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## Study of Phenotypic and Morphometric Characteristics of Achai Cattle at Livestock Research and Development Station Dir (Lower), Pakistan

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**Abstract:** A study was conducted at Livestock Research and Development Station, Animal Analytical Laboratory Dir Lower Khyber Pakhtunkhwa (KPK) Pakistan to document the phenotypic and Morphometric characteristic of Achai cattle. Total 18 pure Achai Cattle were selected in the study. Phenotypic characteristic were recorded visually. Majority (88.50%) of the study Achai color have reddish brown coat color with white face but those animals were also included in the study that have radish brown color with or without white spotted face, gray muzzle, radish and white eye lashes. Physical characteristic (color of coat, muzzle, face, eye lash, horns, hump, udder hooves and tail switch) were recorded visually while morpho-metric measurements (heart girth, body length, height at withers, horn length, ear length, neck length, hoof circumference and tail length) were recorded by using measuring tape and vernier caliper. Mean body, face, ear, horn, rump and tail length was 112±4.78, 42±0.502, 19±0.469, 17±0.874, 33±0.481 and 75±1.332 centimeter, respectively. Mean width of head and shoulder was 12±2.937 and 89±0.2711, respectively. Mean circumference of neck and abdominal was 68±1.03 and 168±2.159. Mean chest girth was 142±0.978 and rump height was observed 103±4.16 accordingly. The average body weight of adult Achai cow recorded was 203.81±6.17 kg. The average birth and weaning weight was recorded 13.90±0.80 and 48.0±5.00 kg, respectively. It was concluded that Achai is a small size breed of Khyber Pakhtunkhwa Pakistan having short stature, radish brown color and fully adapted to the hilly areas of the province.

**Key words:** Achai cattle, phenotypic, morphometric, color body weight, Peshawar

### INTRODUCTION

Livestock sector has been selected as an economy engine for poverty alleviation from Pakistan. According to economic survey of Pakistan 2013-14 its contribution to agriculture value added is approximately 55.9% and national GDP is 11.8%. Gross value addition of livestock has increased from Rs. 756.3 billion (2012-13) to Rs. 776.5 billion (2013-14), showing an increase of 2.7 percent as compared to last year. Livestock is raised by more than 8.5 million small and landless families in the rural areas and 35-40 million rural populations are directly or indirectly dependent on this sector. Cattle breeds found in the country are Sahiwal, Red Sindhi, Cholistani, Bhagnhari, Dajal, Dhanni, Gibrali, Khankraj, Lohani, Rojhan and Thari. Sahiwal and Red Sindhi are well known dairy breeds and internationally recognize due to their distinct characteristics (Anonymous, 2012-13).

Achai cattle breed are small sized found in KPK province and is suitable for mountainous terrain and can resist harsh climatic conditions. The home tract of Achai cattle are district Dir, Swat, Bajaur Agency and some adjoining

areas of Afghanistan. Its feeding requirements are very low due to its small body size so it can thrive under scarce fodder availability and can produce adequately under a hilly and sub-hilly subsistence production setup (Khan *et al.*, 2008).

Achai cattle are not yet documented but are well adapted to northern areas of Pakistan (Saleem *et al.*, 2013). Achai has a better efficiency index than all other cattle breeds of Pakistan except Jersey crossed and Sahiwal (Kenyanjui and Sheikh Ali, 2009) and have better reproductive performance than other cattle breeds in Pakistan (Saleem *et al.*, 2012).

Despite their well-known qualities and adaptive capacity to extensive environment many local breeds remain undocumented making in situ conservation action difficult (FAO, 2007). Due to its vital role in future, public sector in Khyber Pakhtunkhwa an Achai cattle conservation program has recently initiated. However such programs for the conservation of Achai cattle remain ineffective due to lack of scientific information on phenotypically pure Achai cows and bulls (Yakbu *et al.*, 2010). Therefore the present study has been design to

investigate and document the breed-related phenotypic characteristics and their morphometric measurements. This base line data will provide crucial information for further advance research.

## MATERIALS AND METHODS

Present study was carried out at Establishment of Livestock Research and Development Station; Animal Analytical Laboratory Dir Lower Khyber Pakhtunkhwa Pakistan. Climatic condition of this area is characterized by relatively medium to high annual rainfall (1000-1200 mm). Temperature range during winter is -06 to 38°C and in summer is 15 to 40°C. Total 18 pure Achai Cattle were selected in the study.

### Phenotypic and morphometric characteristics:

Physical characteristic (color of coat, muzzle, face, eye lash, horns, hump, udder hooves and tail switch) were recorded visually, Morphometric measurements (heart girth, body length, height at withers, horn length, ear length, neck length, hoof circumference and tail length) were recorded by using measuring tape and vernier caliper.

**Weighing of experimental animals:** All experimental animals were weighed empty stomach at morning prior to feeding by using Dovi's electronic balance. Birth weight and weaning weight was recorded by using the same electronic balance.

