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Cholistan and Cholistani Breed of Cattle

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ABSTRACT

Cholistan, once a green and prosperous land with the source of water being the ancient Hakra River, was also the cradle of great Hakra Valley Civilization. It is sprawled at an area of 26,000 Km^2, located between the latitudes 27º42´and 29º45´North and longitudes 69º52´and 75º24´East. The bioclimatic system of Cholistan falls under the category of "tropical desert" with very scanty rainfall. Geomorphologically, the soils of Cholistan are a complex blend of river alluvium and Aeolin sands. Based on topography, type of soil and vegetation, this desert is divided into two geomorphic regions: the Lesser Cholistan (the Northern 7,770 Km² region) and the Greater Cholistan (the Southern 18,130 Km² region). The primary source of water is rainfall which is utilized through natural depressions or man-made ponds called *"Tobas"* and "Dahars." The secondary source is underground water which is brackish and salty and not fit for human/animal consumption. Two livestock production systems prevail under pastoralism in Cholistan *viz.* transhumanie and nomadic. Despite an uncertain, unpredictable rainfall, low humidity and extremes in temperatures, Cholistan has long been famous for raising different breeds of livestock, contributing a significant share to national milk, meat and wool output. The total livestock population estimated during 2006 was 12,09528, out of which 47% were cattle. Cholistani cattle are considered to be ancestor of the Sahiwal and are a thermo-tolerant, tick-resistant breed. Preliminary data on some productive and reproductive traits of Cholistani cows maintained at Govt. Livestock Station, Jugait Peer, Bahawalpur during the period 2005 to 2009 revealed the avergae values for the productive traits i.e. lactation length, lactation yield, dry period, service period and fat percentage in milk as 165 days, 1235 liters, 155 days, 121 days and 4.8%, respectively. Similarly, the average values for reproductive traits i.e. age at maturity, age at first calving, gestation period and calving interval were 1112, 1390, 278 and 422 days, respectively, which are at par with those of Sahiwal and Red Sindhi cattle. However, comprehensive data supported by research need to be analyzed to manipulate the potentials of this breed. Furthermore, gene mapping and Marker Assisted Selection (MAS) will open up new horizons to study performance traits of Cholistani cattle in detail.

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CHOLISTAN DESERT

Cholistan, once a green and prosperous land with the source of water being the ancient Hakra River (Akbar *et al.*, 1996) was the cradle of great Hakra Valley Civilization (HVC), also known as the Indus Valley Civilization (IVC) or Indus Ghaggar-Hakra Civilization (Ratnagar, 2006). In 600 BC, the Hakra river became irregular in its flow and consequently dried up, and the same was true for most of the life.

The barren but fascinating landscape of the Cholistan desert ("ROHI" in the local dialect) is, in fact, an extension of the Great Indian Desert which includes the Thar Desert in Sindh province of Pakistan and the

Fig. 1: Location map of Cholistan desert

Rajhastan Desert in India (FAO/ADB, 1993; Jowkar *et al.*, 1996, Fig. 1). It starts some 30 Km from the main city of Bahawalpur, Punjab, Pakistan and sprawls over an area of 26000 Km² (Mughal, 1982), located between the latitudes 27º42´and 29º45´North and longitudes 69º52´and 75º24´East.

CLIMATE AND GEOMORPHOLOGY

The climate of the area is an arid subtropical, continental type with low and sporadic rainfall, high temperature, low relative humidity, high rate of evaporation and strong summer winds (Khan, 1957). It is one of the driest and hottest areas of Pakistan, situated at 112m above the sea level with the mean annual temperature of 28.33°C. The month of June is the hottest when the daily maximum temperature normally exceeds 45°C, sometimes crossing 50°C (Ahmad, 2002). The daily maximum temperature comes down in July, August and September due to Monsoon winds (Fig. 2), causing the nights to get cooler abruptly (Ahmad, 1999). The average annual rainfall is 180 mm. but may be as low as 2 mm (Ali *et al.*, 2009). Thus, the monsoon rains have the least influence on the area, making it water scarce and drought stricken with the drought periods sometimes extending from 1 to 3 years (Chaudhry and Nasim, 1995). The bioclimatic system of Cholistan falls under the category of "tropical desert."

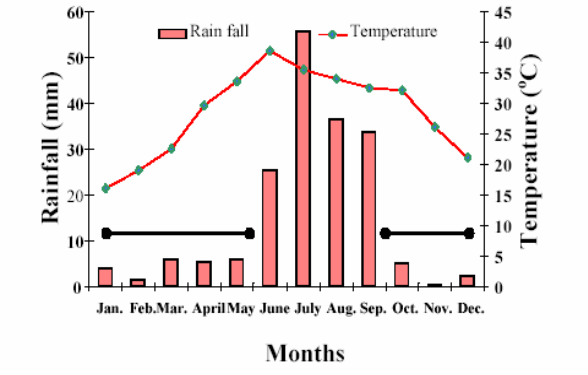

Fig. 2: Monthly mean temperature and rainfall in Cholistan desert during 2005-2009 (Processed from the raw data provided by Regional Office of Pakistan Council of Research in Water Resources, Bahawalpur, Pakistan).

