

Morphological characteristics of native chicken of village Chhajjian, Haripur Pakistan

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ABSTRACT: The present study was conducted to describe the variations in morphological characteristics of different selected populations of indigenous chickens. Five populations of chickens in different (localities) of Chhajjian, KP, Pakistan, were studied based on qualitative traits recorded for a total of 100 chickens. Each of the study populations contains multiple variants of plumage colors and other physical features. The average

flock size was observed to be 38. Predominant plumage color was grayish and other mixtures along with different percentages in different localities. Pea comb was the dominant comb type in all localities. Most of the chickens were yellow skinned. Males in all populations were heavier and taller than the females. This recorded variation in morphological traits will help in the conservation of these chickens.

Key words: indigenous chickens, morphological variation, phenotypic characteristics

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INTRODUCTION

The domestic chicken *Gallus gallus domesticus* first originated in southwestern Asia and was later introduced into China about 1400 B.C. It descended from the red junglefowl. Chickens are also present in Babylonian carvings of about 600 B.C and are mentioned by the Greek writer Aristophanes in 400 B.C. Initially domesticated fowl were reared for different purposes, such as for religious and cultural purposes. Ethiopia was the first country to have indigenous animal migration and livestock population, which are considered gateways to poverty reduction and national food security (Halima et al., 2007). These domesticated taxa were utilized for food, labor, or companionship (Larson et al., 2012). Chickens are important in providing food and also are a source of recreation (Peters et al., 2008; Bett et al., 2011). Indigenous chickens are the best source for food (Tadelle et al., 2003) and provide cheap and easily harvestable white meat rich in protein (Nath et al., 2012; Peter, 2008). Poultry is considered a gateway to

national food security and the “entry point of poverty reduction” because it can elevate living standards and community bonds and can supply nutritional supplements to urban communities (Gueye, 2009). In South Africa, indigenous chickens are a major component of the rural household, providing a source of food and income and also strengthening social relationships (Munisi 2015). Most African families will keep 5 to 20 indigenous birds for eggs and meat production. South African indigenous chickens provide meat (89.8%) and eggs (64.2%) (Mtileni et al., 2009). In Uganda, the chickens are kept mainly for home consumption (36%), cash (33%), ceremonies (16%), and gifts (13%) (Habte et al., 2013). Ethiopia had about 49.3 million chickens, of which 97.3, 0.38, and 2.32% were indigenous, hybrid, and exotic breeds, respectively. In Ethiopia, about 75% of respondents selected farming as a source of providing food for family (Mengesha et al., 2008). In South East Asian countries, rural families have maintained poultry as a backyard practice for centuries, using foraging chickens (Mengesha et al., 2008). In Nigeria, 80% of indigenous chickens were found to be contributing in annual egg and meat production, about 90% for the sale and for meat use (Fayeye et al., 2005). Tanzania is gifted with a rich poultry genetic resource conquered by the free-ranging local domestic fowl. The free-ranging local domestic fowl is a pool of various genetic resources, which is reserved in the rural areas of the

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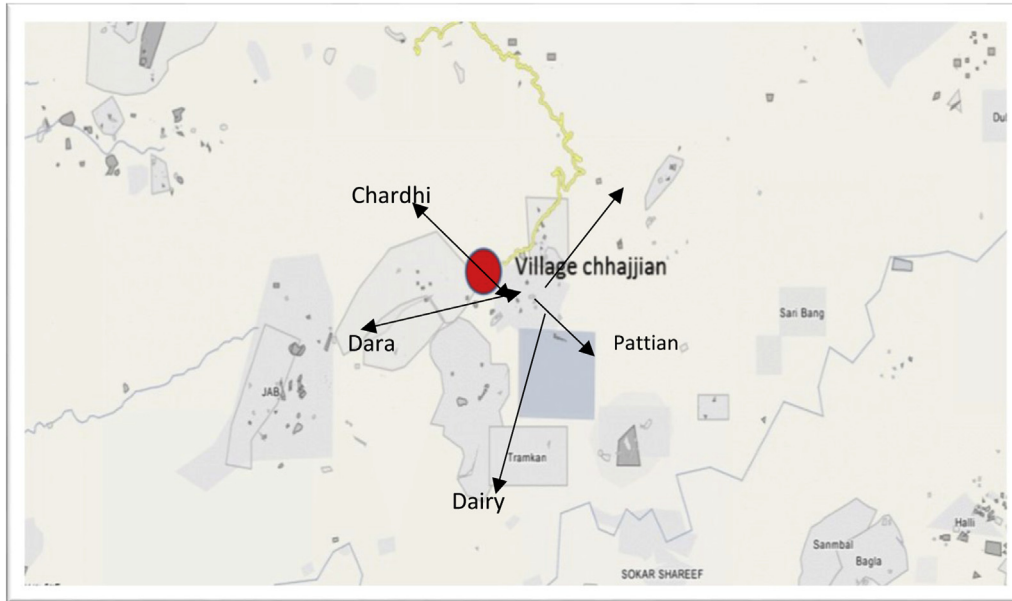


