



Factors influencing body weight of Frieswal cattle in field progeny testing units of Kerala

P. Pavithra¹, G. Radhika¹, Elizabeth Kurian², V.L. Gleeja³, D. Harish¹
K.A. Bindu¹ and Ravinder Kumar⁴

¹Department of Animal Genetics and Breeding, ²Centre for Advanced Studies in Animal Genetics and Breeding, ³Department of Statistics College of Veterinary and Animal Sciences, Mannuthy, Thrissur- 680 651, Kerala Veterinary and Animal Sciences University Kerala, India ⁴FPT scheme, ICAR CIRC, Meerut.

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Abstract

Indian Council of Agricultural Research (ICAR) initiated the Field Progeny Testing (FPT) scheme for cross-bred bulls in Kerala in 1985-86 at the Centre for Advanced Studies in Animal Genetics and Breeding (CASAGB), Mannuthy, Kerala. Since 2002, ICAR has incorporated Frieswal bulls into its breeding program, and their progenies are performing well in the state's agroclimatic conditions. The present study analysed data from 1971 female progenies of six sire batches (12 to 17) maintained in seven FPT units, across Thrissur district, spanning over ten years (2014-2024). The present study aimed to assess the effect of centre, batch of sire and season of birth on the weight at birth, six months, one year and heifer stages of Frieswal cattle. Frieswal calves averaged 31.13 ± 0.09 kg, 84.07 ± 0.31 kg, 158.29 ± 0.51 kg and 256.64 ± 1.19 kg at birth, 6 months, one year of age, and heifer stage, respectively. Centre and batch of sire had a significant effect on body weight at all ages ($p < 0.05$) and season of birth showed no significant effect ($p > 0.05$). Progenies from centre Veerolipadam showed significantly higher mean body weight (kg) at 6 months (87.31 ± 1.035), one-year (165.79 ± 1.47) and heifer (280.211 ± 3.73) stages, whereas those from centre Ayyappankavu showed significantly lower mean body weights (82.8 ± 0.82 , 147.42 ± 1.16 , 244.25 ± 2.96 , respectively), indicating centre-wise management differences. Female progenies sired by batch 17 had significantly higher mean birth weight (32.07 ± 0.48), than those from earlier batches. However, differences among sire batches might reflect a combination of genetic and temporal factors, including changes in management, nutrition and health care, and therefore cannot be interpreted as direct estimates of genetic merit. Mean body weight at six months increased significantly from batch 12 to 13 and remained consistent thereafter, while a marked decline observed in batch 16 at one year and heifer stages which was attributed to limited data collection during the COVID-19 lockdown. The findings highlight the importance of appropriate management practices and systematic selection within Frieswal breeding programmes for improving growth performance under field conditions.

Keywords: Body weight, field progeny testing, frieswal cattle, Kerala

*Corresponding author: pavipavi20001@gmail.com, Ph. 9444646409

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The principal goal of dairy cattle breeding programs is genetic improvement in the milk production potential of animals. Vechur cattle, with a maximum milk production of 3 litres/day, is the only native breed in Kerala, emphasising the need for crossbreeding in cattle to meet the increasing demand for milk and milk products. Over recent decades, crossbreeding has been widely applied, yielding notable improvements in the genetic potential of indigenous non-descript cattle. Several high-yielding crossbred strains have emerged, including the synthetic genetic group “Frieswal,” developed through the cross of Holstein Friesian (62.5%) and Sahiwal (37.5%) by the process of *inter se* mating, selection and progeny testing, which became a base for the evolution of a new crossbred national milch breed (Das *et al.*, 2023). Capable of producing 4000 kg milk with 4% butterfat in a standard 300-day lactation, Frieswal is being propagated extensively by the Project Directorate on Cattle, Meerut, Uttar Pradesh, in collaboration with 37 military dairy farms nationwide (Kumar *et al.*, 2018). At present, the programme is implemented in collaboration with Kerala Veterinary and Animal Sciences University (KVASU), Guru Angad Dev Veterinary and Animal Sciences University (GADVASU), Bharatiya Agro Industries Foundation (BAIF) development research centre, Pune and Govind Ballabh Pant University of Agriculture and Technology.

Body weight at early ages is a key indicator of growth performance and an important economic trait (Manoj *et al.*, 2011). Sole reliance on current milk yield cannot be considered as a reliable selection criterion for maximising economic returns, as other traits of economic significance may not correlate directly with milk production (Kumar *et al.*, 2008). Van *et al.* (2016) studied the association of calf growth traits with production characteristics in dairy cattle and found that pre-weaning growth had associations with milk yield in later life. Emphasis should therefore be given to body weight at various ages as a means to enhance milk yield. This approach can contribute to identification of animals with desirable growth performance and may complement selection decisions based on overall breeding objectives (Rathee *et al.*, 2017). In this context, the present study was designed to assess the effects of selected genetic and non-genetic factors—sire, centre and season on body weights at birth, six months, one year and at the heifer stage in Frieswal cattle raised under field conditions in Kerala.

