DR-1772
[1-4]

RESEARCH ARTICLE Asian Journal of Dairy and Food Research, Volume Issue : ()

Effect of Linear Type Traits Influences on Survivability and Longevity of Sahiwal Cattle

Anupam Soni, Sharad Mishra, A.K. Santra, V.N. Khune, Nishma Singh, Rupal Pathak, Neetu Sonkar, Sudheer Bhagat, S.K. Yadav[1]

10.18805/ajdfr.DR-1772

ABSTRACT

Background: The linear type traits are the one of important tools for selection of milch cattle. The lifespan of cattle mostly depends on these linear type traits particularly feet and udder related traits. So it is necessary to measure the linear type traits and effect on longevity of Sahiwal cattle.

Methods: The experiment was conducted on 86 Sahiwal cattle maintained in Bull mother experimental farm and government cattle breeding farm, Anjora, Durg (C.G.). The linear type traits in Sahiwal cattle were measured as per the recommendation of International committee for animal recording (ICAR).

Result: The different linear type traits were studied the average value of stature 125.39±0.534, Chest width 27±0.49, rump angle 12.75±0.97, rump width 17.32±0.29, rear leg set (side view) 146.03°±0.91, rear leg set (rear view) -3.74±0.15, udder depth 18.97±0.43, udder cleft 2.77±0.95, rear udder height 24.06±0.45, fore udder attachment 130.50±1.75° and front teat position 3.61±0.13 cm. these linear type traits mainly affects the longevity and survivability of Sahiwal herds. The most of the traits were found to be intermediate type it leads to increase the longevity and fewer reproductive problems in the Sahiwal herds.

Key words: Intermediate, Linear type traits, Longevity, Reproductive.

INTRODUCTION

The conformation or linear type trait of animal is one of the essential factors for the breeding and selection of dairy cattle. The longevity of animal largely depends on linear type traits especially the traits which are related to udder, feets and legs (Bunger *et al*., 2001; Ducrocq, 2001). These traits are important criteria during selection of animals as it is not only the better indicator of health condition (Saloniemi *et al*., 1986) but also a reflection of its production performance and temperament (Blake and Mc Daniel, 1979). However, these traits vary with time period or physiological stage of animals. The milk yield can be tremendously affected by the poor udder conformation leading to udder deformities and sometimes such animals are even prone to mastitis resulting in huge economic loss. The shapes, location, strength and attachment of udder are heritable traits having ability to alter the morphological structure of cow's udder (Atkins, 2007). Dairy animal basically has open and well sprung fore and rear ribs with wide chest and sufficient body depth to support the ability to produce milk performance and temperament (Blake and Mc Daniel, 1979). However, these traits vary with time period or physiological stage of animals. The milk yield can be tremendously affected by the poor udder conformation leading to udder deformities and sometimes such animals are even prone to mastitis resulting in huge economic loss. The shapes, location, strength and attachment of udder are heritable traits having ability to alter the morphological structure of cow's udder (Atkins, 2007). Dairy animal basically has open and well sprung fore and rear ribs with wide chest and sufficient body depth to support the ability to produce milk. Animals with narrow chest width, having high risk of culling it necessary to measure the chest width. The rump angle with straight to moderate slope from hip to pin bone have been linked with less reproductive problems and less involuntary culling (Caraviello *et al*., 2004; Sewalem *et al*., 2004). Thus, it may be the reason that the incidences of reproductive problems were less in Sahiwal herd. In narrow rump width animals are more prone to calving problems (Cue *et al*., 1990). Intermediate type of rear leg set is expected to possess the longer herd life (Atkins and Shannon, 2002). Udder depth

Department of Livestock Production and Management, College of Veterinary Science and Animal Husbandry, Dau Shri Vasudev Chandrakar Kamdhenu Vishwavidyalaya, Anjora, Durg-491 001, Chhattisgarh, India.

[1]Department of Veterinary Surgery and Radiology, College of Veterinary Science and Animal Husbandry, Dau Shri Vasudev Chandrakar Kamdhenu Vishwavidyalaya, Anjora, Durg-491 001, Chhattisgarh, India.

Corresponding Author: Anupam Soni, Department of Livestock Production and Management, College of Veterinary Science and Animal Husbandry, Dau Shri Vasudev Chandrakar Kamdhenu Vishwavidyalaya, Anjora, Durg-491 001, Chhattisgarh, India.
Email: vetanupam456@gmail.com

How to cite this article: Soni, A., Mishra, S., Santra, A.K., Khune, V.N., Singh, N., Pathak, R., Sonkar, N., Bhagat, S. and Yadav, S.K. (2021). Effect of Linear Type Traits Influences on Survivability and Longevity of Sahiwal Cattle. Asian Journal of Dairy and Food Research. DOI: 10.18805/ajdfr.DR-1772.

