

Research results on indigenous chicken genetic resources conservation in Vietnam

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1. Background

Vietnam contains a great wealth of animal genetic resources in general and indigenous chicken genetic resources in particular. Vietnam's biodiversity constitutes a unique heritage both nationally and globally. These resources are important to the economy and well being of the country today and vast household potential for development in the future.

A lot of evaluation reports indicate that indigenous chicken (especially scavenging village chicken) play a significant role in poverty alleviation and enhancing gender equity among the disadvantaged communities. These chicken are kept for eggs and meat and are associated mainly with rural households.

It was only as recently as 1990 that the indigenous chickens' potential contribution to household food security was recognized, as well as it being a poultry genetic resource that should be conserved for posterity.

But like other countries in the world, the Vietnamese indigenous chicken breeds are threatened by extinction as a result of changes in livestock production systems and the introduction of exotic breeds.

Program was established at the Ministry for Science, Technology and the Environment with the aim of conserving the gene pool of all the different indigenous chicken lines and to promote their applications in rural food production. As no scientific data were available on the production potential of these chicken lines, trials were conducted in order to provide a phenotypic characterization with the different lines and test for differences in growth, carcass traits and egg production.

2. Material and methods

2.1. Description of the indigenous lines

Ac chicken has small body size with blue comb, green earlobes, five toes, bearded, white silkie feather, black bone, black muscle, black skin – Tran Thi Mai Phuong – 1999

Ri chicken has been used widely by farmer for household egg production for many years. These chicken have colourful feather, small body size. They can develop well in local condition and good disease resistant (Tran Long et al – 1994)

Dongtao chicken has big body size. The typical characteristics are: dark red feather for cock and light yellow feather for hen, they have a very big foot. (Bui Duc Lung, Tran Long - 1994)

Mia chicken cock has red and dark tail feather and green wing feather, during the hen has light yellow feather. They have also big body size (Bui Duc Lung, Tran Long – 1994)

2.2. Methods

These above breed was kept in in-situ method with two trends:

- + Selection and pure breeding
- + Selection and crossbreeding

2.2.1. Selection and pure breeding

What kind of chicken breeds were used for selection and pure breeding: They were: Ac, Ri, Dongtao, Mia, Ho.... Those were kept by scavenging method and intensive method.

Scavenging chickens are characterized by low level of inputs and outputs. The main input is the feed from household refuse as well as that scavenged around the village. With such low inputs, the village chicken is capable of generating cheap and readily have stable meat and eggs for immediate home consumption and sale for income generation. In some communities, village chickens are important in breaking the vicious cycle of poverty, malnutrition and disease (Robert – 1992).

Body weight and feed intake per family were recorded on a weekly basis.

Intensive method: Chickens are kept in an environmentally controlled house and reared on commercial ration, a vaccination programme at the Animal Husbandry Research Institute for small farming enterprises. Males and females were not separated.

2.2.2. Selection and crossbreeding

In order to improve the egg and meat production, but remaining some good characteristic of indigenous chicken lines (good disease resistant, develop well in local condition..), we introduce some exotic breed such as: Chinese Yellow Chicken, Kabir (from Israel). We also make crossbred between two indigenous lines (Mia x Ri).

Trial were carried out to provide base-line data for growth and egg production for different lines. Group of 200 bird for each breed (Ac, Ri, Mia, Dongtao, F1(Dongtao x Chinese Yellow Chicken) F1 (Kabir x Ri) and F1: (Mia x Ri) to record growth performance and also 200 hens for each breed (Ac, Ri, Mia, Dongtao) for egg production parameter.

Body weight and feed intake per pen were recorded on a weekly basis

At the end of the growth period (12 weeks of age), 10 birds of each line were selected, weighed and slaughtered.

For egg performances: the separate groups of chicken were kept in ventilated house, equipped with a battery system and were fed on a commercial layer's mash. Egg production were recorded per day per hen..

Data evaluation were used SAS and Excel program

3. Results and discussion

Significant differences were found among the indigenous chicken lines and in comparison with Chinese Yellow chickens and Kabir chickens for the production traits.

For growth of purebred, the Dongtao chickens had the heaviest weight (1.43 kg), followed by the Mia (1.22 kg) and the Ri chicken (0.98 kg), while the Ac had a significant lower growth, only reaching an average weight of 0.45 kg at 12 weeks of age. All indigenous chickens had lower body weight in comparison with Chinese Yellow Chicken (1.72kg) – Nguyen Dang Vang et al-1998 and in comparison with Kabir chicken (2.13 kg) – Pham Minh Thu et al - 2000. In table 2 for the crossbred: the F1 (Dongtao and Chinese Yellow Chicken) had heaviest weight (1.7kg), followed by the F1(Kabir x Ri) 1.68 kg, while the F1(Mia x Ri) had the lowest body weight, only reaching an average weight of 1.10kg. All F1 had the lower body weight than Exotic breed (Chinese Yellow chicken and Kabir).

