 92.14 ± 0.51 %. Buffaloes calving during 1985 showed the highet persistency (93.75 ± 0.71 %). The persistency of lactation for buffaloes calving in different seasons ranged from 91.62 ± 1.25 to 92.S0 ± 50.52% (Table 2). Buffaloes calving during hot humid were persistent than the buffaloes calving in other seasons of the year. The spring season was the least persistent. The analysis of variance for the effect of year and season has been given in table-3, which showed that persistency differed significant in buffaloes calving in different years. While the effect of season was statistically non-signi fieant.

The results obtained in present study are in agreement with those reported by Gurung and Johar (I *n2)* who reported that the periods, each o five yar duration. had a significant effect on milk yield in Indian buffaloes.

Table: **1**   Mean and Co-efficient of Vriance for Various Lactation Parameters.

Lactation Parameters	Unadjusted Mean	Least Square Mean ± SE	Range	CV (%)
Persistency	92.59 ± 4.36	91.31 ± 0.55	80.3 - 99.96	3.42
Peak Milk Yield (Kg)	241.69 ± 11.44	239.15 ± 7.74	100.S - 399.0	20.76

averaged 239.15 ± 7.74 kg and ranged from 100.8 to 399.0 kg with a coefficient of variation of 20.76%.

The findings of present study about non-significant effect of season of calving on total milk yield was in line with the findings of Raizada *et at.* (1971) who reported that milk yield in Murrah buffaloes was not influenced by season of calving.

Table 2:   Least Square Means for Persistency of Milk Yield in Nili-Ravi Buffalo

Effects	No. of Observations	Least Square ± S.B. (Kg)	Effects	No. of Observations	Least Square ± S.E. (Kg)
Years of Calvinz			2] I - 240	44	89.72 ± 0.70
1978	9	89.06 ± 1.25	241 - 270	85	92.23 ± 0.60
1979	10	92.91 ± 1.18	271-300	7₁t	92.16 ± 0.64
1980	15	91.49 ± 1.02	301 - 330	64	92.57 ± 0.63
198\	21	89.97 ± 0.91	331 - 360	43	94.09 ± 0.70
1982	32	91.93:t-	361 - 390	3]	93.67 ± 0.77
1983	22	91.37±Q~	391-420	29	93.77 ± 0.77
1984	28	91.63 ± 0.80	> 420	24	93.80 ± 0.83
1985	26	92.93 ± 0.81	Lactation Number		
1986	40	90.52 ± 0.72	1	122	93.25 ± 0.41
1987	42	93.56 ± 0.71	2	81	93.51 ± 0.49
1988	36	93.75 ± 0.71	3	68	93.51 ± 0.50
1989	32	92.09 ± 0.75	4	62	93.77 ± 0.52
1990	31	93.44 ± 0.77	5	44	92.19 ± 0.58
1991	37	92.97 ± 0.68	6	29	92.58 ± 0.69
1992	34	93.49 ± 0.74	7	19	93.18 ± 0.81
1993	22	93.33 ± 0.86	8	8	91.28 ± 1.12
Season of Calving			9	3	89.34± 1.91
Winter	51	9] .64 ± 0.63	10	I	88.78 ± 3.32
Spring	8	91.62 ± 1.25	Duration to attain peak yield (Month)		
Hot Dry	89	92.29 ± 0.59	1	38	92.22 ± 0.70
Hot humid	178	92.80 ± 0.52	2	193	90.53 ± 0.54
Autumn	III	92.35 ± 0.52	3	106	89.43 ± 0.59
Lenath of lactation (Days)			4	46	93.31 ± 0.67
< 180	9	90.05 ± \.20	5	32	93.45 ± 0.77
181 - 210	34	89.32 ± 0.71	6	22	93.90 ± 0.86

Table No. 3 Least Square Analysis of Variance for Persistency of Milk Yield in Nili-Ravi Buffalo

S.O.V.	d.f.	S.S.	M.S	F. RATIO	PROB.
Year	\5	596.23	39.75	3.97*"	0.00
Season	4	56.06	14.02	1.38^{NS}	0.24
Lactation Length	9	818.62	90.96	9.01*"	0.00
Lactation No.	9	163.18	18.13	1.80^{NS}	0.07
Duration of attain milk yield	5	872.49	174.50	1.80'*	0.00
Error	394	3977.70	10.10	17.28'*	
Total	473	6764.62			

* = *Singnificant at 0.05*   ** = *Significant at 0.01   NS = Non-significant*

However, these findigns are not in line witht he findings of Khan (1986) who reproted that season of calving had a significant effect of milk yield in buffaloes. The discrepancy may be attributed to differences in eleassification of the season of calving in the present study as compared to other workers.

2. Length of Lacatation: The least square means for the length of lactration have been given in Table-2. An increasing trend in persistency of lactation was observed with the increasing length of lactation. The mean persistency was 89.32 ± 0.71 % for lacation length of 181-210 day while it was 93.80 ± 0.83% for lacation length more than 420 days. The analysis of variance revealed highly significant difference in persistency of lactation due to length of lactation (Table - 3).