Submitted: 22-06-2021 **Accepted:** 02-09-2021 **Online:** 14-09-2021

is positively correlated with length of productive life of animal (Larroque and Ducrocq, 2001).

MATERIALS AND METHODS

Time and place of experiment

Total 86 Sahiwal cows were selected for this experiment. The experiment was conducted in February to June month of 2019 at the Bull Mother Experimental Farm and Government Cattle Breeding Farm located at the campus of College of Veterinary Science and Animal Husbandry, Dau Shri Vasudev Chandrakar Kamdhenu Vishwavidyalaya, Anjora, Durg (C.G.).

Measurement of linear type traits

The linear type traits in Sahiwal cattle were measured as per the recommendation of ICAR (2018).

Stature: The stature, indicating height of animal at highest point of spine was noted in Sahiwal cows.

Chest Width: This trait is measured from rear as a distance between top of two fore limbs.

Rump angle: This trait indicated the angle between highest point of hook bone to the highest point of pine bone.

Rump width: It is the distance between two pin bones of cows.

Rear leg set (Side view): Rear leg set, as viewed from side, measures angle of hock joint.

Rear leg set (Rear view): The distance between hock joint and between two fetlock was measured and difference between both the distance is termed as rear leg set (rear view).

Udder depth: The depth of udder was measured as a difference in distance between the floor of udder to the hock joint.

Rear udder height: The rear udder height indicated the vertical distance from bottom of vulva to milk secreting tissue.

Udder cleft: The udder cleft was measured at base of the udder supported by central ligament.

Fore udder attachment: This trait was measured as an angle between fore part of udder and abdominal wall.

Front teat position: The front teat placement was measured from the centre of quarter of cows.

Stastical analysis

The mean, standard error and coefficient of variation of data were calculated by using formula given by Snedecor and Cochran (1989).

RESULTS AND DISCUSSION

Stature

The stature, indicating height of animal at highest point of spine was noted in Sahiwal cows and the mean value of stature was found to be 125.39±0.534 cm (Table 1) with maximum value 137.60 cm was recorded (Table 2). The maximum number tall types of Sahiwal cows were found to be 54.64%, it might be the one of the reason for less culling rate.

Chest width

The average value of chest width was 27.74±0.49 cm with coefficient of variation of 17 per cent (Table 1). The minimum and maximum values of chest width were 18.40 and 39.30 cm respectively (Table 2). Moreover, the values of this trait in percentage for narrow, intermediate and wide groups were 31.35 per cent, 52.35 per cent and 16.30 per cent respectively (Table 3). According to Atkins (2007), the animals with wide chest width is desirable as it support the ability to produce high quantity of milk. However, the cows with wide chest width, reduces the risk of culling. Since, in present study, the maximum percentage of animals comes under intermediate type of chest width (52.35%) which could be one of the reasons for low culling rate in Sahiwal cows.

Rump related traits

Rump angle and rump width were traits related to rump. The mean values of rump angle and rump width were 12.75±0.97 cm and 17.32±0.29 cm respectively (Table 1).

Table 1: Mean, standard error and coefficient of variation of linear type traits in Sahiwal cows.

Linear type traits	Mean ± S.E	C.V. (%)
Stature (cm)	125.39 ± 0.534	4
Chest width (cm)	27.74 ± 0.49	17
Rump angle (cm)	12.75 ± 0.97	29
Rump width (cm)	17.32 ± 0.29	16
Rear leg set (side view) (degree)	146.03 ± 0.91	6
Rear leg set (rear view) (cm)	-3.74 ± 0.15	38
Udder depth (cm)	18.97 ± 0.43	21
Udder cleft (cm)	2.77 ± 0.95	32
Rear udder height (cm)	24.06 ± 0.45	18
Fore udder attachment (degree)	130.50 ± 1.75	12
Front teat position (cm)	3.61 ± 0.13	33

Table 2: Minimum and maximum values of different linear type traits in Sahiwal cows.

Linear type traits	Minimum value	Maximum value
Stature (cm)	116.20	137.60
Chest width (cm)	18.40	39.30
Rump angle (cm)	4.60	22.30
Rump width (cm)	11.60	24.50
Rear leg set (side view) (degree)	128	164
Rear leg set (rear view) (cm)	-7.90	-1.30
Udder depth (cm)	10.60	28.00
Rear udder height (cm)	12.10	33.70
Udder cleft (cm)	0.90	4.70
Fore udder attachment (degree)	89	159
Front teat position (cm)	0.50	5.70

The maximum frequencies of rump angle and rump width were observed intermediate type *i.e*. 58 (67.50%) and intermediate type 49 (57.00%) respectively in Sahiwal cows (Table 3). According to ICAR (2010), the animal had been low rump angle and extreme slope with narrow rump width (Cue *et al*., 1990) which is considered as unacceptable, while, animal with intermediate rump angle is considered as acceptable. Cow's with straight to moderate rump angle and intermediate rump width has been linked less reproductive as well as less calving problems (www.wales.co.uk) and reduces the risk of involuntary culling (Caraviello *et al*., 2004; Sewalem *et al.,* 2004). Since, in present investigation, maximum number of cows comes under intermediate group. It could be one of the reasons for fewer incidences of calving difficulties and other reproductive problems as observed in Sahiwal herd.