The feed conversion varied from 2.8 for the Ac chicken to 3.59 kg for the Mia chicken and the feed conversion of indigenous chicken lines were not very far differences in comparison with Chinese Yellow Chicken (3.29 kg) - but higher in comparison with Kabir chicken 2.91 kg – Le Thi Nga et al – 2000.

The indigenous chicken lines had difficulty feeding from the feeding troughs during the first week and they also had to spend more time feeding around the feeding troughs as well as scavenging in the pen. This behaviour may have an influence on their performance. These results were obtained for an intensive system with adequate nutrition, housing and disease control.

The dressing percentage of Ac and Ri chicken (65.10% and 68.97% respectively) were lower than the rest : Dongtao and Mia had the dressing percentage of 71.42% and 73.58% , similar to the Chinese Yellow chicken (71.27 %) - (Nguyen Dang Vang et al 1998) and 71.90% in Kabir - (Le Thi Nga et al – 2000). and the F1 between indigenous lines and exotic lines had the dressing percentage similar to exotic breed (Table 4). The thigh meat percentage of Ac and Ri (65.10% and 68.97%) were lower than the other lines. Dong tao had the highest thigh meat percentage (23.88%), followed by F1 (Dong tao x Chinese Yellow chicken) 22.70%. Ac chicken had lower percentage of dressing carcass, because of the age for slaughter (only 8 weeks of age and the live weight of Ac chicken at that time was 311.0 g). The crossbred had higher percentage of dressing carcass, thigh meat, breast meat, but these differences were not significant.

Chemical analysis indicated that all the indigenous chicken lines and their F1 had high crude protein (from 23.61-25.27%) in breast meat and from 20.55 – 22.67% in thigh meat. Ac chicken meat had the highest crude protein (CP 22.67-25.27%) and lower fat percentage (0.53-1.52%), followed by Ri (CP: 22.17-23.61%) and (CF: 0.35-1.16%).

The indigenous lines reached sexual maturity (the first laying egg) between 16-20 weeks of age while the Chinese Yellow Chicken and Kabir chicken reached sexual maturity between 20-22 weeks of age. The egg production of Ri chicken were the highest, (110 eegs/hen/year) followed by the Ac(95.03 eggs/hen/years). Mia and Dongtao chicken had lower egg production (75.6 and 67.71 eggs/hen/year). Whie the Chines Yellow Chickens had 143.93 egg/hen/year – (Nguyen Thi Khanh et al –2000).

The egg weight of Indigenous chicken varied from 29.99 g to 47.18 g, smaller than Chinese Yellow chicken 50.37 g (Nguyen Thi Khanh et al –2000). Ac chicken had the smallest egg, only reached 30 g. The average weight for hen at 5% of laying were 1.99 kg for the Dongtao chicken, 1.75 kg for the Mia 1.75 kg and 1.60 kg for the Ri . Whie the Ac chicken reached only 0.565 kg. The hatchability of Ac chicken was lowest, only reached 66.65%.

Table 1: Body weights (g) of different pure lines over a period of 12 weeks

| Week of age | Ac (n = 200) | Ri (n 0 200) | Mia (n=200) | Dongtao (n=200) |
|-------------|---------------|----------------|---------------|-----------------|
| One day old | 17.11 ± 0.17 | 29.80 ± 0.63 | 31.21 ± 0.45 | 33.83 ± 0.31 |
| 1 | 30.71 ± 0.36 | 51.06 ± 1.53 | 58.43 ± 2.40 | 65.82 ± 0.79 |
| 2 | 48.42 ± 0.66 | 98.30 ± 2.20 | 101.00 ± 3.30 | 100.43 ± 1.59 |
| 3 | 76.80 ± 1.23 | 130.20 ± 5.80 | 164.33 ± 5.44 | 146.71 ± 2.39 |
| 4 | 105.23 ± 1.60 | 239.82 ± 7.33 | 274.43 ± 7.55 | 222.08 ± 3.97 |
| 5 | 145.75 ± 2.45 | 310.20 ± 13.00 | 375.28± 10.78 | 335.15 ± 5.37 |
| 6 | 189.95 ± 3.03 | 380.20 ± 14.20 | 442.75 ±14.62 | 475.71 ± 10.32 |
| 7 | 231.80 ± 3.42 | 470.30 ± 20.10 | 574.46±22.48 | 620.36 ± 13.54 |
| 8 | 271.44 ± 3.95 | 559.50 ± 23.20 | 656.50±33.40 | 778.45 ± 18.09 |
| 9 | 327.06 ± 4.71 | 662.00 ± 30.54 | 739.00± 45.50 | 939.88 ± 19.97 |
| 10 | 366.33 ± 5.75 | 772.00 ± 35.40 | 905.30±37.45 | 1110.83 ± 23.35 |
| 11 | 408.77 ± 6.42 | 885.70 ± 40.60 | 1062.0±38.60 | 1281.07± 27.54 |
| 12 | 445.77 ± 7.07 | 997.75 ± 49.23 | 1223.5±40.79 | 1428.8 ± 28.12 |

