

MORPHOLOGICAL CHARACTERIZATION OF SELECTED HOLSTEIN-FRIESIAN AND LOCAL DAIRY COWS

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Abstract

This experiment was conducted in the Animal Genetic Engineering of Biotechnology and Genetic Engineering Discipline at Khulna University, Bangladesh during the period of 2010-11. A total of 20 pure, crossbreed and local cattle were randomly selected from cattle shades of Central Cattle Breeding and Dairy Farm, Saver, Dhaka and the morphological characters were studied. The cattle breeds were also compared with high yielding exotic breeds as PHF, LF 75% and LF 50% based on discrete external morphological traits. The UPGMA dendrogram shows that four breeds of cattle divided in three main clusters. The maximum genetic distance was found between Local (Pabna) and LF 75%, which was 1.1896. The minimum genetic distance was obtained between LF 75% and LF 50%, which was 0.4964. This indicates the close relationship between LF 75% and LF 50%.

Keywords: Holstein-Friesian and local dairy cows, morphological characters, genetic distance

Introduction

Livestock, being one of the major components of agricultural output (crops, livestock, fisheries and forestry) plays a vital role in national economy, contributing about 6.5% of Gross Domestic Product (GDP) and 13% of total foreign exchange earnings (DLS, 1994). Bangladesh possesses a cattle population (24.5 million heads cattle, FAO, 2004) comprised of indigenous, exotic and crosses with indigenous (ILRI, 2004). Holsteins are most quickly recognized by their distinctive color markings and outstanding milk production. Since the 1960s, the people of Bangladesh have been rearing three categories of cattle viz. pure breed, crossbreed, and local. The pure breed and the crossbreed cattle have high nutritional requirement, less adaptability, and are susceptible to parasitic infestation and diseases compared to the local variety. On the other hand, the local variety is less prone to diseases and is heat tolerant (Hossain et al., 2002). The birth weight of Pabna cattle (15.6 ± 0.40 kg) an improved variety of local cattle (Udo et al., 1990). Birth weight of Friesian X Local cattle found within the range 17.28 ± 0.436 to 23.05 ± 0.32 kg reported by Hirooka and Bhuiyan (1995) and Nahar et al., (1992). Milk production in Bangladesh is reported to have increased from 14.9 thousand tons in the year 1993–94 to 16.2 thousand tons in the year 1997–98 (Ahmed, 1987). The present study was, therefore, undertaken to find out the morphological characters of selected Holstein-Friesian and local dairy cows.

Materials and methods

This experiment was conducted in the Animal Genetic Engineering of Biotechnology and Genetic Engineering Discipline at Khulna University,

Bangladesh. The morphological characters were studied in Central Cattle Breeding and Dairy Farm, Saver, Dhaka. The following materials and methodologies were used in the laboratory for DNA extraction and quantification of Holstein-Friesian and local dairy cows blood samples.

Table 1. Cattle breeds, cow number, sex of the animals and sample location

SL. No.	Cattle No.	Location from where sample was collected	Cattle identity	Sex
1	27	Kachua, Bagerhat.	Local	male
2	99	Kachua, Bagerhat	Local	male
3	102	Kachua, Bagerhat	Local	female
4	50	Kachua, Bagerhat	Local	female
5	69	Kachua, Bagerhat	Local	female
6	3	Kachua, Bagerhat	Local	male
7	35	Kachua, Bagerhat	Local	male
8	35	Kachua, Bagerhat	Local	female
9	85	Nazirpur, Pirojpur	Local	female
10	5	Nazirpur, Pirojpur	Local	female
11	7	Nazirpur, Pirojpur	Local	male
12	10	Nazirpur, Pirojpur	Local	female
13	1	Nazirpur, Pirojpur	Local	female
14	13	Nazirpur, Pirojpur	Local	female
15	9	Pabla, Khulna.	Local	male
16	2	Pabla, Khulna.	Local	female
17	3	Pabla, Khulna.	Local	male
18	11	Pabla, Khulna.	Local	male
19	12	Pabla, Khulna.	Local	female
20	17	Pabla, Khulna.	Local	female

Animal selection and blood sample collection

A total of 20 pure, crossbreed and local cattle were randomly selected from cattle shades of Central Cattle Breeding and Dairy Farm, Saver, Dhaka, for this study (Table 1). Five or ten ml of blood was collected from each animal in 10 ml EDTA vacutainer tube. The blood was gently mixed with EDTA (present in the vacutainer as an anticoagulant agent) and kept on ice box to maintain low temperature in order to prevent cell. Subsequently the blood samples were transported to the laboratory and stored at 0°C.

