

PHENOTYPIC CHARACTERIZATION OF NATIVE CHICKEN IN PALAWAN, PHILIPPINES

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ABSTRACT

Three hundred and one native chickens, consisting of 199 hens and 102 roosters, from three regions of Palawan were randomly sampled to describe the morphological characteristics and measure the morphometric characteristics of native chickens in Palawan, Philippines. Results showed variations in the morphological characteristics of native chickens in Palawan. However, it is noted that Palawan native chickens were predominantly of yellow shanks, white skin, red earlobes and red plumage pattern. Comb was mostly of the single type in hens while roosters showed rose comb type. Body length, shank length and wingspan were not significantly different among native hens and among native roosters in the three regions of Palawan. On the other hand, chest circumference of hens and roosters in the southern region was significantly larger than those in the northern and central regions of Palawan.

Keywords: native chicken, Palawan, phenotype

INTRODUCTION

Phenotypic characterization is the process of identifying distinct breed populations and describing their characteristics and those of their production environments. It has a “primary” characterization phase which involves a single visit to the field to gather measurements of the animals’ morphological features, interviews with raisers and identification of some aspects of the production environment and an “advanced” characterization phase which requires repeated visits to measure productive and adaptive capacities of breeds in specified production environments (FAO, 2012).

In the Philippines, some information are available on the phenotypic characteristics (Avante, 1989; Gerona, 1991; TLRI, 1991; Lambio and Gay, 1993; Bondoc, 1998; Lambio *et al.*, 1998), molecular characteristics (Lambio *et al.*, 1991; Roxas *et al.*, 1996; Lambio and Barrion, 1998) and production environment (Oñate,

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1991; Roxas *et al.*, 1996; Magpantay *et al.*, 2006; Celestino, 2010) of native chickens and those belonging to certain genotypic groups of Philippine native chickens, but there is limited information regarding their characteristics in the field and geographical distribution. Included in this genetic group of Philippine native chickens is the Paraoakan which is identified to be predominant in the province of Palawan, Philippines (TLRI, 1991; Roxas *et al.*, 1996; Lambio and Barrion, 1998). However, there are no studies dealing with the production environment and phenotypic characteristics of native chickens in Palawan.

This present study, a primary level phenotypic characterization activity, was carried out in Palawan in order to document the actual phenotypic characteristics of native chickens in the field with considerations on the characteristics describing Paraoakan. It is in line with the goals of the Philippine Native Animal Development program (PNAD; DA Admin. Order # 15 Series 2010) in documenting the characteristics of the native animals of the Philippines with the ultimate purpose of finding novel breeds and, if possible, to register these breeds. Molecular characterization that could be correlated to the phenotypic characteristics was not carried out. The study describes the morphological characteristics and determines the morphometric measurements of native chickens in Palawan, Philippines.

METHODOLOGY

Sampling procedure

The province of Palawan was divided into three regions - northern, central and southern. This division is in consideration with the phenotypic and genotypic variations that could exist among indigenous breeds (Nei, 1975) given the geographical separations brought about by distance, mountain range and accessibility in going to and fro one municipality to another (Rendel, 1976). There are no known studies describing the management, climatic pattern and feed resources of chicken in northern, central and southern regions of Palawan.

Probability proportionate sampling was done in determining the three municipalities, the three barangays per municipality and the four raisers per barangay who raise the native chickens used in the study. Probability proportionate sampling in this study means the number of chicken inventory in a municipality or a barangay corresponded to the number of chances where the municipality or the barangay could be drawn. This gave higher chances for the municipalities with greater number of chicken inventories to be drawn.

Sampling of native chickens

A total of 301 heads of native chickens, 199 hens and 102 roosters were randomly caught from all of the chickens raised by the respondents during the actual conduct of the phenotypic identification and body measurements. The number of samples follows the common rooster to hen mating ratio of 1:2.4 (Magpantay *et al.*, 2006) to 1:5.67 (Lingaya *et al.*, 2007) among native chickens raised in the Philippines. It also follows the recommended representative set of adult animals for poultry, *i.e.* 10-30 males and 100-300 females (FAO, 2012).

Phenotypic characterization

Morphological characteristics and morphometric measurements of the birds were based on the FAO Animal Production and Health Guidelines No. 11: Phenotypic Characterization of Animal Genetic Resources (FAO, 2012). Morphological characteristics include feathering characteristics covering only plumage pattern, while skin characteristics considered skin color, shank color, comb type and earlobe color.