Geomorphologically, the soils of the area have been reported to be a complex blend of two types of materials *i.e.* river Alluvium and Aeolian sands (Ahmad, 2007). The Alluvium consists of mixed calcareous material, which was derived from the igneous and metamorphic rocks of the Himalayas and was deposited by the Satluj and abandoned Hakra rivers most probably during different stages in the sub-recent periods (Ahmad, 2005a). The Aeolian sands have been derived mainly from the Rann of Kutch, the sea coast, and partly from the lower Indus Basin (FAO/ADB, 1993).

TOPOGRAPHY AND WATER RESOURCES

Based on topography, type of soil and vegetation, this desert is divided into two geomorphic regions: the Lesser Cholistan comprising the Northern 7,770 Km² region and the Greater Cholistan comprising the Southern 18,130 Km² region (Farid *et al*., 1992; Akbar *et al.*, 1996). Apart from the intersecting perennial waters of Satluj and Beas rivers in the lesser Cholistan, this is an arid area with less than 100m of low-lying sand dunes and extensive flats of alluvial clays ("*Dahars*" in the local dialect). Low lying flat lands and perennial waters have made this area somewhat suitable for cultivation but has also caused a decrease in free grazing lands by one third (Ali *et al.*, 2009). Thus, from the turn of this century, an intensive irrigation system based on canals was constructed along the northern fringes of Lesser Cholistan. Greater Cholistan, on the other hand, is a wind resorted sandy desert, comprising of a number of old Hakra river terraces with various forms of sand ridges and inter-ridge valleys (Tahir *et al.*, 1995).

The primary source of sweet water in Cholistan is the surface water collected in natural depressions or man-made ponds called "*Tobas"* and "*Dahars*" during the rainy season. Water seepage and high rates of evaporation do not allow these stored waters to stay for long and the evaporation losses of water have been reported to be higher than seepage losses (Khan *et al.,* 1990). Baig *et al*. (1980) suggested that better water harvesting and storage techniques could not only lead to sufficient water for humans and their livestock but also for raising nurseries and forages. At present, there are 598 *Tobas* in Cholistan, where the desert dwellers collect and store the rainwater. The secondary source of water is underground which is mostly saline and brackish with the salinity ranging from 368 to 35,000 mg/ml (Baig *et al.,* 1980) of total dissolved solids (TDS). Varying salt levels deem it unfit for human or animal consumption.

The absence of canal system and negligible rainwater recharge makes the aquifers of Cholistan too deep in the ground. Two major aquifers in Cholistan have sweet water but are surrounded by saline water (FAO/ADB, 1993).

LIVESTOCK PRODUCTION AND PASTORAL SYSTEMS

Two livestock production systems prevail under pastoralism in Cholistan *viz.* transhumanie and nomadic. Transhumanie is the largest mass movement of both people and their livestock (Arshad *et al*., 1995). In the rainy monsoon season (July/August), the pastoralists stay in the desert at *Tobas* as the forages are abundant. During the post-monsoon season (October-November), migration occurs to semi-permanent settlements having wells (*Khoo* and *Kund* in local dialect); whereas during spring (March-April) pastorals migrate to the fringes of canal-irrigated areas (Khan, 2009). This system, being highly dependent on timing and quality of rainfall, can be severely disrupted by droughts. The nomadic system, on the other hand, applies to the larger herds of cattle, camels and goats which remain throughout the year in the desert of Lesser or Greater Cholistan. The size of such herds varies from around 4 to 150 animals. Depending on the size of the herds to be left in the desert, one or two members of each household remain behind to look after the herds and an additional herdsman may be hired to assist if the herd is particularly large. The other members of the household follow the normal transhumanie system and return to the irrigated land, taking along one or two camels for transport (Ahmad, 2005b).

Inspite of an uncertain, unpredictable rainfall, low humidity and extremes in temperatures, Cholistan has long been famous for raising different breeds of livestock and contributing a significant share to national milk, meat and wool output (Ali *et al.,* 2009). Cattle, sheep, goats and camels are the predominant types of livestock and the total livestock population in Cholistan is estimated as 12,95462 out of which 5,67510 heads are of cattle (Livestock Census of Pakistan, 2006). Communal ceremonies like weddings, funerals and tribal celebrations include slaughtering and exchange of animals and status of a person in the desert nomadic lifestyle is reflected mainly by the size of herd he maintains (Ahmad, 2005b). The economy and livelihood of nomadic herders, in fact, depends upon livestock and the increase in the livestock population is at the expense of fragile ecosystem (Taj *et al.,* 2006). The only feeding source for the livestock is the patchy vegetative growth, halophytic plants and trees/bushes. The data collected from the Deputy Livestock Office (DLO), and Cholistan Development Authority (CDA), Bahawalpur indicates that the livestock population is on the boom with the progression of years though the vegetation and the resources have depleted.

