



## Studies of Effect of Parity and Stage of Lactation on various Body Measurements, Body Weight and their Relationship with Each Other in Frieswal Cows

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Received: 05 May, 2018

Revised: 02 June, 2018

Accepted: 05 June, 2018

### ABSTRACT

The study was carried out at Military Dairy Farm on Eighty Frieswal cows. The cows were divided in five parities and three stages of lactation. The study on different body measurements and body weight along with the effect of parities and stages of lactation were done. Result of the study showed the significant ( $P < 0.01$ ) effect of parity on heart girth, height at wither, height at hook, body length and body weight. The significant ( $P < 0.01$ ) effect of stages of lactation was observed heart girth and body weight. The non significant effect of stages of lactation was observed on height at wither height at hook and body length. The various body measurements were found in close relationship with each other and it can be concluded that they are bounded with each other strongly.

**Keywords:** Frieswal cow, Body Condition Score, Parity, Stages of lactation.

Indian economy is primarily agriculture based with more than 70 percent of the population living in villages depend on agriculture (crop husbandry), animal husbandry and associated activities for their livelihood. Farmer's income, agricultural product and rural economy greatly depend upon the livestock. The animal husbandry contributes a significant role in generating employment opportunities and supplementing the income of small and marginal farmers and landless labourers of rural India, besides providing food security. The Military dairy farms are the largest source of crossbred animals in India. Not only have they played an important role in providing quality milk for defense forces, but also set a standard for dairy animal management. The Project Directorate on Cattle was established by the Indian Council of Agricultural Research (ICAR), New Delhi, India, in the seventh Five-Year Plan. The main aim of the project is to evolve a new national breed of dairy cow called Frieswal by utilizing

the crossbred herds available at the Military dairy farms. India has adopted, throughout the country, a mass cross breeding programme to increase the milk production of indigenous animals. In this line an exotic blood, Holstein Friesian has been extensively used successfully in this country and as a result the milk production has increased significantly. In this study it was observed that the Friesian cow that loss of body weight occur only during the first 3 to 4 week of the lactation. And body weight increase for the remainder of the lactation. The crossbred cows of different parity and different stage of lactation have direct impact on different body measurement as well as body weight of animals.

### MATERIALS AND METHODS

Eighty Frieswal cows were included in the experiment. The observations were recorded at weekly intervals. The



cows were divided into their respective parity and stage of lactation. The P1, P2, P3, P4, P5 parity have 21, 23, 18, 11, 7 animals respectively and for Stage of lactation (Post parturient days of milking) in S1 (0-90 days), S2 (91-180 days), S3 (181 & above) 13, 27, 40 animals respectively.

### Body measurements (Cms)

The measurements were recorded when animal was standing on even surface with its neck elevated to a position level with back. For the maximum precision, all the observations like heart girth, wither height, hook height, and body length measured by using measuring scale and measuring tape. All the body measurement was recorded on weekly basis.

### Heart girth

Circumference of thoracic region just behind the point of elbow.

### Height at wither

Perpendicular distance from the ground to the wither point (highest point of wither).

### Height at hook

Height measured through hip over the hook bones from ground base.

### Body length

Oblique distance from shoulder joint to pin bones.

### Body weight (Kg)

Body weight of each animal was calculated from their heart girth and body length measurement as per the Shaffer's formula (Shastry and Thomas, 1982) in morning and evening.

Body weight (lb) =  $(G^2 \times L)/300$

Where, G = heart girth (inches)

L = Body length from shoulder to pin bone (inches)

The factor 0.4536 (for convert lb into kilogram)

### Statistical analysis

The data were subjected to statistical analysis using least square analysis technique as outlined by Harvey (1976). The degree of association between two different variables was estimated by calculating the Pearson's correlation coefficient (Snedecor and Cochran 1994). After completion of analysis of variance the significant effect were further analyzed to make all pair wise comparisons by using DMRT as modified by Kramer (1957).

## RESULTS AND DISCUSSION

### Heart girth

The heart girth ranged from 165.58 to 184.76 cm with an average of 177.27 cm. The cows in first parity showed minimum heart girth (165.58 cm). This might be due to first time calved Frieswal cows are still growing during first lactation and subsequent increase in heart girth of Frieswal cows was again reflected in increasing trend of body weight of cows up to fourth parity. However after the fourth parity, there was slight declination in heart girth which could be attributed due to age factor. The present study was found to be in close agreement with the results of Bhakat (2004) who reported a range of heart girth from 168.59 to 183.68 cm for different parities in crossbred cows, and from 196.85 to 214.77 cm. in Murrah buffaloes (Chavan and Siddiqui, 2012).