The quantitative body measurements, including body length, shank length, wingspan and chest circumference, were obtained as follows:

- *Body length*. Taken when the bird's body is completely drawn throughout its length from the tip of the beak to that of the base of the tail.
- *Shank length*. Measured from the hock joint to the spur of either leg.
- *Wing span*. Taken between the tips of the right and left wings after both are stretched out in full.
- *Chest circumference*. Taken at the tip of the pectus.

Data analysis

Data on morphological characteristics were tabulated according to the three regions and were analysed in terms of frequency and percentages. The distributions of the observed frequencies from these qualitative traits were analyzed using Chi-square statistics. Body measurements were subjected to one-way analysis of variance using the MINITAB Release 14 Statistical Software.

RESULTS AND DISCUSSION

Morphological characteristics

Shank color

The female native chickens in Palawan were found to have predominantly yellow shanks, followed by white shanks and green shanks (Table 1). Generally, yellow shanks were largely observed among the roosters in the whole province. Bluish-black shank color was observed only in roosters in central and northern regions of Palawan. Computed chi-square statistics of hens and roosters indicate that the proportions significantly deviate from the expected equal distribution of the shank color among native chickens in Palawan.

Yellow shanks were predominant in the roosters in the southern and central regions. Roosters with white shanks were more abundant in the northern region. Chi-square statistics show that such distribution of shank color among roosters differ in the different regions. This predominance could indicate that more of the roosters resemble the shank of Paraoakan which are described to have yellow shanks (TLRI, 1991). It is a common knowledge in the province that Paraoakan is raised more in southern Palawan where it is utilized for a cultural cockfight called "*tampor*" by the locals. Results of the study suggest that its presence influence the inheritance of the yellow shank color among the roosters in the region.

In contrast with the findings of Roxas *et al.* (1996) and Oñate (1991), five shank colors were identified in Palawan which include yellow, white, green, black

Table 1. Proportion of hens and roosters according to shank, skin and earlobe colors and comb type, by region in Palawan, 2011.

	Southern Palawan		Central Palawan		Northern Palawan		Whole province	
	n=70 Hen %	n=34 Rooster %	n=60 Hen %	n=35 Rooster %	n=69 Hen %	n=33 Rooster %	n=199 Hen %	n=102 Rooster %
Shank color								
Black	5.71	2.94	8.33	5.71	7.25	3.03	7.04	3.92
Bluish black	0.00	0.00	13.33	5.71	14.49	9.09	9.05	4.90
Green	31.43	14.71	13.33	5.71	21.74	12.12	22.61	10.78
White	24.29	26.47	16.67	22.86	21.74	54.55	21.11	34.31
Yellow	38.57	55.88	48.33	60.00	34.78	21.21	40.20	46.08
Skin color								
White	77.14	76.47	48.33	54.29	68.12	69.70	65.33	66.67
Yellow	22.86	23.53	51.67	45.71	31.88	30.30	34.67	33.33
Earlobe color								
Red	71.43	91.18	71.67	74.29	71.01	69.70	71.36	78.43
White	18.57	2.94	11.67	8.57	11.59	0.00	14.07	3.92
Red and White	10.00	5.88	13.33	17.14	17.39	30.30	13.57	17.65
Red and Black	0.00	0.00	3.33	0.00	0.00	0.00	1.01	0.00
Comb type								
Pea	50.00	17.65	28.33	8.57	31.88	0.00	37.19	8.82
Rose	18.57	73.53	10.00	48.57	5.80	24.24	11.56	49.02
Single	31.43	8.82	61.67	42.86	62.32	75.76	51.26	42.16

and bluish-black. Roxas *et al.* (1996) observed eight shank colors in the whole country while the shank colors of native chickens in the province of Camarines Sur were found to be either yellow, black or white (Oñate, 1991). The present findings are in contrast with the predominant white shanks among the native chickens in Bangladesh (Faruque *et al.*, 2010), black shanks among the Vietnamese H'mong chickens (Cuc *et al.*, 2006) and predominant black and white shanks in Nigeria (Egahi *et al.*, 2010) but are similar to the findings of Duguma (2006) and Dana *et al.* (2010) in Ethiopia and Daikwo *et al.* (2011) in Dekina, Nigeria, who observed predominantly yellow shanks among indigenous chickens.