Materials and methods

Data Generation and standardisation

The present investigations were carried out on Frieswal cattle maintained in the FPT field units, Kerala, India. The data on body weights of 1971 Frieswal cattle were collected at six-month intervals from birth to age at first calving, spread over a period of 10 years (2014–2024). The records of the animals with known pedigree were only

considered. Abnormal records were not included in the study. The records with disposal in the middle of lactation, abortion, stillbirth and other pathological conditions were excluded from analysis. As part of data standardisation, observations outside the mean ± 2 standard deviation range were excluded to minimise the influence of extreme observations on the analysis. The whole year was divided into three seasons as Summer (February–May), Rainy (June–October) and Winter (November–January) as per Mathai and Raja (1976). The bulls are being maintained separately at Bull Rearing Unit, Meerut, under intensive feeding and management and are subjected to regular health checks before induction for semen production. The body measurements were taken on different categories of animals for heart girth, body length, and body height. The body measurements were recorded at birth (within 24 hours of birth), six months, one year, and heifer stage (16 months up to age at 1st calving). Heifer-stage body weight was recorded during the operational heifer period, defined in the present study as the period from 16 months of age until first calving. Therefore, heifer-stage observations represent a developmental/management stage rather than body weight measured at a fixed chronological age. Body weights were calculated from these measurements using the formula, originally suggested by Johnson (1939), as cited by Khan *et al.* (1978)

$$\text{Body weight (kg)} = LG^2 / 300$$

where,

L = Length of the body, measured as the distance between the point of shoulder and pin bone (inches)

G = Heart Girth (Circumference of the chest just behind the elbow joint (inches)

Statistical analysis

To appreciate the different studied parameter tendencies, data collection was submitted to statistical analysis using standard procedures. Statistical analysis was done by General Linear Model (GLM) procedure using SPSS (V.25.0) to analyse the Least-squares means (LSM) and standard errors (SE) in each level of random and fixed effects and the differences between means were detected by Duncan's Multiple Range Test. The following model was used:

$$Y_{ijkl} = \mu + S_i (\text{Batch}) + C_j + B_k + e_{ijkl}$$

Y_{ijkl} = The individual observation

μ = Overall mean

S_i = Random effect of the i^{th} Sire batch

(Sire batch was included as a random grouping factor to account for variation among successive sire batches within the field progeny testing programme. It was not intended to represent individual sire breeding values)

C_j = Fixed effect of the j^{th} centre

B_k = Fixed effect of the k^{th} season of birth

e_{ijkl} = Error term (Normally and independently distributed)

Results and discussion

Growth performance across different stages

The least square means for body weights of Frieswal calves were estimated as 31.13 ± 0.09 kg at birth, 84.07 ± 0.31 kg at six months, 158.29 ± 0.51 kg at one year and 256.64 ± 1.19 kg at the heifer stage. In the present investigation, the mean birth weight of Frieswal calves averaged 31.13 ± 0.09 kg, which was higher than those reported earlier by Raja *et al.* (2010), who observed an average of 27.83 ± 0.48 kg, Kumar *et al.* (2018), who reported 26.51 ± 0.15 kg in Frieswal calves and Das *et al.* (2009) who reported that the birth weight of Jersey crossbred calves was 28 ± 2.23 kg. In contrast, the observed mean body weight at six months of age (84.07 ± 0.31 kg) was considerably lower than that documented by Kumar *et al.* (2018), who reported an average of 117.95 ± 1.70 kg in Frieswal cattle. The same authors reported that the average body weight of Frieswal heifers was 257 ± 1.68 kg at 18 months, which was in close agreement with the present study (256.64 ± 1.19 kg). This concordance suggests that, despite slower growth during the early stages, compensatory growth might have occurred later, enabling the animals to attain comparable body weights at maturity.

Effect of centre

A significant effect of centre was observed on body weights across all age groups ($p < 0.05$). The Mean ($\pm$ SE) body weights at different stages from different centres are mentioned in Table 1. Calves from the centre Veerolipadam, consistently recorded significantly higher mean body weights at six months, one year and heifer stages compared to other centres. This superior performance might be attributed to its rural location (20km from Thrissur town), abundant fodder resources, and better management practices, including adequate milk feeding. Conversely, centre Ayyappankavu, situated in an urban area with limited grazing and fodder availability, showed significantly lower body weights at these stages, highlighting the differences in management practices between centres. Though centre Chuvannamannu exhibited higher birth weights, it showed comparatively lower weights during later growth stages.