Figure 1. Map of village Chhajjian.

developing world (Msoffe et al., 2005). The flock size in rural Africa is 3-65 (Kitalyi, 1998), in South America 10-30, and in Asia 5-20 (Fasina et al., 2007). Almost all the rural families keep a small flock of scavenging chickens. Indigenous chickens are an essential element in diversifying cultivation production and food, so consumers prefer them because of their taste, compactness, and aptness for dishes (Mtileni et al., 2009). Thai indigenous chicken is one of the important chickens that are produced for consumption. In Thailand, indigenous chickens make up almost 20 to 25% of total chicken production. Indigenous chickens comprise 86% of total animal production in all parts of Thailand (Wattanachant,

2008). Domestic chickens essentially contribute to human nutrition, play a crucial role in vital and applied research, and provide an enjoyable source of human entertainment and free-time activities (Delany, 1998). In Chad, pure black and white chickens are favored for religious services, whereas in Mozambique, chickens with curled feathers are popular with traditional healers. O Shamo (Japanese large game) are well known in Japan for having delicious meat. In contrast to the benefit in meat volume and quality, the rate of egg production in this breed is very low (Deeb and Lamont, 2002). Village chickens are generally birds of indigenous breeds living in almost symbiotic relationship with human communities.



Figure 2. The hatched chicks and chickens.

Table 1. Percentage of plumage colors of all indigenous chickens from localities in village.

Plumage Color	Locality	Yellow	Green	Red	White	Black	Others
	Chhajjian Khas	3.2	36.8	6.8	2.1	25.3	Grayish mixture 32.6%
	Ghumawan	4.6	34.5	32	9.33	5.33	Multicolor 65.7% (male) 65.70% (female)
	Saral	14.5	10.4	3.1	6.8	38.7	Grayish (17.3%)
	Jab	16.7	35.6	5.1	34.5	27.9	Dark brown plumage (27.9%) Wheaten (19.1%), Reddish Brown with white and black mottling (25%).
	Sanjiala	3.1	24.6	28.5	35.6	33.6	Barred (55%)

In Bangladesh, about 89% of the rural households keep chickens, with an average flock size of 5.33 per holding under backyard foraging system (Kanginakudru et al., 2008). In India, Livestock industry is an important component of economy; India has enormous population of poultry, out of which around 25% of the total poultry population was native chicken (Vetrivel and Chandrakumarmangalam, 2013). In India, 72.22% of the population lives in urban areas, and 89% of urban livestock householders raise native poultry as an important additional source of cash income. Meat from native chickens in India is favored by people because of its taste, leanness, and coloring (Kumaresan et al., 2008). In scavenging systems, mostly indigenous breeds of chickens are kept (Badubi et al., 2006). In Pakistan, rural and commercial chickens have been playing a vital role in connecting the gap between daily requirement and supply of animal protein. *Aseel* chickens are well known for their excellent meat-producing qualities and are among the ancestors of the White Cornish (Babar et al., 2012). Although many researchers described *Aseel* as a reduced egg producer *Aseel* has been traditionally bred for its meat. Of the live birds that hatch and survive, 60 to 70% are sold, 15 to 20% are consumed at home, and the remaining 10 to 15% are kept as breeding stock to increase the flock. *Aseel* meat is highly valued by rural and urban dwellers, rich and poor alike, with prices per kg live weight being 50 to 100% higher than that of the broilers because of its superior taste and texture. Indigenous chickens play many socioeconomic roles in traditional religious and other customs and are a source of animal protein (McCain, 2005). Village chickens also contribute to the cultural and social life of farmers (Mapiye et al., 2008). South African chickens play important socioeconomic roles in urban populations (Mtileni et al., 2009). In Chad, pure black and white chickens are favored for religious ceremonies. Special clothes such as skirts, pillows, and hats are created

from chicken feathers for use in traditional ceremonies (Nematollahzadeh et al., 2011). The major threats to the village's indigenous chickens are haphazard cross-breeding and breed replacement, changes of production, and destruction of the environment (Egahi et al., 2010; Cabarles et al., 2012). Therefore, characterization of these valuable indigenous animal resources using genetic and phenotypic methods for the purpose of conservation has become very crucial. In the present study, morphological characteristics of indigenous Chickens in the villages of Chhajjian were investigated.

MATERIALS AND METHODS

Study Sites

The study was conducted in Chhajjian, a valley in the Haripur District in the Khyber Pakhtunkhwa province of Pakistan. It is located in the southeast of the Haripur District at 33.88522°N 73.038054°E. It is surrounded by mountains covered with pine trees and rich in wildlife. Rainfall is much higher than in most other parts of the district. This study was conducted in 5 different localities in the villages of Chhajjian, Chhajjian Khas, Ghumawan, Saral, Jab, and Sanjiala.