Skin color

White and yellow skin colors were observed among the native hens and roosters in Palawan. White skin color was observed in the majority of the hens in the

southern and northern regions. Similarly, white skin phenotype was predominant among the roosters in the southern region. Computed chi-square values indicate that more native hens and roosters in the southern region resemble the white skin phenotype that is characteristic of Paraokan than the hens and roosters found in the central and northern regions. In addition, there was equal distribution of white and yellow skin color among hens and roosters in the central region and roosters in the northern region

Results of this study are in contrast with the findings of Dana *et al.* (2010) but agree with the findings of Roxas *et al.* (1996) where white skin color was predominant among the native chicken in the Philippines. Likewise, two skin colors, white and yellow, were noted among the native chickens in the country.

Earlobe color

Four earlobe colors, namely, red, white, red and white, and red and black, were observed. All four earlobe colors were observed only in hens from the central region. On the other hand, red, white and red and white were seen in hens and roosters in the southern and northern regions of Palawan. In general, the red color was dominant, followed by red and white, and white. Chi-square values reveal that the distribution among the earlobe colors of the hens and roosters in the different regions also significantly deviates from the expected equal distribution. This finding disagrees with the observations of Roxas *et al.* (1996), Faruque *et al.* (2010) and Egahi *et al.* (2010) where white color is abundant among the native chickens.

Smyth (1990) reported that most breeds of chickens have red earlobes due to the unmasked vascularization of the cutaneous tissues. Likewise, the presence of Paraokan could possibly result to more roosters with red earlobes in Palawan, contrary to the dominant white earlobes among roosters generally found in the Philippines.

Comb type

Three comb types were observed among native hens and roosters in the three regions of Palawan. Single comb type was found to be dominant among the hens in the central and northern regions. On the other hand, pea comb type was more dominant among the hens in the southern region. Only few hens were observed to have rose comb in the three regions. Chi-square values reveal that the distribution of comb type among hens in the different regions as well as in the whole province deviates from the equal distribution.

Among the roosters, rose comb was observed to be the predominant comb type in the southern and central regions. Single comb type also prevailed among the roosters in northern region. The distribution of comb types among roosters in the southern, central and northern regions significantly deviates from the equal distribution. This is in conformity with the results obtained in the Paraokan roosters obtained in previous studies (TLRI, 1991; Lambio, 2000).

Oñate (1991) and Roxas *et al.* (1996) observed that single comb type prevailed over the other comb types, rose and pea combs, in native chickens found in the Philippines. Similarly, the native chicken in Bangladesh (Faruque *et al.*, 2010) and Nigeria (Egahi *et al.*, 2010) has single comb type.

Plumage pattern

Six plumage patterns were observed among the native chickens: barred, laced, mottled, pencilled, plain and speckled (Table 2). Plain red plumage pattern was the most popular among native chickens in Palawan, both in hens and roosters. This plumage pattern is characterized by the dominance of red plumage color in the body of the chicken. Other plumage colors were occasionally present and were mixed with the dominant plumage color but were not enough to cause major changes in the dominant red plumage color. The distribution of plumage pattern among hens and roosters in the whole province and in the different regions departs from the expected equal distribution.

Pencilled plumage pattern was seen only in hens. Likewise, mottled plumage pattern was only seen among roosters from the southern region. Laced and speckled plumage patterns in hens were observed only from hens in the central and northern regions but was seen among roosters in all three regions.

Table 2. Proportion of hens and roosters according to plumage pattern, by region in Palawan, 2011.

Plumage pattern	Southern Palawan		Central Palawan		Northern Palawan		Whole province	
	n=70 Hen %	n=34 Rooster %	n=60 Hen %	n=35 Rooster %	n=69 Hen %	n=33 Rooster %	n=199 Hen %	n=102 Rooster %
Barred	5.71	14.71	13.33	25.71	14.49	29.03	11.06	23.00
Laced	0.00	17.65	5.00	22.86	4.35	6.45	3.02	16.00
Mottled	10.00	5.88	3.33	0.00	5.80	0.00	6.53	2.00
Pencilled	10.00	0.00	6.67	0.00	7.25	0.00	8.04	0.00
Plain	74.29	61.76	66.67	45.71	66.67	58.06	69.35	55.00
Speckled	0.00	0.00	5.00	5.71	1.45	6.45	2.01	4.00

