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Research Article

STANDARDIZATION OF VOLUNTARY WAITING PERIOD AND EVALUATION OF PRODUCTION AND REPRODUCTION TRAITS IN KARAN FRIES COWS

DIVYA P.[1]*, AVTAR SINGH[2] and RANI ALEX[3]

[1]Animal Genetics and Breeding, Dairy Production Section, Southern Regional Station, National Dairy Research Institute, Adugodi, Bangalore- 560030, [2]Dairy Cattle Breeding, National Dairy Research Institute Karnal -132001, [3]Central Institute for Research on Cattle, Meerut, India

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ABSTRACT

Present study was aimed to standardize the voluntary waiting period (VWP) and evaluation of production and reproduction traits like first lactation total milk yield (TMY), first lactation 305 days or less milk yield (FL305MY), first lactation length (LL), total milk yield per day of lactation length (TMY/LL), total milk yield per day of first calving interval (TMY/FCI), first calving interval (FCI) and days open (DO) for Karan Fries (KF) cows. First lactation records of 591 KF cows, spread over a period of 26 years from 1986 to 2011 on TMY, FL305MY, FCI, LL, TMY/LL, TMY/FCI, calving to first service period (CTFS) and DO were collected/generated. In order to standardize the VWP, the data were classified into different class intervals based on CTFS (>85, 64-85, 42-63, and <42). The TMY/FCI and TMY/LL were plotted against these groups of CTFS for the whole data set. Range of CTFS (from 41-85) was chosen for further study where comparatively high TMY/FCI as well as TMY/LL was observed. Also majority of the animals were falling in this range of CTFS. It was observed that 51 days VWP was the most appropriate with highest TMY/FCI (9.60), TMY/LL (11.46), number of observations and lowest DO (88 days) for KF cows. Effect of CTFS group along with other fixed effects like season and period of calving and age group on production and reproduction traits was analysed using fixed model and CTFS group and period of calving were found to have significant effect on TMY, FL305MY, FCI, LL and DO.

Key words: Voluntary waiting period, Karan Fries cow

Fertility and milk production are the two major factors determining the profitability of any dairy production system. However, over the years majority of research in India was oriented towards improving only the production and this has led to decline in fertility. This in turn will affect milk production and overall efficiency of dairy production system. Decision to inseminate a cow after calving is one of the important factors that decide the future reproductive performance. There should be sufficient rest period for proper involution of uterus and for animal to regain health in order to support the pregnancy. In order to achieve the goal of one calf per year, the cows should be inseminated within 50-60 days and should conceive within 85 days postpartum. If the animal conceives before 85 days post-partum and if the dry period is kept at 60 days then the lactation length is reduced to 280 days instead of 305 days (Kumaresan *et al.*, 2012). It indicates that the decision of when to inseminate the cow postpartum has direct influence on total milk production. Time during early lactation in which cows are willingly not inseminated even if they display estrous, to allow for optimum uterine involution and recovery from negative energy balance is known as voluntary waiting period (VWP). The VWP is quite variable across dairy herds. Every farm should have its own VWP. In India, in majority of organized dairy farms, VWP is not optimized. An optimum voluntary period will help in proper management as well as for optimum synchronization and insemination. In order to optimize the production and reproduction performance of the animals in the Indian herds and to reach global level of production a decision of VWP will be more important in the present situation. The present study was planned with the objective to standardize the VWP and to evaluate the factors affecting production and reproduction traits in Karan Fries (KF) cows.

*Corresponding author: drdivyapalat@gmail.com

MATERIALS AND METHODS

First lactation records of 591 Karan Fries cows maintained at NDRI, Karnal were collected which were spread over a period of 26 years from 1986 to 2011 (cows born from 1986 onwards). Information on first lactation total milk yield (TMY), first lactation 305 days or less milk yield (FL305MY), first lactation length (LL), first calving interval (FCI), serving period (SP) and

calving to first service period (CTFS) were collected. Data were classified into different subclasses based on season and period of calving and different age groups based on age at first calving. Year was classified into four seasons (Winter-December to March; Summer-April to June; Rainy-July to September and Autumn-October to November). Similarly, periods of calving was divided into seven groups (1989 to 1991; 1992 to 1994; 1995 to 1997; 1998 to 2000; 2001 to 2003; 2004 to 2006 and 2007 to 2011) and age at first calving was classified using Sturges rule into six groups (≤823; 824 to 921; 922 to 1019; 1020 to 1117;1118 to 1215 and ≥1216).

In order to standardize the VWP period, CTFS was taken as a base which was grouped into three classes initially with <42 days, 43-85 days and >85 days. Before standardization of VWP, in order to see further narrowing of CTFS class intervals with five days increment will have any significant effect on milk production and fertility traits, the CTFS subclass of 43-85 was further grouped into 11 classes with five days class intervals. In order to standardize the VWP, CTFS was taken as a base. The total milk yield per day of first calving interval (TMY/FCI) and total milk yield per day of first lactation length (TMY/LL) were calculated. Averages of TMY/FCI and TMY/LL corresponding to CTFS groups were also calculated. Classes of CTFS were plotted against corresponding mean of TMY/FCI and TMY/LL.After plotting the graph for whole data, range of CTFS was chosen where comparatively high TMY/FCI as well as TMY/LL were observed along with higher number of observations. Range of VWP from 42 to 85 days was finalized, because logically, the VWP above 85 days cannot be advocated practically in a cow herd even though those cows produced fairly good TMY / FCI as well as TMY / FLL.