The Analysis of Variance and DMRT showed significant effect of stage of lactation on heart girth in Frieswal cows. The maximum heart girth (181.80 cm) was found in third stage of lactation followed by second (177.27 cm) and first (172.75 cm) stages. The significant difference was observed between first and third stage of lactation. This may be due to less drainage of nutrients due to decrease in milk yield or it may be due to pregnancy effect. The heart girth changed (174.34 to 179.76 cm) in different stages of lactation, was reported by Bhakat (2004) which is very well in accordance with present findings.

### Height at wither

The height at wither of the Frieswal cows ranged between 124.73 to 130.15 cm with an overall mean of 127.22 cm. The maximum height at wither was found in third parity. There was slight fluctuation amongst the parities.

**Table 1:** Least Square Means and standard error of Heart Girth, Height at wither, Height at hook, body length and body weight under different parity and stage of lactation in Frieswal cow

Effect	Mean±SE (heart girth)	Mean ± SE (height at wither)	Mean ± SE (height at hook)	Mean ± SE Body length)	Mean ± SE Body weight (Kg)
<b>Parity</b>					
P1	165.58 <sup>a</sup> ±1.77	125.33 <sup>ab</sup> ±0.89	127.29 <sup>ab</sup> ±0.88	130.11 <sup>a</sup> ±0.94	331.48 <sup>a</sup> ±9.79
P2	174.33 <sup>ab</sup> ±1.70	126.98 <sup>ab</sup> ±0.86	128.29 <sup>ab</sup> ±0.85	134.57 <sup>ab</sup> ±0.90	381.33 <sup>ab</sup> ±9.41
P3	182.41 <sup>bc</sup> ±2.02	130.15 <sup>b</sup> ±1.02	131.71 <sup>b</sup> ±1.00	136.79 <sup>b</sup> ±1.07	422.30 <sup>bc</sup> ±11.1
P4	184.76 <sup>c</sup> ±2.46	128.89 <sup>ab</sup> ±1.24	130.54 <sup>ab</sup> ±1.22	138.93 <sup>b</sup> ±1.30	440.46 <sup>c</sup> ±13.5
P5	179.27 <sup>bc</sup> ±3.03	124.73 <sup>a</sup> ±1.53	126.17 <sup>a</sup> ±1.50	136.99 <sup>b</sup> ±1.60	408.59 <sup>bc</sup> ±16.7
ANOVA	Significant at P<0.01	Significant at P<0.01	Significant at P<0.01	Significant at P<0.01	Significant at P<0.01
<b>Stage of lactation</b>					
S1	172.75 <sup>a</sup> ±2.26	125.62±1.14	127.39±1.12	133.99±1.20	370.48 <sup>a</sup> ±12.4
S2	177.27 <sup>ab</sup> ±1.66	127.66±0.84	128.82±0.82	135.76±0.88	399.78 <sup>ab</sup> ±9.17
S3	181.80 <sup>b</sup> ±1.32	128.37±0.66	130.19±0.65	136.66±0.70	420.24 <sup>b</sup> ±7.28
ANOVA	Significant at P<0.01	Non significant	Non significant	Non significant	Significant at P<0.01
<b>Overall mean (μ)</b>	<b>177.27±1.06</b>	<b>127.22±0.53</b>	<b>128.80±0.53</b>	<b>135.47±0.56</b>	<b>396.83±5.88</b>

Means linked by similar superscripts do not differ significantly.

The height at wither increased up to third parity and then gradually decreased. But there was conspicuous difference between first and third parity. It can be attributed to the fact that due to maturity the body frame size increases gradually and then slightly declines in next parities, this again indicated age factor. Chavan and Siddiqui (2012) reported a range of height at wither (129.43 – 135.15 cm) for different parities in Murrah buffaloes supported the present findings.

**Table 2:** Table of Correlation Coefficient between different body measurements

	HG	WH	HH	BL
WH	0.614**			
HH	0.595**	0.976**		
BL	0.776**	0.632**	0.631**	
BW	0.988**	0.637**	0.621**	0.855**

\*\* Correlation is significant at the 0.01 level; \* Correlation is significant at the 0.05 level.