The results of the present study are in line with the findings of many workers who reported that increase in the length of lactation was reponsible for increasing the persistency indices (Rao and Sandaresan *1979,* Rao and Sundarson, 1982). A number of other workers also reported that persistency of lactation was significantly correlated with lactation. Length of lactation and the coeficient of correlation ranged from 0.23-0.84. Rao and Sundason (1981), Gupta and Johar (1982), stated taht length of lactation significantly affected the persistency of lactation.

3. Lactation Number: Mean vlaue of persistency of lactation for different lactation numbers have been given in table 2. The highest value was obtained in 4th lactation (93.77 ± 0.52%) whereas lowest value was obtained in the 10th lactation (88.78 ± 3.32%). However, the analysis of variance revealed that lactation number had non-significant effect on persisency of lactation (Table-3). The result of present study are in line with the findings of

Ibeawuchi (1984), who reported similar trend of persistency. However, the result of present study are in partial agreement with the findings of Sekarden (1991), who analyzed data of first lactation of 448 and 582 Jersey cows and reported that lacatation persistency was highest in 4th lactation and lowest in first lactation.

4. Duration to Attain Peak Yield: The least square means for persistency of lactation have been given in Tahle-2. It is evident that buffaloes attaining peak yeild in 1_{st} and 4_i to 6_{iii} mont hl. were re atrvely more persistent than those attaining peak yield in other months. Persistency of lactation vary due to variation in the duration to attain peak yield as widend from the results given in the analysis of variance (Table-3), but no significant difference was observed when least square means for persistency of lactation were compared statistically for buffaloes attaining peak yield in 1st and from 4th to 6th month of lactation.

The findings of the present study are in partial agreement with the findings of Mansuri and Dave (1990), who sudied the effect of duration to attain peak yield on persistency in Jersey X Kankrej and Holstein X Kankrej cows. It was reported that the JK and HK cows reached the average peak weekly yield in the 4th and 3rd week of calving, respectively.

B) INFUENCE OF VARIOUS FACTORS ON PEAK MILK YIELD.

1. Year and Season of Calving: The least square means for peak milk yield during different years of calving in Nili-Ravi bufalo have been given in Table-a. The average peak milk yield in the year 1979 was maximum (280.67 ± 18.40) and was minimum (202.89 ± 10.98) in the year 1987. The highest peak yield (249.53 ± 8.10 kg) was recoreded during hot dry months and the lowest average peak yield

Table 4: **Least Square Means of Peak Milk Yield in Nili-Ravi Buffalo**

Effects	No. of Observations	Least Square ± S.E. (Kg)	Effects	No. of Observations	Least Square ± S.E. (Kg)
Years of Calving			Hot humid	180	245.12 ± 7.83
1978	9	245.07 ± 19.13	Autumn	114	233.16±7.84
1979	10	280.67 ± 18.40	**Lactation Number**		
1980	15	242.01 ± 15.69	I	124	227.55 ± 6.20
1981	21	267.78 ± 13.74	2	81	236.18±7.32
1982	33	225.31 ± 11.41	3	70	240.13 ± 7.33
1983	23	2b9.82 ± 13.28	4	63	243.65 ± 7.93
1984	29	221.82± 12.18	5	46	246.59 ± 8.84
1985	28	231.40± 12.32	6	29	255.10 ± 10.69
1986	40	249.05 ± 11.18	7	21	234.21 ± 12.01
1987	43	202.89 ± 10.98	8	9	243.65 ± 17.93
1988	38	213.40± 10.70	9	3	259.53 ± 29.81
1989	32	242.20 ± 11.44	10	1	204.94 ± 51.75
1990	31	224.67 ± 11.72	**Duration to attain peak milk yield (month)**		
1991	37	254.83 ± 10.49	1	39 8.72%	248.32 ± 10.56
1992	36	255.52±11.14	2	198 44.29%	252.41 ± 8.19
1993	22	259.44 ± 13.24	3	109 24.38%	234.72 ± 8.90
Season of Calving			4	47 10.51%	231.39 ± 10.22
Winter	55	245.03 ± 9.58	5	32 7.15%	228.57 ± 11.82
Spring	9	222.93 ± 18.50	6	22 4.92%	239.51 ± 13.24
Hot Dry	89	249.53 ± 8.10			

Table No. 5   **Least Square Analysis of Variance for Peak Milk Yield in Nili-Ravi Buffalo**

S.O.V.	d.f.	S.S.	M.S	F. RATIO
Year	15	173449.21	11563.28	4.59 "*
Season	4	16970.68	4242.67	1.69 NS
Lactation Length	9	24919.37	2768.82	I. IONS
Duration of attain milk yield	5	35704.27	7140.85	2.84 '
Error	413	1039625.71	2517.25	
Total	447	1291344.45		

* = Singnificant at 0.05   ** =Significant at 0.0 I   NS = Non-significant

(0.3) medium

(222.93 ± 18.50 kg) was recorded during spring season.