Rear leg related traits

The rear leg set (side view) and rear leg set (rear view) such traits related to rear legs. in present experiment, the mean values of rear leg set (side view) and rear leg set (rear view) were 146.03±0.91 degree and -3.74±0.15 (Table 1). The maximum values of rear leg set (side view) and rear leg set (rear view) were 164° and1.30 cm respectively (Table 2). In present study, the maximum frequency of cattle was intermediate types of (65.20 per cent) and rear leg set (rear view) (51.60 per cent) (Table 3). Accordance to McDaniel (1994) cattle with both the extremities *i.e*. straight and sickle leg are linked with reduced longevity. Cows with intermediate type of rear leg set (side view) could be associated with increased longevity (Atkins and Shannon, 2002) and increased production and profitability (Perez-Cabal and Alenda, 2002). According to Atkins (2007) the 41 per cent of total variation of locomotion/ movement was influenced by leg traits, out of which approximately 55 per cent was contributed by rear leg set (rear view). Moreover, the incidence of toes out and bowlegged condition reduces the longevity as well as production performance of a herd. In present study, most of the animals possess the intermediate type of both traits such as of rear leg set (side view) and (rear leg set rear view), hence, it could be assumed that relative risk of involuntary culling due to lameness might be less in Sahiwal cattle, it might be assumed that Sahiwal cattle possess more longevity.

Udder related traits

Udder depth, udder cleft, rear udder height, fore udder attachment and front teat placement were traits related to udder. The average value of udder depth, udder cleft, rear udder height, fore udder attachment and front teat placement were found 18.97±0.43 cm, 2.77±0.95 cm, 24.06±0.45 cm, 130.50°±1.75° and 3.61±0.13 cm respectively (Table 1) The maximum value of all this traits were found to be 28.00cm, 4.70cm, 33.70cm 159° and 5.70 cm respectively (Table 2). Under 1 -9 point scoring system the percentages of all traits (except fore udder attachment) were recorded as intermediate type in Sahiwal cattle. The frequencies were 65.20%, 51.16%, 64.0% and 53.49% for udder depth, udder

Table 3: Frequencies of different linear type traits under 1-9 point scoring system of Sahiwal cows.

Linear type traits	Score group (1-9 score point)		
	1-3	4-6	7-9
Stature (cm)	Short	Intermediate	Tall
	15(17.35%)	24(28%)	47 (54.65%)
Chest width (cm)	Narrow	Intermediate	Wide
	27 (31.25%)	45 (52.35%)	14 (16.30%)
Rump angle (cm)	Low	Intermediate	High
	23 (26.70%)	58 (67.5%)	5 (5.80%)
Rump width (cm)	Narrow	Intermediate	Wide
	25 (29.0%)	49 (57.0%)	12 (14.0%)
Rear leg set side view (degree)	Straight	Intermediate	Sickle
	25 (29.0%)	56 (56.20%)	5 (5.80%)
Rear leg set rear view (cm)	Toes out	Intermediate	Bow legged
	9 (10.4%)	44 (51.6%)	33 (38.0%)
Udder depth (cm)	Below hock	Intermediate	Shallow
	25 (29.0%)	56 (56.20%)	5 (5.80%)
Rear udder height (cm)	Low	Intermediate	High
	6 (7.0%)	55 (64.0%)	25 (29.0%)
Udder cleft (cm)	Weak	Intermediate	Strong
	20 (23.25%)	44 (51.16%)	22 (25.58%)
Fore udder attachment (degree)	Weak	Intermediate	Strong
	15 (17.44%)	33 (38.37%)	38 (44.18%)
Front teat position	Narrow	Intermediate	Wide
	11 (12.79%)	46 (53.49%)	29 (33.72%)

cleft, rear udder height and front teat placement respectively (Table 3). But, in present study, the percentage of fore udder attachment was strong udder attachment in Sahiwal cows. According to Carlen *et al*., 2004, cows with deep/ below hock udder increased risk of mastitis and locomotion problems.

