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Phenotypic Characterization of Native Chicken Ecotypes in Lower Northern, Thailand

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Introduction

Thai native chickens have been originated from four types of South East Asia jungle fowls. They are Red jungle fowls, Ceylon jungle fowls, Grey jungle fowls and Green jungle fowls (Sawai et al., 2010). Naturally, native chickens are not enclosure by housing but they are let free grazing around trees and the space under farmer's house. Thus, the native chicken development is depending much on the nature and their owner's life styles. Their death usually caused by natural disaster and infectious diseases but those stronger can survive to reproduce and increase number of their population. The process of natural selection in Thai native chickens continues until today. For this reason, raising the native chickens is categorized as one of the cultural heritages of local people and also one of variety biotechnologies that fit the living style of farmers in rural areas in Thailand. Living in harmony among native chickens, farmers are in multi-relationship and need to cooperate with each other. (H.R.H. Princess Maha Chakri Sirindhorn and H.I.H. Prince Akishinonomiya Fumihito, 2009). During period from 2005 to 2007, bird flu was spread all over the world and Phitsanulok was not an exception. The high mortality rate native chickens influenced strongly both of quantitative and qualitative characteristics of the native chickens (Duangjinda et al., 2012) as well as to income of farmers in the regions. The basic characters of certain breeds have been developed and might have been improved continuously. Biological diversity has been discovered afterwards. Those external factors could lead to the changes of native chickens characters, which exposed through phenotypes from older generation to new generation. All the information about phenotypic characterization of native chickens could be helpful to conservation, development of native chickens as well as planning and supporting to chicken farmers in the region. It will be more meaningful in future when especially ASEAN Economic Community is developing.

Materials and Methods

The study was conducted in Bang Rakam, Mueang, Wang Thong, Bang Krathum and Phrom Phiram Districts of Phitsanulok Province, Thailand. A total of 440 native chicken populations were collected from August 2013 to November 2015. The adult chickens were characterized under field conditions for phenotypic characterization traits following FAO standard descriptors (FAO, 2012). The phenotypic characters studied were classified into qualitative and quantitative traits; 7 qualitative traits namely comb type (Hin, Single, Wong-duan, Bae, Ghog-chaba, Pea, Strawberry, Cushion, and Walnut comb), plumage neck colour, plumage back colour were defined as golden-yellow, partridge, grey, cuckoo, red, white, black, and orange, long curving tails colour (partridge, grey, cuckoo, white, and black), back tails colour (partridge, grey, cuckoo, white, black, and orange), plumage wing colour (golden-yellow, partridge, dark green, grey, cuckoo, red, white, black, and orange) and shank colour (yellow, white, black, green, and grey) of native chicken, and 5 quantitative traits; body weight (kg), body height (cm), body length (cm), wing length (cm) and shank length (cm) of native chicken. Factor in this study was 5 districts ecotypes (Bang Rakam, Mueang, Wang Thong, Bang Krathum and Phrom Phiram) of Phitsanulok province.

The dataset was analysed in order to determine factors affecting body weight, body height, body length, wing length and shank length of native chicken. All considered factors (Bang Rakam, Mueang, Wang Thong, Bang Krathum and Phrom Phiram Districts) were tested for their effect on the variation of the studied traits using GLM procedures in SAS software (SAS, 2004). Least square means of the studied traits were estimated by the considering factors, and then were compared using a t-test in all model except for comb type, plumage neck colour, plumage back colour, long tails colour, back tails colour, plumage wing colour and shank colour of native chicken, which used a chi-square test, at an a = 0.05.