Red Sindhi and Sahiwal cattle have already found an international fame as being the tropical milk breeds and hefty research work has been done on these breeds. However, Cholistani breed of cattle was a new entry in the Livestock Census of Pakistan in 2006 and research data regarding this breed is very scanty. According to Khan *et al*. (2005), Cholistani cattle are a newly emerged breed which might have originated from the cross of Sahiwal with the local cattle. Some unconfirmed references depict it to be an ancestor of Sahiwal breed. Extensive phylogenetic study coupled with the gene mapping would reveal the true origin of this breed. The last few years have witnessed this fairly ignored breed catching avid attention of the governments and now the developmental/ up gradational work for this breed is under way. The start of the project "Development of Cholistani Cattle Through Provision of Better Animal Services" in the Govt. Livestock Farm (GLF), Jugait Peer, Bahawalpur which is presently harboring 450 heads of fine specimen of Cholistani cattle, is one of the commendable strategy of the government of Pakistan. Phenotypically, Cholistani is a large-sized flabby breed with small horns, long ears, well developed hump in males and large dewlap in both males and females (Fig. 3). Its body is speckled red, black or brown all over with the switch of the tail being black and the elite specimen of Cholistani cows produce 15 to 18 liters of milk daily. The average body weight recorded by the preliminary data from the GLF, Jugait Peer, Bahawalpur varied from 500 to 600 and 300 to 400 Kg in male and female cattle, respectively.

Fig. 3: Elite specimen of Cholistani cow with the milk yield of 15-18 liters per day maintained at the Govt. Livestock Farm, Jugaitpeer, Bahawalpur, Pakistan.

Table 1: Average values of productive and reproductive traits of Cholistani cattle*

Productive traits	Average values	Reproductive traits	Average values
Lactation length (days)	165	Age at maturity (days)	1112
Lactation yield (liters)	1235	Age at first service (days)	1112
Dry period (days)	155	Age at first calving (days)	1390
Service period (days)	121	Gestation period (days)	278
Milk fat (%)	4.8	Calving interval (days)	422

*Recovered from the data collected from Govt. Livestock Farm, Jugaitpeer, Bahawalpur, Pakistan.

PRODUCTIVE AND REPRODUCTIVE POTENTIALS OF CHOLISTANI CATTLE

Cholistani breed of cattle is a zebu (*Bos indicus*) or humped breed of cattle of Indian origin just like other zebu cattle. Although both Zebu and Taurine (*Bos taurus*) cattle originated from the same ancestors named "the extinct aurochs" (*Bos primigenius*), but during various phases of evolution and genetic adaptation the Zebu cattle acquired genes of thermotolerance making them better able to regulate body temperatures than the *Bos taurus* breeds of temperate region (Hammond *et al.*, 1996). Hence, the adverse effects of heat stress for milk and meat production are less for *Bos indicus* than for European *Bos taurus*. The same fact stands for the Cholistani breed of cattle too. Adequate thermo-tolerance and tick-resistance make them able to withstand severe heat stress without much effect on the productive and reproductive performance. Hefty work has been documented on the performance traits of Sahiwal and Red Sindhi breeds of cattle in their respective local climates but studies pertaining to Cholistani cattle in correlation to their tropical desert environment still need to be navigated.

In a pilot study, data on productive and reproductive traits of Cholistani cattle kept at GLF, Jugaitpeer Bahawalpur during the period 2005 to 2009 were recorded. Averages values for the productive traits i.e. lactation length, lactation yield, dry period, wet average, overall average and fat percentage in milk, and reproductive traits i.e. calving interval, age at maturity, gestation period, age at first calving and age at first service are given in Table 1.

Table 2: A comparison of productive and reproductive parameters of Cholistani, Sahiwal and Red Sindhi cattle*

Parameter (days)	Sahiwal[1]	Red Sindhi[2]	Cholistani
Lactation length	260	265	165
Lactation yield (liters)	1529	1350	1235
Dry period	164	230	155
Service period	149	210	121
Age at maturity	1065	-	1112
Age at first service	1065	-	1112
Age at first calving	1350	1350	1390
Gestation period	285	-	278
Calving interval	429	495	422

*Adapted from [1]Zafar *et al.* (2008) and [2]Aslam *et al.* (2002).

The comparative information regarding the average values on productive and reproductive traits depicts that Cholistani cattle are at par with Sahiwal and Red Sindhi breeds (Table 2). However, further elaborated studies under the local climatic conditions need integrated efforts. In addition, marker assisted selection might be useful to select the desirable phenotypes affected by non-additive gene action or epistatic interactions between loci.

Conclusions

Cholistan, though a tropical desert, is a marvelous blend of bio-physical, ecological, socioeconomic and cultural integration. The nomadic pastoralists and their livestock population compel for quick measures to enhance its productivity through livestock up gradation. The Cholistani cow, being an excellent heat tolerant and tick-resistant breed, needs perennial attention of the government, veterinarians and researchers to enhance its socio-economic scope through provision of veterinary health cover, better marketing facilities and training of manpower. Furthermore, the use of gene mapping and marker assisted selection will open up new horizons in the study of its performance traits. This will not only help alleviate the shortage of milk and meat but will also strengthen the socio-economic status of the local community.

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