Barred plumage pattern occurs when there is an alternate barring of two or three plumage colors. It is usually characterized by the alternate barring of black, grey and white plumage color, locally known as "*bulik*". Another barred plumage pattern observed in native chickens is the alternate barring of black, red and white plumage color. However, there are other plumage colors that are alternately barring. Local raisers have vernacular terms for these barring patterns. In this study, plain reddish-black plumage pattern was seen only among the roosters in the southern and central regions. This is the plumage pattern that was characteristic of Paroakan roosters. Undoubtedly, results suggest strong support to the presence of Paroakan mostly in the southern and in central regions.

Other characteristics

Some phenotypic characteristics were also observed in a very small number of native chickens in Palawan which include frizzled feathers, crested chickens, bearded chickens, rumpless chickens, hens with spur and multiple toed chickens.

Quantitative body measurements

The average body measurements of native hens and roosters in the three regions of Palawan are presented in Table 3. Data showed that hens and roosters in the southern region appeared to have longer body than the hens and roosters in the central and northern regions. However, these differences were not significant

Table 3. Average body measurements of hens and roosters, by region, Palawan in 2011.

Parameters	Region	Mean	SD	Minimum	Maximum
Hens					
Body length ^{ns}	Central	41.23	3.04	32.00	47.50
	Northern	40.79	2.59	33.50	45.50
	Southern	41.76	3.40	32.50	49.00
Wingspan ^{ns}	Central	41.18	5.55	4.00	48.00
	Northern	41.17	2.60	33.50	46.00
	Southern	41.05	2.92	34.00	47.00
Shank length ^{ns}	Central	6.01	0.59	4.50	7.50
	Northern	6.12	0.56	4.50	7.50
	Southern	6.27	0.52	5.00	7.50
Chest circumference*	Central	12.95 ^b	1.42	10.00	16.00
	Northern	13.28 ^b	1.73	10.00	18.00
	Southern	14.87 ^a	1.62	11.00	18.50
Roosters					
Body length ^{ns}	Central	45.53	3.74	37.00	53.00
	Northern	45.49	3.48	38.50	50.50
	Southern	46.56	3.84	37.50	55.00
Wingspan ^{ns}	Central	47.68	4.37	39.00	58.50
	Northern	46.17	4.33	39.00	54.00
	Southern	46.40	4.38	35.00	55.00
Shank Length ^{ns}	Central	7.22	0.91	5.00	9.00
	Northern	7.44	2.29	5.50	9.50
	Southern	7.69	0.78	6.00	9.00
Chest circumference*	Central	14.56 ^b	1.60	11.00	17.00
	Northern	14.76 ^b	2.02	8.00	19.50
	Southern	16.46 ^a	2.30	12.00	22.50

*Means with different superscripts within the same parameter are different (P<0.05).

($P>0.05$). The shortest wingspan was noted among hens in northern Palawan while the longest wingspan was noted in the roosters in central Palawan. However, the differences in the length of wingspan among roosters and among hens were insignificant ($P>0.05$).

The shank lengths of hens were comparable to some of the indigenous hens of Ethiopia but the roosters have shorter shank compared to indigenous roosters of Ethiopia (Duguma, 2006; Dana *et al.*, 2010). Shanks of roosters and hens in the southern region were relatively longer than the shanks of the roosters and hens from the central and northern regions. Although the difference was insignificant ($P>0.05$), it can possibly be an indication that the bloodlines of Paraoakan, which has long and powerful shanks (TLRI, 1991; Lambio, 2000) has infused in more chickens in the southern regions than in the central and northern regions.

Hens and roosters in the southern region have larger chest circumference than those in the central and northern regions ($P<0.05$). This could indicate the possible infusion of Paraoakan bloodlines and genetic potentials among the native chickens in the southern region. Paraoakan is the biggest among the genetic groups of native chickens identified in the Philippines. It is also an indication that environmental conditions in this part of the province favor the expression of genes that produces larger chest circumference.

It is evident that the body measurements of the hens are generally smaller than that of the roosters in all four body measurements. This can be attributed to the fact that the body built of roosters, or any males in general, are suited for muscle building. On the other hand, the body of hens are built for reproduction. There is a negative correlation between body size and egg production.

The results of the present study show that there is variation in the morphological characteristics of the native chicken in Palawan.

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