Effect of sire

The batch of sire had significant ($p < 0.05$) effect on body weights across all growth stages. The Mean $\pm$ SE of body weights of progenies sired by bulls from different batches are presented in Table 2. Results from Table 2 revealed that birth weight of calves did not differ significantly among batches 12 to 16. However, calves sired by batch 17 bulls exhibited significantly higher mean birth weight ($p < 0.05$), than the earlier batches. This indicates a difference in phenotypic performance among

Table 1. Centrewise Body weights of Frieswal progenies at birth, 6 months, one year and heifer stage

Centre	Mean $\pm$ SE			
	At birth (kg)	Six months (kg)	One year (kg)	Heifer (kg)
Chirakkakod (n=104)	$30.88^b \pm 0.41$	$82.70^{bc} \pm 1.56$	$164.45^b \pm 2.21$	$256.03^{bc} \pm 5.62$
Avannur (n=258)	$30.28^{bc} \pm 0.29$	$83.19^{bc} \pm 1.10$	$159.88^c \pm 1.56$	$248.19^c \pm 3.98$
Chempamkandam (n=293)	$29.69^d \pm 0.29$	$85.22^b \pm 1.09$	$156.81^c \pm 1.55$	$260.96^b \pm 3.94$
Chuvannamannu (n=155)	$33.02^a \pm 0.25$	$83.23^{bc} \pm 0.96$	$164.47^b \pm 1.36$	$258.71^{bc} \pm 3.45$
Marottichal (n=182)	$30.20^{cd} \pm 0.34$	$84.21^b \pm 1.29$	$158.10^c \pm 1.83$	$255.84^{bc} \pm 4.66$
Ayyappankavu (n=614)	$32.72^a \pm 0.21$	$82.82^c \pm 0.82$	$147.42^d \pm 1.16$	$244.25^d \pm 2.95$
Veerolipadam (n=365)	$30.64^{bc} \pm 0.27$	$87.31^a \pm 1.03$	$165.79^a \pm 1.46$	$280.21^a \pm 3.72$

Table 2. Batchwise Body weights of Frieswal progenies at birth, 6 months, one year and heifer stage

Batch	Mean $\pm$ SE			
	At birth (kg)	Six months (kg)	One year (kg)	Heifer (kg)
12 (n=256)	$30.96^b \pm 0.41$	$80.00^b \pm 1.00$	$159.10^b \pm 1.64$	$240.14^b \pm 2.19$
13 (n=299)	$30.78^b \pm 0.29$	$84.77^a \pm 0.90$	$163.11^{ab} \pm 1.48$	$243.27^b \pm 1.98$
14 (n=488)	$30.74^b \pm 0.29$	$83.42^a \pm 0.63$	$166.19^a \pm 1.03$	$254.19^a \pm 1.37$
15 (n=412)	$30.41^b \pm 0.25$	$84.70^a \pm 0.68$	$167.79^a \pm 1.12$	$257.28^a \pm 1.49$
16 (n=310)	$30.99^b \pm 0.34$	$81.66^{ab} \pm 1.01$	$149.79^c \pm 1.66$	$236.86^b \pm 2.22$
17 (n=206)	$32.07^a \pm 0.48$	$82.2^a \pm 1.72$	$157.50^b \pm 4.74$	$270.98^a \pm 3.95$

the successive sire batches. However, because sire batch is also associated with the time period in which the animals were produced and managed, the observed difference cannot be attributed solely to genetic improvement. Changes in management, nutrition, health care and other temporal factors may also have contributed to the observed variation. Batch 17 represented the most recent batch, corresponding to the period when Frieswal was getting established as a breed (recognized in 2023). Therefore, both genetic improvement and improved managerial practices might have contributed to the higher birth weight. This finding agreed with Raja *et al.* (2010) and Parikh *et al.* (2022), who reported significant ($p < 0.05$) sire effects on birth weight in Frieswal and Gir calves, respectively. Therefore, the present batch-wise comparison should not be interpreted as a direct estimate of genetic gain.

The mean body weight at six months showed a significant increase from batch 12 to 13 and remained relatively constant upto batch 17. Similarly, the mean body weights at one year and heifer stages were stable across batches 12 to 15. Due to restricted field access during the COVID-19 lockdown period, only limited data could be collected for batch 16. Hence, batch 16 recorded a marked decrease in mean body weight at both one year and heifer stages.

Effect of season

Season of birth did not exert any significant effect on body weights at any stage ($p > 0.05$), which corroborates the findings of Rahman *et al.* (2015), who also reported non-significant seasonal effects on growth traits in crossbred calves.