Results and discussion

Results of qualitative phenotypic characteristics of native chicken (comb type, plumage neck colour, plumage back colour, long curving tails colour, back tails colour, plumage wing colour and shank colour) showed significant differences among the 5 districts ecotypes ($p<0.0001$; Table 1). Native chickens in 5 districts ecotypes had the

highest Hin comb (58.17%) followed with Pea comb (8.66%), Wong-duan (8.17%), Ghog-chaba (6.68%), Strawberry (5.45%), single (4.46%), Bae (3.71%), Cushion (2.72%), and Walnut comb (1.98%). The shank colour had the highest yellow (39.94%) followed by white (39.04%), grey (10.81%), green (6.31%), and back (3.90%), respectively. These resulted were in agreement with the study of Punrapee et al. (2000a; 200b); Suphawadee (2014) and Nguyen Hoang Thinh et al. (2015) who found that Hin comb and yellow shank had the highest. Moreover, diversity of comb in male native chickens known by the popularity of location. There are 11 types of comb in Pichit Province such as Hin, Au, Ja or Jak, Bye Sree, Tum, Teo, Bae, Dhog-GonKai, Dhog-Ghaba, Wong-duan, and Nok-Takrum (Punrapee, et al., 2000a).

According to results of neck plumage colour, partridge was the highest (35.54%) followed by golden-yellow (18.22%), cuckoo (9.79%), black (9.34%), red (8.20%), orange (7.97%), grey (6.15%), and white colour was the lowest (4.78%). Similarly in back plumage colour, partridge took majority with 37.95%, followed by golden-yellow (17.73%), cuckoo (12.05%), red (11.14%), black (7.95%), grey (5.68%), orange (4.55%), and white colour (2.95%). Long curving tails colour had the highest partridge (39.24%) followed by black (17.73%), white (12.05%), cuckoo (5.20%), and grey colour (2.36%). However, black colour was the highest ratio for back tails colour with 40.43%, followed by partridge (34.21%), cuckoo (9.09%), white (7.89%), grey (6.22%), and orange colour (2.15%). Wing plumage colour had the highest partridge (28.77%) followed by black (15.75%), red (14.38%), golden-yellow (14.16%), cuckoo (10.96%), orange (5.94%), grey (5.48%), white (3.20%) and dark green colour (1.37%). From the results of qualitative phenotypic characteristics indicated neck plumage, back plumage, long curving tails, back tails, and wing plumage colour variations for the different at 5 districts ecotypes of native chicken. The results are in agreement with Punrapee, et al. (2000a); Suphawadee (2014) and Suphawadee et al. (2016) who reported that the original breeding becomes hard to find today since farmers are not interested in any pure breed. Free grazing chicken could lead to the variation of breeds and genes and diversification of hybrid chickens. However, it was contrast for the fighting cock raisers when they do not care much about the colour of features and other phenotypic characterizations than origination of their chickens.

According to the results of body weight, wing length and shank length of native chickens, there were significantly differences among chickens from different ecotypes ($p<0.0001$) except for height and length of body (Table 2). Phrom Phiram chickens showed the highest body weight (2.72 ± 0.06 kg), followed by chickens from Wang Thong (2.66 ± 0.06 kg), Bang Krathum (2.61 ± 0.06 kg), Mueang (2.39 ± 0.03 kg), and Bang Rakam (2.30 ± 0.04 kg). However, chickens from Bang Rakam had higher wing and shank length than those from Mueang (40.28 ± 0.35 vs 39.23 ± 0.31 cm and 9.07 ± 0.11 vs 8.75 ± 0.10 cm respectively). These values were similar to those from native chicken in Pichit Province (Punrapee, et al., 2000a, 2000b, 2000c). These results implied that in order to development of production, conservation and preservation of native chickens, farmers need to be promoted and supported from government and private organizations in sustainable manner of each ecotypes.