As per the guidelines of ICAR (2018), cattle with strong central ligament are better than weak ones since; the udder is attached on the pelvic cavity by means of the medial and lateral suspensory ligaments of udder cleft. Thus, the animals with strong udder cleft can bear more weight of udder when filled with milk. However in case of weak / loose ligament, the risk of udder damage is high. Udder cleft is the one of most important traits which is associated with udder health. Hence, the udder cleft has greater influence on the longevity and productive performance of animals (Vollema *et al*., 2000; Larroque and Ducrocq, 2001 and Schneider *et al*., 2003). The animals with strong fore udder attachment is supposed to provide ample surface for secretory tissue of udder to synthesize more milk. According to ICAR (2010), in dairy cattle, very low and intermediate type of the rear udder height is considered as undesirable, while high rear udder height is considered as desirable. It may be due to the fact that animal with high rear udder height provides greater surface area for secretary tissues of udder to synthesize larger amount of milk.

In present study, the highest frequency was observed for intermediate type of all udder related traits in Sahiwal cows, which might be one of the reasons for low incidences of mastitis and improves the milk productions.

CONCLUSION

It is concluded that the linear type traits such as chest width, rump width, rump angle, udder depth, rear leg set (side view), rear leg set (rear view) and udder cleft were intermediate types observed. Hence, it could be reason that low culling rate in Sahiwal herd and increase the longevity and fewer reproductive problems.

REFERENCES

Atkins, G. (2007). Using Conformational Anatomy to Identify Functionality in Dairy Cows. 27th European Holstein and red Holstein conference, Denmark.

Atkins, G. and Shannon, J. (2002). Minimizing lameness through genetic selection. Advances in Dairy Technology. 14: 93.

Blake, R.W. and Mc Daniel, B.T. (1979). Relationships of udder conformation with labour and machine inputs to milk harvest in dairy cattle. Journal of Dairy Science. 62: 475.

Bunger, A., Ducrocq, V.V. and Swalve, H.H. (2001). Analysis of survival in dairy cows with supplementary data on Type score and housing system from a region of North-West Germany. Journal of Dairy Science. 84: 1531-1541.

Caraviello, D.Z., Weigel, R.A. and Gianola, D. (2004). Analysis of the relationship between type traits and functional survival in U.S. Holstein cattle using a weibull proportional hazards models. Journal of Dairy Science. 87: 2677-2686.

Carlen, E., Strandberg, E. and Roth, E.E. (2004). Genetic parameters for clinical mastitis, somatic cell score and production in first three lactations of Swedish Holstein cows. Journal of Dairy Science. 87: 3062-3070.

Cue, R.I., Monardes, H.G. and Hayes, J.F. (1990). Relationships of calving ease with type traits. Journal of Dairy Science. 73: 3586-3590.

Ducrocq, V. (2001). Illustration of trend validation test for longevity evaluation. Interbull Bulletin. 27: 147-152.

ICAR, Conformational Recording of Dairy Cattle (2018). Available at: www.icar.org/ documents/……/ guidelines/.

International Committee for Animal Recording (ICAR). (2010). International agreement of recording practices. Section 5.1, conformation 760 Tapki and Guzey / Greener Journal of Agricultural Sciences recording of dairy cattle. Approved by the general assembly held in Riga, Latvia, pp. 199-213.

Larroque, H. and Ducrocq, V. (2001).Relationships between type and longevity in the Holstein breed. Genetics Selection Evolution. 33: 39-59.

Mc Daniel, B.T. (1994). Feet and Leg Traits of Dairy Cattle. Proc VIII Int. Sym Disorders of the Ruminant Digit, Banff, Canada. Published by Continuing Veterinary Education Section, University of Saskatchewan, Saskatoon, Saskatchewan, Canada. pp. 102- 109.

Pe´rez-Cabal, M.A. and Alenda, R. (2002). Genetic relationships between lifetime profit and type traits in Spanish Holstein cows. Journal of Dairy Science. 85: 3480-3491.

Saloneimi, H., Grohn, Y. and Syvajarvi, J. (1986). An epidemiological and genetic study on registered diseases in finish Ayrshire cattle II. Acta Veterinary Scandinavica. 27: 196-208.

Schneider, M., Del P., Durr, J.W., Cue, R.I. and Monardes H.G. (2003). Impact of type traits on functional herdlife of Quebec Holsteins using by survival ananalysis. Journal of Dairy Science. 86: 4083-4089.

Sewalem, A., Kistemaker, G.I., Milglior, F. and Van Doormal, B.J. (2004). Analysis for the relationship between survival in Canadian Holsteins using a weibull proportional hazards model. Journal of Dairy Science. 87: 3938-3946.

Snedecor, G.W. and Cochran, W.G. (1989). Statistical Methods (seventh editions). Iowa, State University Press, Ames, Iowa (U.S.A).

Vollema, A.R., Van der Beek, S., Harbers, A.G.F. and De Jong, G. (2000). Genetic evaluation for longevity of Dutch dairy culls. Journal of Dairy Science. 83: 2629-2639.

www.ddc-wales.co.uk. Dairy development centre. Available at: http:// / www.ddc wales.co.uk/publi/index.cfm.