To estimate the effect of non-genetic factors like season and period of calving, age group as well as CTFS group on FL305DMY, TMY, LL, calving interval (CI), SP, TMY/FCI and TMY/FLL, a fixed model analysis of data was carried out by Least-squares maximum likelihood programme (Harvey, 1990), the following model was used for the study:

$$Y_{ijklm} = \mu + P_i + S_j + B_k + A_l + e_{ijklm}$$

where,

Y_{ijklm} is observation on the mth cow in l^{st} age group, k^{th} CTFS group, j^{th} season and i^{th} period

μ=overall mean, P_i=is fixed effect of ith period of calving, S_j=is fixed effect of jth season of calving, C_k=is fixedeffect of kth CTFS group, A_l=is fixed effect of l^{st} age group, e_{ijklm}=is the random error which is NID (0, σ_e^2)

RESULTS AND DISCUSSION

Voluntary Waiting Period: The KF cows which were inseminated before 41 days after calving (VWP ≤ 41days) produced relatively lower amount of FTMY/FCI and TMY/LL (Table 1). In case of cows which were inseminated after 41 days to 85 days, these estimates were 9.23 kg and 11.05 kg, respectively. Variation in TMY/FCI and TMY/LL with CTFS (Fig. 1) made it clear that cows inseminated after 51 days produced highest TMY/FCI and TMY/LL. The trait, total milk yield per day of first calving interval (TMY/FCI) is one trait that depicts both production and reproductive performance because on an average animal

Table 1
Class intervals of CTFS with corresponding FTMY/FCI, FTMY/FLL, FSP and number of observations in Karan Fries cows

Class interval of CTFS	FTMY/ FCI (kg)	FTMY/FLL (kg)	FSP (days)	No. of observations
= 41	8.29	10.15	76	33
42-45	8.73	10.55	89	43
46-50	9.21	10.77	115	32
51-55	9.60	11.46	88	51
56-60	8.96	10.84	118	33
61-65	9.32	11.27	128	41
66-70	9.05	11.07	111	37
71-75	8.83	10.13	111	36
76-80	8.68	10.74	126	36
81-85	10.42	11.91	132	21
= 85	9.20	10.85	176	228

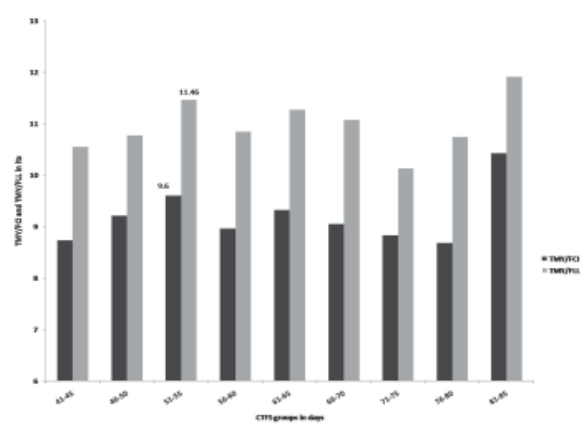

Fig 1. Variation in FTMY/FCI and FTMY/FLL with increase in CTFS in Karan Fries cows

Table 2
Least squares means (along with standard error; SE) of FL305DMY, TMY, LL, DO, FCI, TMY/CI and TMY/LL in Karan Fries cows