Results and discussion

Classification of selected cattle breeds based on morphological characters

In this experiment the cattle breeds were classified based on morphological characters (Table 2). Although the morphological characters are governed by environmental factors in some extent, but can be used as marker for breed identification.

Table 2. Morphological characters of Pure Holstein-Friesian (PHF), Local X Friesian (LF, 75%), local X Friesian (LF, 50%) and Local (Pabna) cattle

Cow No.	Characteristics of cattle breed	PHF	LF (75%)	LF (50%)	Local (Pabna)
1	Coat color	black& white	black& white	black& white	red brown
2	Av. Body weight (kg)	486	300	350	260
3	Av. Body length (cm)	62	58	60	47
4	Ear length(cm)	10	8.5	10	9.5
5	Ear width(cm)	6.5	6	6.5	5
6	Head length(cm)	21	19	20	18.5
7	Head width (cm)	11	8	9.5	7
8	Fore leg length(cm)	53	45	46	41
9	Hind leg length(cm)	53	45	46	41
10	Tail (cm)	31	30	33	27
11	Horn (cm)	absent	5	8	6
12	Teat length(cm)	2	2	2.5	1.5
13	Av. Milk production (L/D)	8.94	5.10	6.3	2.48
14	Av. Gestation period (days)	250	265	271	271
15	Heart girth	72	58	62	60

Pair-wise genetic distance

Pair-wise Genetic distance among the cattle breed is presented in Table 3. From the morphological characters the genetic identity and genetic distance were estimated using soft-ware POPGENE (Version 1.31). The maximum genetic distance was found between Local (Pabna) and LF 75%, which was

1.1896. The minimum genetic distance was obtained between LF 75% and LF 50%, which was 0.4964 (Table 8). This indicates the close relationship between LF 75% and LF 50%.

Table 3. Pair-wise genetic distance among cattle breeds

Pop ID	PHF	LF 75 %	LF 50%	Local (Pabna)
1	****			
2	0.9954	****		
3	0.7841	0.4964	****	
4	0.9954	0.9383	1.1896	****

Dendrogram without root

Dendrogram based on Nei's (1972) genetic distance using unweighted Pair Group Method of Arithmetic Means (UPGMA) indicated segregation of the cattle breed. LF 75% and LF 50% genetic similarities are plotted in the same cluster of the dendrogram. This means LF 75% and LF 50% are originated from the same root. The genetic distance is very high between Local (Pabna) and LF 50% (Figure 1).

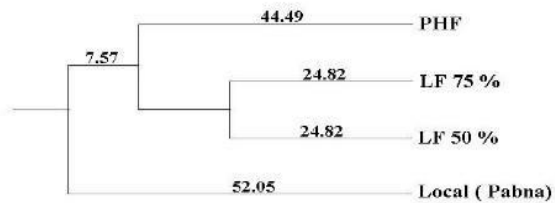


Fig 1: Dendrogram without root

Dendrogram with root

Dendrogram with root means to show the ancestors of the progenies. The UPGMA dendrogram shows that four breeds of cattle divided in three main clusters. Cluster 1 consisted of the exotic breeds as LF 75% and LF 50%, cluster 2 consisted of the PHF and cluster 3 consisted of the Local (Pabna). This indicates the close relationship between LF 75% and LF 50% (Figure 2).

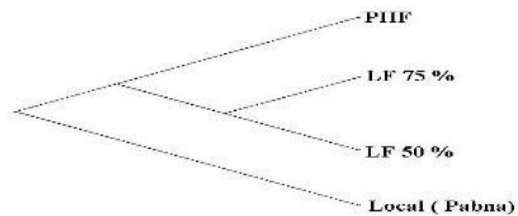


Fig 2. Dendrogram with root

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