Sampling

For the purpose of sampling, a structured questionnaire (Supplementary Material 1) was distributed to 200 households from the 5 localities, 50 for each locality (Figure 1). Data for the physical examinations included 1,000 chickens that covered pattern and color of plumage, shank length, skin color, comb color, and type. Questionnaire about phenotypic characterization was supported by group discussions among villagers and also by direct observation at my own house in the village.

Structure and Flock Size

The flock size was estimated from each house by asking and visiting the houses one by one.

Morphological Characteristics

Morphological traits were examined by survey and direct examination.

Table 2. The localities having the number of selected households and the range of birds kept in each household in 5 localities.

Locality/district	Number of HH	Range (birds)
Chhajjian Khas	40	4-32
Ghumawan	40	6-30
Saral	40	2-28
Jab	40	9-26
Sanjiala	40	3-36

Abbreviation: HH, house holders from whom data collected.

Table 3. Percentage comb and earlobe colors of indigenous chickens from different localities.

Comb color	Black	Red	White	Pale	Others
Chhajjian khas	-	100	-	-	-
Ghummawan	6.3	-	1.1	-	Red others 92.6
Saral	-	100	-	-	-
Jab	-	0.485	-	0.511	-

Earlobe color	Yellow	Red	White	Pink	Orange	Red other
Chhajjian Khas	-	-	13.7	14.7	-	71.6
Ghummawan	-	100	-	-	-	-
Saral	-	73.5	-	-	16.5	-
Jab	-	78.4	3.9	-	-	17.7
Sanjiala	-	81.5	18.5	-	-	-

RESULTS

Structure and Flock Size

The flock size estimated from each house was different at different localities and was not significantly different in each locality: 4-32 in Chhajjian Khas, 6-30 in Ghummawan, 2-28 in Saral, Jab 9-26, Sanjiala 3-36.

Management of Flock

It was recorded that mostly one large wooden cage was used for keeping the chickens, and a small wooden box (in local language, Khara) was used for the young hatched chicks, along with their mother, because they are not able to forage and have not reached a suitable size (Figure 2). This small wooden box is usually used mostly at night to protect them from attacks from predators, mostly dogs, hawks, cats, and crows. But it is difficult to get back chickens in their wooden farm so most of the chickens were found perched in the tree branches at night in every season of the year from hot summer to extreme winter, sometimes even in snowy conditions. They are mostly fed grains in the early morning, along with pieces of bread, and in the evening with corn or wheat grains. They spend the day feeding in the nearby farms. Most chicken's population was of hens, usually 2-3 or 4 roosters. They lay eggs on the husk of the wheat that is used for the cattle, and they lay eggs in the side of the nearby fields. Chicken were found to be scavengers for a variety of feed stuffs that included cereals, weeds,

seeds, insects, worms, and various herbs. Some farmers usually supplement their chickens' diets with whole cereals once every morning.

Morphological Characteristics

Different color patterns and sizes were found; there was no discrimination in their names—there were only 2 names mostly used golden chickens and Desi Murghi called by the local villagers. Golden chickens were found to be good at egg laying, and mostly they were brighter than Desi Murghi. The chicks when hatched were of the same yellowish color, but as they grew and reached the age of 3 mo, they were found to have different colors. Most of the chickens contained or inherited the color patterns of the rooster.

Plumage Color

There are differences in percentages of colors in chickens found in different localities. The highest percentage of yellow was found in Jab; the highest percentage of green was found in Chhajjian Khas (36.8%). The percentage of red was highest in Ghummawan (32%), and the percentage of white was highest in Sanjiala (35.6%). Other than these single colors, some mixed colors were in highest percentages in chickens in different localities multicolored patterns were observed, in Ghummawan 65.7% (male) 65.70% (female; Table 1).

Comb Type

The highest percentage of pea comb type was found in Chhajjian Khas. The highest percentage of cushion type was found in Ghummawan. Single comb type was observed in Saral in 92.5%. Rose comb type in Jab was highest having 49.02% other comb types also observed such as brown gray barred in 2 other localities as shown in Tables 2 and 3.

Shank and Skin Colors

Different colors of shank were observed, such as black, bluish-black, yellow, and others, but the highest percentage observed in all the localities was yellow.

Table 4. Percentage of shank and skin color of indigenous chickens from various localities.