	No.	FL305DMY	TMY	LL	FCI	DO	TMY/CI	TMY/LL
Overall	547	3236 ±50	3624±74	337±5	405±5	125± 5	9.0±0.2	10.8±0.2
Season		**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
1	230	3277±57	3721±86	337±6	403±6	124 ± 6	9.3±0.2	11.0±0.2
2	141	3208±8	3632±102	339±7	401±7	123 ± 7	9.1±0.2	10.6±0.2
3	97	3167±79	3515±118	339±8	410 ± 8	130 ± 8	8.7±.2	10.5±0.3
4	79	3294 ±85	3627±127	332±8	404 ±9	122 ±9	9.1±0.3	11.0±0.3
Period		**S****	**S****	**S***	**S***	**S***	**S****	**S****
1	25	3271±140	3510±208	320±14	393 ±14	112 ±14	9.1±0.4	10.9±0.5
2	105	3120 ±75	3434±111	330±7	404±8	122 ±8	8.6±0.2	10.6±0.3
3	106	3001±72	3247±108	319±7	386 ±7	107±7	8.4±0.2	10.2±0.2
4	66	2651 ±90	3077±135	352±9	425± 9	143 ± 9	7.4±0.3	8.9±0.3
5	58	2961 ±96	3360±144	337±9	407 ±10	126 ±10	8.3±0.3	10.0±0.3
6	87	3414±81	3716±121	328±8	396 ±8	119 ± 8	9.4±0.2	11.3±0.3
7	100	3737 ±117	4324±174	354±11	413 ± 8	135 ±12	10.5±0.4	12.2±0.4
Age group		**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
1	42	3205 ±109	3612±163	346±11	408 ±11	128 ±11	8.9±0.3	10.5±0.4
2	110	3170 ± 71	3619±106	342±7	403 ± 7	122 ± 7	9.0±0.2	10.6±0.2
3	164	3229± 60	3686±90	343±6	412 ± 6	133 ± 6	9.0±0.2	10.8±0.2
4	105	3177 ± 74	3483±111	327±7	395 ± 8	115 ± 8	8.9±0.2	10.7±0.3
5	81	3199 ±79	3500±118	325±8	396 ± 8	117 ± 8	9.0±0.2	10.9±0.3
6	45	3337 ±152	3734±227	337±15	409 ±16	129 ±15	9.3±0.5	11.0±0.5
CTFS		S**	S**	S**	S**	S**	**NS**	**NS**
1	57	2957±96	3154±143	298±9	363±10	84±10	8.8±0.3	10.6±0.3
2	278	3346±53	3646±79	332±5	398±5	118±5	9.2±0.2	11.0±0.2
3	212	3406±56	4071±84	380±6	453±6	173±6	9.1±0.2	10.8±0.2

No.=Number of observation, S*=P<0.05 and S**=P<0.01, NS=non-significant

possessinghighest value for this parameter will have high production and low calving interval. Furthermore, maximum numbers of animals were falling in this group and first service period (FSP) was also found to be ideal (88 days) for this group of animals. Hence, the VWP was standardized as 51 days after first calving.

A waiting period of 60 days was assumed for calculating national genetic evaluations of USA for daughter pregnancy rate (Van Raden *et al.*, 2004). On the other hand, Norman *et al.* (2009) reported VWP as 85 days in HF cows and 86 days in Jersey cows for first parity. Patil (2011) reported 63 days of VWP to be most appropriate for Murrah buffaloes. Singh *et al.* (2001) studied the effect of post-partum breeding interval (PPBI) on milk production and reproductive efficiency traits in KF cattle. It was reported that the highest milk yield per day of calving interval (9.72±0.43 kg) was observed in 61-65 day PPBI class and inferred that a minimum period of 60 days should be taken as postpartum breeding interval for better reproductive efficiency and higher milk production.

Effect of Non-Genetic Factors: The season and age group had non-significant effect on all the traits. This was in agreement with Nehra (2011). Period had significant effect ($p \leq 0.05$) on FCI, DO and LL and highly significant effect ($p \leq 0.01$) on FL305DMY, TMY, TMY/LL as well as TMY/FCI. Kokate (2009) also reported significant effect of period of calving on FL305DMY in KF cattle. CTFS groups with three subclasses were found to have highly significant effect on FL305DMY, TMY, FCI and DO. No significant effect of CTFS group was found on TMY/LL and TMY/FCI. Analysis with 11 groups of CTFS with five days class interval also found to have highly significant effect on all the trails analysed except TMY/LL and TMY/FCI. Least squares means of different production and reproduction traits has been summarized in Table 2. This suggests that VWP is one of the important non-

genetic factors affecting production and reproduction performance in dairy cattle.

Calving to first service interval gives an indication about the ability of animal to recycle after calving and is a trait which is heavily influenced by managemental decisions like fixed VWP, efficiency of estrus detection, hormone treatments for inducing estrus etc. Therefore, a proper management along with implementation of standardized voluntary waiting period may be helpful to improve the fertility of the KF cows.

One calf per year is the major goal of any dairy herd, for this the cow should conceive within a period of 85 days post-partum, which requires that the animal should commence cyclicity as early as 45 days and should be bred by 60 days. In general, a minimal VWP of 45 to 60 day post-partum could be recommended allowing for complete uterine involution and resumption of normal ovarian cyclicity to improve the rate of successful conception after AI (Fetrow *et al.*, 2007). In addition to that inseminating a cow earlier will affect the lactation length also. i.e. even though a shorter CI is regarded as economically optimal, it was suggested that a small extension of the CI may be advantageous in a cow showing a high milk persistency in combination with a high milk production level (Allore and Erb, 2000; Arbel *et al*., 2001). Further, Fetrow *et al.* (2007) reported that since individual cows differ largely in milk production, VWP may also differ between cows. It was reported that 37% of the cows had an optimal VWP of 6 weeks (42 days) and 63% of the cows had an optimal VWP around 8 week. In the present study, high significance of CTFS groups on production and reproduction traits further emphasizes the importance of an optimum VWP. Therefore, it can be concluded that voluntary waiting period is one trait that has to be standardized not only on the basis of time for involution of uterus but production also has to be considered and the optimum voluntary waiting period for Karan Fries cows in NDRI cattle farm is 51 days postpartum.

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