Conclusion

The ICAR- FPT scheme under the monitoring and guidance of ICAR-CIRC has been implemented successfully in Kerala over the past few decades. The present study demonstrated significant variation in body weight of Frieswal cattle across field progeny testing centres and successive sire batches, whereas season of birth did not have a significant effect. The higher body weights observed at Veerolipadam highlight the importance of appropriate fodder availability, feeding and management practices under field conditions. Differences among sire batches indicate variation in phenotypic performance across successive batches; however, these differences cannot be considered direct estimates of genetic merit because sire batch is also associated with changes in management, nutrition, health care and other environmental conditions. The present findings therefore support the importance of maintaining consistent management practices and systematic selection within the Frieswal breeding programme. Future genetic evaluations incorporating individual sire effects and appropriate adjustment for environmental and temporal factors would

provide more precise estimates of genetic merit and genetic progress and contribute to the sustainable improvement of Frieswal cattle under field conditions in Kerala.

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Conflict of interest

The authors declare that they have no conflict of interest

References

- Das, A. K., Mitra, A., Kumar, R., Singh, U. H., Kumar, S., Raja, T. V., Alex, R., Kumar, K. A., Sirohi, A. S., & Saha, S. (2023). Genetic evaluation of Frieswal cattle for first lactation milk yield from smallholder dairy production systems in Kerala, India. *Indian Journal of Animal Sciences*, 93(2), 176–181. <https://doi.org/10.56093/ijans.v93i2.124591>
- Das, S. K., Mishra, P. C., Mohanty, D. N., & Das, K. C. (2009, February 14–17). Comparison of performance between crosses of Holstein Friesian and Jersey in coastal Odisha with supplemental concentrate feeding. In *Proceedings of Animal Nutrition Association World Conference* (p. 256). New Delhi, India.
- Johnson, D. W. (1939). *Livestock weights from measurements* (Extension Folder 70). Minnesota Agricultural Extension.
- Kumar, S., Alex, R., Gaur, G. K., Mukherjee, S. S., Mandal, D. K., Singh, U., Tyagi, S., Kumar, A., Das, A. K., Deb, R., & Kumar, M. (2018). Evolution of Frieswal cattle: A crossbred dairy animal of India. *Indian Journal of Animal Sciences*, 88(3), 265–275. DOI: <https://doi.org/10.56093/ijans.v88i3.78254>.
- Kumar, S., Singh, Y. P., & Kumar, D. (2008). Genetic studies on performance traits in Frieswal cattle. *Indian Journal of Animal Sciences*, 78(1), 107–110. DOI: <https://epubs.icar.org.in/index.php/IJAnS/article/view/3395>
- Manoj, R. S., Gandhi, & Raja, T. V. (2011). Effect of non-genetic factors on body weights at different ages in Sahiwal cattle. *Journal of Applied Animal Research*, 39(2), 147–148. <https://doi.org/10.1080/09712119.2011.565564>
- Mathai, E., & Raja, C. K. S. V. (1976). A study on the growth rate and age at puberty of Jersey-Sindhi

- females under different regime of feeding. *Kerala Journal of Veterinary Science*, 7, 114–123. DOI: <https://www.cabidigitallibrary.org/doi/full/10.5555/19771457636>.
- Parikh, S. S., Savaliya, B. D., Patbandha, T. K., & Makwana, R. B. (2022). Calf, dam and sire factors affect birth weight of Gir calves. *Indian Journal of Veterinary Science and Biotechnology*, 18(2), 49–53. DOI: <https://www.acspublisher.com/journals/index.php/ijvsbt/article/view/2160>
- Rahman, S. M. A., Mohammad, S. A. B., & Abul, K. F. H. B. (2015). Effects of genetic and non-genetic factors on growth traits of high yielding dairy seed calves and genetic parameter estimates. *Journal of Advanced Veterinary and Animal Research*, 2(4), 450–457. <https://doi.org/10.5455/javar.2015.b116>
- Raja, T. V., Venkatachalapathy, R. T., & Kannan, A. (2010). Estimates of genetic and phenotypic parameters on birth weight of crossbred cattle raised under organized farm conditions. *Journal of Animal and Veterinary Advances*, 9(17), 2275–2278.
- Rathee, S. K., Gupta, A. K., Raja, T. V., & Chakravarty, A. K. (2017). Factors influencing production and reproductive performance of Frieswal cattle maintained at organized farm conditions. *Indian Journal of Animal Sciences*, 87(11), 1350–1357. DOI: <https://doi.org/10.56093/ijans.v87i11.75886>.
- Van De Stroet, D. L., Calderón Díaz, J. A., Stalder, K. J., Heinrichs, A. J., & Dechow, C. D. (2016). Association of calf growth traits with production characteristics in dairy cattle. *Journal of Dairy Science*, 99(10), 8347–8355. <https://doi.org/10.3168/jds.2015-10738> ■