Shank color	Black	Bluish black	Pink	Green	Yellow	Others
Chhajjian Khas	7	16.3	-	8.5	33.3	Gray (19) white (15)
Ghummawan	3.9	4.9	-	10.78	46.1	-
Saral	38.9	3.5	-	-	24.5	Blue (18.7), White (17.9)
Jab	-	40.3	-	-	30.5	-
Sanjiala	-	29.2	-	-	40.3	-

Skin color	White	Red	Black	Yellow	others
Chhajjian khas	66.7	-	-	33.3	Bluish white (20.5)
Ghummawan	0.7	-	-	40.5	-
Saral	66	8.7	0.7	24.7	-
Jab	-	-	-	40.3	Whitish
Sanjiala	0.4	-	0.02	50.5	-

In case of skin color, the white and yellow type skin color was found to be very common in all the localities, as shown in Table 4.

DISCUSSION

The findings of this study indicate unassertive variations in colors (plumage, earlobe, and comb), comb types, skin color, and shank color both among and within chicken breeds. These variations in the native chicken populations across the 5 different localities in KPK Pakistan were examined. Various plumage colors were observed in the study. These findings are in agreement with previous studies in Africa (Melesse and Negesse, 2011). Indigenous chickens anatomically have diverse plumage colors that aid in camouflage against predators (Duguma, 2006b). These findings are in accordance with the study by Tsudzuki et al. (2007). Sarker et al. (2012) found earliest in the ancestral chickens of these chickens mentioned that *Aseel* has no fixed plumage color, whereas plumage color has a significant effect on egg production (Jahan, 2013), and the genes that affect plumage color also affect shank color (Round et al., 1990). Daikwo et al. (2011) reported that the single comb followed by the pea and rose comb, respectively, were the most common types in a population of Nigerian chickens. Mammo et al. (2008) revealed that morphological appearances, particularly plumage color and comb type, are significantly important for price variation of the marketable birds of various chicken ecotypes. A similar trend was observed by Gering et al. (2015), Duguma (2006a), and Faruque et al. (2010). Owing to unmarked vascularization of the cutaneous tissues, most chickens have red earlobes (Smyth Jr, 1990). These findings are similar to those of Duguma (2006a), Dana et al. (2010), and Daikwo et al. (2011), who observed predominantly yellow shanks in indigenous chickens. Literature showed that yellow skin color was inherited from gray junglefowl *Gallus gallus sonneratti* and Ceylon junglefowl *Gallus gallus lafayetti*, which crossbreed with red junglefowl *Gallus gallus* (Cabarles et al., 2012). Socioeconomically, these chickens are very important from a traditional, religious, and cultural point of view in South Africa (Alemayehu et al., 2018). Chickens, being a staple food, have a great importance in Pakistan and play a significant role into the overall gross domestic products of the country. Village chickens also play a vital role in the cultural and social life of smallholder farmers (Altieri et al., 2012). Chicken feathers are valuable in making special clothes, such as pillow, hats, and skirts that are used in traditional ceremonies (Orchardson-Mazrui, 1998). The major threats to the village flock size in the region vary between seasons and are mainly the occurrence of diseases, the presence of predators, as well as the economic status of the owners. As it is commonly observed in large animals, variations in plumage colors across regions were found, which might be due to geographical isolation as well as periods of natural and to some extent, artificial selection. Furthermore, these variations could be due to limited

exchange or transport of local chickens over long distances. Chickens and their products are mostly sold in the nearby markets for household consumption purposes.

CONCLUSION

Across the selected localities in general, grayish mixture is the most dominant plumage color, red being the most common comb and earlobe color. Single combs was predominant comb type for further studies key information found to be a useful. No such type of work has been carried out before, so this data may be helpful in identifying distinct phenotypic characteristics of indigenous chickens. We concluded that the indigenous chickens are the important source of genetic and phenotypic diversity; efforts are needed to conserve the genetic resources of these Chickens.

Comprehensive knowledge of population stratification and the distribution of phenotypic variability in indigenous chickens are important factors when considering conservation measures with the aim of maintaining sufficient phenotypic diversity within a species for future generations.

Common predators are dogs, cats, snakes, eagles, hawks, and thieves. Predation can be overcome by close monitoring of village chickens during scavenging periods and caring for them in proper houses during the night. Hunting, trapping, or poisoning of predators can also reduce predation levels. Chicks are the most susceptible; there are chick mortalities of up to 60% (Muchadeyi et al., 2005). Farmers are encouraged to provide extra care for their chicks by using a hay-box brooder, which is made by local people to reduce chick mortality. Pullets and cockerels consist the broken group because they provide a chance for cash and food security through sales and consumption (Muchadeyi et al., 2005). The death rate of chicks was higher in the village chicken production system, and based on the prevalent market values, chick death accounted for 3 times the value of the losses in adult birds. In adult birds, losses due to wildcats, foxes, and stealing were as serious as losses due to disease.

DISCLOSURES

No conflict of interest.

SUPPLEMENTARY DATA

Supplementary data associated with this article can be found in the online version at <https://doi.org/10.1016/j.psj.2020.11.022>.

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