The analysis of variance for peak milk yield in Nili-Ravi buffalo calving durign different yeas has been shown in Table-5. The results revealed that peak milk yield differed significanLly (P<O.01) due to year of calving. The analysis of variance showed that there was no significant variation in peak milk yield due to season. The average peak yield in the hot dry season closely corresponded with hot humid and winter seasons. The average peak yield in spring and Autumn seasons did not differ significantly with each other.

The results of present study are in line with the results of Rao and Sandaresan (1979) and Graeha and Tiwana (1980). These research workers also reported that there is a significant effect of year of calving on peak milk yield.

2. **Lactation Number:** The least squre means of the peak yield in the first ten lactatons have been given in Table-4. The average peak yield was 204.94 ±51.75 for the 10th lactation which was lowest among the other lacttions. The highest average peak yield of 259.53 ± 29.81 kg was recoredcd in the 9th lactation. The analysis of variance however indicated that parity caused non-significant variation in peak milk yield (Table 5).

The findings of some workers are in line with the findings of present study. Singh and Gopal (1982), studied the effect of parity on milk yield in bufalo and reported that peak milk yield increased with increasing parity. The findings of the present study are not in agreement with the findings of Rao and Sandaresan (1979), Gracha and Tiwana (1980) who stated that lactation number had significant effect on peak yield.

3. **Duration to Attain Peak Yield:** The least square means for peak milk yield have been given in Table-4. Bufalo which attained peak milk yield in the 2nd month of lactation had the maximum peak yield. The analysis of variance for the effect of different durations to attain peak yield peak yield has been given in Table-S.

There was significant difference between the average peak yield of buffalo and duration to attain peak yield. The findings of the present study are in line with the findings of Mansuri and Dave (1990).

REFERENCES

Gracha, D.S. and M.S. Tiwana. 1980. Effect of some environmental and physiological factors on persistency of inilk yield in buffaloes. Ind. J. Anim. Sci., 50 (8) : 612-615.

Gupta, R. N. and K. S. Johar, 1982. Genetic factors affecting persistency of first lacation in Tharparkcr. Ind. J. Dairy Sci. 35: 1982.

Gurung, B. S. and K. S. Johar, 1982. Studis on the factors affecting first lactation yield in Murrah buffaloes lnd. Vet. J. 59 : 521-526.

Harvey, W.R. 1960. Least-square analysis of data with unequal subclass numbers. SUDA ARS-20-8.

Ibeawuchi, J. A. 1984. Pcrsistenty of lactation in white Fulani (bunaji) zcbuc cattle at Vom, Nigeria. 1. Anim. Prod. Res. 4 : 153-159 (Anim. Breed. Abst. 54 : 2707, 1986).

Khan, M. A. 1986. Genetic analysis of purebred herd of Nili-Ravi Buffaloes. Ph.D. Thesis. Univ. of Agri. Faisalabad.

Ludwick, T.M. and W.E. Petersen, 1943, A measure of persistency of lactation in dairy cows. J. Dairy Sci, 26 : 439-445 (Anim. Bred. Abst. 59 : 4547,1991).

Mansuri, M.N. and A.D. Davc, 1990. Study on the lactation curve and the rate of

decline in milk yield in cross bred cattle. Ind. Vet. J. 67 : 127-129.

Raizada, B. C, D. S. Singh and R.B.L. Tiwari, 1971. The effect of season on the lacation performance of buffalo cows. Ind. J. Anim. Sci. 41 : 315-320 (Anim. Breed. Abst. 40 : 1530, 1972).

Rao, M. K. and D. Sundarcsan, 1979. Influence of environmental and hertidity on the shape of lactation curves in sahiwal eows. J. Agric. Sci. 92: 393-40 I. (Anim. Breed. Abst. 47 : 5363, 1979).

Rao, M. K. and D. Sundaresan, 1981, Studies on the lactation curves on Brown-Swiss X Sahiwal crossbred cows. World Rev. Anim. Prod. 17 : 4, 6, 61-69.

Rao, M. K. and D. Sundersan, 1982. Factors affecting the shape of lactation curve in Fiesian Sahiwal crossbred cows. Ind. J. Dairy Sci. 35 (Anim. Breed. Abst. 52 : 2387, 1984).

Sekerden, O. 1991. Lactation persistency of Jersey cows at thc Geleman and Karakoy state farms. Doga Turk Veterinarlik Ve Hayvancilic Dergisi 15 : 33-34. Kurupelit, Samsun Turkey. (Anim. Breed. Abst, 59: 7489. 1991).

Singh, R.P. and R. Gopal, 1982. Presisteney and peak milk yield of cattle in a rural area. Ind. J. Anim. Sci. 52 : 487-489.

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