The Analysis of Variance and DMRT revealed that stage of lactation had no effect on height at wither. There were slight changes with increasing tendency in wither height but of no significance. This can be partially explained by the fact that during the period of lactation the cow receive

same plane of nutrition every day, therefore no change in wither height has observed.

### Height at hook

The height at hook of the Frieswal cows ranged between 126.17 to 131.71 cm. with an overall mean of 128.80 cm. The maximum height at hook (131.71 cm) was observed in third parity. There was slight fluctuation between parities for height at hook. The height at hook have significantly (P<0.01) declined from third to fifth parity. This again indicated that cows attain maximum body up to third parity and thereafter cows could not maintain body frame and reduction in body frame again has been observed. This may be due bending of legs after third parity. The height at hook did not influenced by stages of lactation. The height at hook observed in present study in Frieswal cows was in close agreement with the finding of Bhakat (2004) who reported a similar range from 126.52 – 132.40 cm in crossbred cows, similarly, Chavan and Siddiqui (2012) who reported a range of 135.41 – 141.00 cm for different parities in Murrah buffaloes.

### Body length

The study revealed that body length ranged between 130.11 to 138.93 cm among different parities with maximum



in fourth (138.93 cm) and minimum in first (130.11 cm) parity. There was significant ( $P < 0.05$ ) increase in body length from first to fourth parity (6.78 %) but slight decline in fifth parity. It may indicate that with advancement of age, animal attains the maturity in turn increase in the body frame size.

The present study showed close relationship with the findings of Bhakat (2004) who reported the body length in different parities ranged between 132.88 – 152.78 cm. Chavan and Siddiqui (2012) asserted that body length increased in initial sequence of lactation and then decreased in fifth parity.

The body length varied from 133.99 (S1) to 136.66 cm. (S3) in Frieswal cows. Which did not differed significantly indicated different stages of lactation did not have any impact of lactation length. These findings are in accordance with the findings of Chavan and Siddiqui (2012).

### Body weight

The body weight of Frieswal cows significantly ( $P < 0.05$ ) increased linearly (32.87%) from 331.48 (P1) to 440.46 cm.(P4) but declined non significantly in fifth parity. This increase in body weight in subsequent parities may be due to muscular and skeleton growth with advancement of age upto fourth parities but then afterwards decline. This again indicated that parity / age must be considered in judging the animals for body condition score.

The present study revealed the significant effect of stage of lactation on body weight in Frieswal cows. The body weight showed increasing tendency in subsequent stages of lactation i.e. maximum in third stage of lactation and minimum in first stage of lactation. The fact may be assumed that in advance stage of lactation, animal goes in advance stage of pregnancy. The present study revealed similarity with the findings of Koenen and Veerkamp (1997) who reported that loss of body weight occurred only in first 3 – 4 week of lactation. Bhakat (2004) also reported significant effect of stage of lactation on body weight of crossbred cows, which ranged from 399.62 to 430.70 kg.

The body weight was found to be positively significant ( $P < 0.01$ ) with various body measurements i.e. heart girth; wither height, hook height and body length. The positive significance of body weight with heart girth (0.988) was

found in close agreement with the findings of Korom (1974). The findings of Korom (1974) and Suchanek *et al.* (1986) on the body weight were positive and significantly correlated with hook height ( $P < 0.01$ ) as similar to our findings.

The Correlation of body weight with body length (0.855) showed the close agreement with the finding of Korom (1974).

The study revealed that the heart girth was positively significantly ( $P < 0.01$ ) correlated with height at wither, height at hook and body length (0.614, 0.595 and 0.776, respectively). The correlation of heart girth with wither height supported by the findings of Mangurkar and Desai (1978), while was contrary to the finding of Tripathi *et al.* (1978). In the study height at wither showed positive significant ( $P < 0.01$ ) correlation with height at hook and body length of the Frieswal cow. The positive and significant ( $P < 0.01$ ) correlations of all the body measurement were found in close accordance with Bhakat (2004). The significant ( $P < 0.01$ ) finding between height at wither and body length were in close agreement with the finding of Tripathi *et al.* (1978), Peeva and Venkov (1983).

### ACKNOWLEDGEMENTS

The authors acknowledge the support and facilities provided by the Department of Livestock Production and Management, College of Veterinary Science and Animal Husbandry, Mhow. (M.P.)

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