## RESULTS AND DISCUSSION

**Phenotypic and morphometric characteristic:** Table 1 showed the phenotypic characteristics of Achai cattle. Majority (88.50%) of Achai cattle have radish brown coat color with white face. White spots have been seen on the udder underline and the legs of some animals. Animals with spotted radish brown color have also been reported by Saleem *et al.* (2013). Variation in coat color depends upon geographical and climatic environment (Seo *et al.*, 2007; Desta *et al.*, 2011). Muzzle was gray to whitish in color with black pigment. In female horns were small and thin with variable curls while in males horns were large, directed upward and forwarded. Color of the horns was gray with black tips, however light brown color horns have also been reported by Saleem *et al.* (2013). In male hump was large in size while females have small hump. Eye lashes were radish in color but animals with white eye lashes have also been observed. Udder is well attached above hock joint, prominently demarcated into right and left quarter with narrow width and low height from the near. Teats were short and look like part of the udder. Front teats were located wide apart while rear teat are little close. The hooves were gray in color but animals with light brown and black hooves have also been observed. Switch of the tail was reddish brown and white in color. Similar phenotypic characteristics have also been reported by Muhammad Saleem *et al.* (2010).

Table 1: Phenotypic characteristic of Achai cattle

Variable	Color	Percent (%)
Coat	Solid reddish brown	88.50
	Spotted reddish brown	12.5
Face	Reddish	46.87
	White	53.13
Hoof	Gray	81.25
	Light brown	12.5
	Black	6.25
Switch of tail	White	37.5
	Reddish brown	62.5
Eye lashed	Reddish	71.87
	White	28.13
Muzzle	Gray with black pigment	87.5
	White with black pigment	12.5
Horn	Gray	93.75
	Whitish	6.25

Table 2: Morphometric measurements of achai cattle

Variable	Min. value	Max. value	Mean	Mean SE
Rump height (cm)	97	112	103	4.16
Body length (cm)	101	125	112	4.78
Face length	38	46	42	0.502
Ear length	16	24	19	0.469
Horn length	10.6	25	17	0.874
Rump length	30	39	33	0.481
Tail length	66.5	88	75	1.332
Neck circumference	63	81	68	1.03
Abdominal circumference	160	196	168	2.159
Chest girth	133	149	142	0.978
Head width	11	14.5	12	2.937
Shoulder width	77	136	89	0.2711

Various morphometric measurements play key role in demarcation and identification between and within various cattle breeds (Mwacharo *et al.*, 2006; Yakbu *et al.*, 2010). Within the breeds variation in morphometric measurement reflects adaptability of breed to a specific production system (Hall, 1998; Kugonza *et al.*, 2011). Table 2 shows the morphometric measurement of Achai cattle. Mean heart girth, body length and height at withers were recorded as 138.361±1.70 cm 112±4.78 cm and 99.73±1.26 cm, respectively. Similarly results of mean heart girth body length and height at wither of Achai cattle was recorded 134.33±0.63 cm, 112.20±0.78 cm and 101.79±0.41 cm, respectively (Khan *et al.*, 2005). Similarly Muhammad Saleem *et al.* (2010) reported the average heart girth body length and height at wither of male Achai cattle 134.33±0.6, 115 and 105.5 cm, respectively. Tail extending down size; neck was short, strong and well developed particular in males was reported mostly in this study. Tail extend down well below the hock joint (75±1.332 cm) with a fluffy reddish brown switch but animals with white switch have also been observed which is in line with the results of Muhammad Saleem *et al.* (2010). In this study the dewlap was observed quite voluminous in male Achai cattle but less in female. The legs were short thin and covered with hair. The rear legs were pointed out ward and forwarded from hock joint. Similar results have also been reported by Muhammad Saleem *et al.* (2010). Achai was fairly small-sized breed having short stature as indicated by the smaller heart girth: body length and

height at wither (Table 2). The average body weight of Achai cow was recorded  $203.81 \pm 6.17$  kg. Muhammad Saleem *et al.* (2010) reported 280 and  $188.23 \pm 2.66$  kg adult body weight for Achai male and female, respectively. Similarly Khan *et al.* (2005) also been reported it, the smallest cattle breed in Pakistan. Its small body size may be the result of natural selection, to meet fodder scarcity in harsh climatic condition so this breed has high adoptive capacity to adverse environmental conditions (Mwacharo *et al.*, 2006). Smaller animals can survive better during fodder shortage (Hall, 1998) and can move more easily and quickly (Ouma *et al.*, 2004) on mountain slopes for grazing.

Average birth and weaning weight was recorded  $14 \pm 1.22$  and  $50.0 \pm 5.00$  kg, respectively. These finding are in line with the finding of Rajwali *et al.* (2012) who reported  $15.23 \pm 0.49$  and  $45.05 \pm 0.84$  kg birth and weaning weight, respectively. Average daily growth rate up to weaning of Achai cattle calves was recorded 0.39 kg. Similar findings have been reported by Rajwali *et al.* (2012) who reported mean daily growth rate up to weaning 0.33 kg.

**Conclusion and recommendation:** Achai cow is the smallest cattle breed in Pakistan. It is multipurpose animal and its genetic resource being reared both as dairy and draft animal. Constant threat to Achai breed is indiscriminate breeding due to the lack of pure breeding bull and pure semen which results in losing its breed's trails. Documenting its phenotypic and Morphometric characteristics can help in improving its breed's trails. A conservation program has been initiated by the Department of Livestock and Dairy Development Department of the Khyber Pakhtunkhwa but the capacity and scope still needs improvement.

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