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Table 1 Qualitative phenotype characteristics of 5 native chicken ecotypes of Phitsanulok Province, Thailand

Phenotype characteristics	Districts					Total (%)
	Bang Rakam (%)	Mueang (%)	Wang Thong (%)	Bang Krathum (%)	Phrom Phiram (%)	
Comb type						
Hin	33.65	33.33	100	100	100	58.17
Single	13.46	2.67	-	-	-	4.46
Wong-duan	29.81	1.33	-	-	-	8.17
Bae	1.92	8.67	-	-	-	3.71
Ghog-chaba	21.15	3.33	-	-	-	6.68
Pea	-	23.33	-	-	-	8.66
Strawberry	-	14.67	-	-	-	5.45
Cushion	-	7.33	-	-	-	2.72
Walnut	-	5.33	-	-	-	1.98
Neck plumage colour						
Golden-yellow	15.09	18.03	8.00	46.00	8.00	18.22
Partridge	13.21	29.51	50.00	38.00	88.00	35.54
Grey	2.83	4.37	18.00	14.00	-	6.15
Cuckoo	3.77	14.75	22.00	2.00	-	9.79
Red	15.09	9.29	2.00	-	4.00	8.20
White	9.43	6.01	-	-	-	4.78
Black	30.19	4.92	-	-	-	9.34
Orange	10.38	13.11	-	-	-	7.97
Back plumage colour						
Golden-yellow	13.08	18.03	8.00	46.00	8.00	17.73
Partridge	17.76	32.79	50.00	38.00	88.00	37.95
Grey	1.87	3.83	18.00	14.00	-	5.68
Cuckoo	5.61	19.13	22.00	2.00	-	12.05
Red	23.36	11.48	2.00	-	4.00	11.14
White	6.54	3.28	-	-	-	2.95
Black	28.04	2.73	-	-	-	7.95
Orange	3.74	8.74	-	-	-	4.55
Long curving tails colour						
Partridge	69.52	30.41	-	-	85.42	39.24
Grey	0.95	5.26	-	-	-	2.36
Cuckoo	3.81	10.53	-	-	-	5.20
White	24.76	9.36	40.82	60.00	2.08	21.99
Black	0.95	44.44	59.18	40.00	12.50	31.21
Back tails colour						
Partridge	66.35	44.05	-	-	-	34.21
Grey	0.96	5.36	18.37	14.29	-	6.22
Cuckoo	8.65	10.71	22.45	-	-	9.09
White	16.35	8.33	-	2.04	2.08	7.89
Black	3.85	28.57	59.18	83.67	97.92	40.43
Orange	3.85	2.98	-	-	-	2.15
Wing plumage colour						
Golden-yellow	9.35	12.09	8.00	44.00	8.16	14.16

Partridge	27.10	15.38	50.00	2.00	87.76	28.77
Dark green	-	3.30	-	-	-	1.37
Grey	1.87	3.30	18.00	14.00	-	5.48
Cuckoo	5.61	16.48	22.00	2.00	-	10.96
Red	21.50	20.33	2.00	-	4.08	14.38
White	8.41	2.75	-	-	-	3.20
Black	21.50	14.84	-	38.00	-	15.75
Orange	4.67	11.54	-	-	-	5.94
shank colour						
Yellow	65.00	46.90	-	-	-	39.94
White	15.00	18.62	100	100	100	39.04
Black	1.00	8.28	-	-	-	3.90
Green	4.00	11.72	-	-	-	6.31
Grey	15.00	14.48	-	-	-	10.81

Table 2 Individual average body weight, body height, body length, wing length and shank length of native chicken ecotypes

Traits	**Districts**					**Sig**
	Bang Rakam	**Mueang**	**Wang Thong**	**Bang Krathum**	**Phrom Phiram**	
Body weight, kg	2.30±0.04[b]	2.39±0.03[b]	2.66±0.06[a]	2.61±0.06[a]	2.72±0.06[a]	0.0001
Body height,cm	54.59±0.63	54.76±0.57	-	-	-	0.8412
Body length,cm	21.56±0.23	21.44±0.21	-	-	-	0.6870
Wing length,cm	40.28±0.35[a]	39.23±0.31[b]	-	-	-	0.0247
Shank length,cm	9.07±0.11[a]	8.75±0.10[b]	-	-	-	0.0307

[a,b]Different superscripts within each row are significantly different (P<0.05)

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