Sources: Animal Husbandry Research Institute (AHRI)

Table 2: Body weights (g) of different crosslines over a period of 12 weeks

| Weeks of age | F1 Dongtao x CYC (n=200) | Kabir x Ri (n=200) | Mia x Ri (n=200) |
|--------------|--------------------------|--------------------|------------------|
| One day old | 35.50 ± 0.27 | 32.73 ± 0.77 | 30.73 ± 0.50 |
| 1 | 74.40 ± 1.10 | 63.46 ± 2.50 | 53.54 ± 2.02 |
| 2 | 139.42 ± 2.14 | 124.55 ± 3.79 | 96.02 ± 3.24 |
| 3 | 220.91 ± 3.69 | 200.50 ± 6.41 | 141.35 ± 4.64 |
| 4 | 327.44 ± 5.25 | 335.63 ± 11.40 | 262.20 ± 7.04 |
| 5 | 471.65 ± 6.97 | 447.18 ± 13.92 | 363.57 ± 9.98 |
| 6 | 642.09 ± 12.09 | 642.51 ± 28.73 | 434.38 ± 14.39 |
| 7 | 813.59 ± 16.57 | 778.64 ± 35.27 | 553.85 ± 20.54 |
| 8 | 993.21 ± 21.33 | 971.12 ± 36.05 | 632.34 ± 33.07 |
| 9 | 1175.35 ± 23.49 | 1110.57 ± 40.94 | 705.00 ± 40.08 |
| 10 | 1365.12 ± 29.06 | 1355.56 ± 35.14 | 897.86 ± 45.74 |
| 11 | 1557.12 ± 33.58 | 1508.50 ± 38.73 | 1008.00 ± 52.34 |
| 12 | 1721.16 ± 34.52 | 1683.08 ± 39.60 | 1106.47 ± 58.23 |

Sources: AHRI

CYC: Chinese Yellow Chicken

Table 3: Feed conversion for different chicken lines

| Chicken lines | Feed conversion (kg/kg weight gain) |
|---------------------------------------|-------------------------------------|
| Ac | 2.8-3.1 |
| Ri | 3.55 |
| Mia | 3.59 |
| Dongtao | 3.14 |
| F1 (Dongtao x Chinese Yellow Chicken) | 3.11 |
| F1 (Kabir x Ri) | 3.17 |
| F1 (Mia x Ri) | 3.56 |

Sources: AHRI

Table 4: Dressed carcass percentage, thigh meat, breast meat, abdominal fat percentage for different chicken lines (n=10)

| Chicken lines | Dressed carcass % | Thigh meat % | Breast meat % | Abdominal fat % |
|--------------------|-------------------|--------------|---------------|-----------------|
| Ac ¹ | 65.10 | 17.91 | 14.08 | 1.1 |
| Ri | 68.97 | 17.52 | 16.34 | 2.45 |
| Mia | 73.58 | 18.66 | 19.16 | 1.64 |
| Dongtao | 71.42 | 23.88 | 16.51 | 2.07 |
| F1 (Dongtao x CYC) | 72.00 | 22.70 | 17.60 | 1.81 |
| F1 (Kabir x Ri) | 74.48% | 19.52 | 18.77 | 1.90 |
| F1 (Mia x Ri) | 73.01% | 18.17 | 16.68 | 1.85 |

Sources: AHRI

CYC: Chinese Yellow Chicken

1: Ac chicken was slaughtered at 8 weeks of age

Table 5: Meat composition (water, crude protein, crude fat and ashe content) in breast and thigh meat for different lines

| Chicken Lines | Water % | | Crude protein | | Crude fat % | | Ashe % | |
|----------------|---------|-------|---------------|-------|-------------|-------|--------|-------|
| | Breast | Thigh | Breast | Thigh | Breast | Thigh | Breast | Thigh |
| Ac | 73.54 | 74.60 | 25.27 | 22.67 | 0.53 | 1.52 | 1.20 | 1.21 |
| Ri | 74.74 | 75.50 | 23.61 | 22.17 | 0.35 | 1.16 | 1.29 | 1.17 |
| Dongtao | 73.28 | 75.56 | 23.91 | 21.10 | 1.53 | 1.80 | 2.00 | 1.21 |
| F1(DTxCYC) | 73.04 | 75.63 | 24.03 | 20.69 | 1.00 | 1.80 | 2.93 | 0.97 |
| F1(Kabir x Ri) | 71.65 | 73.30 | 23.94 | 21.68 | 0.89 | 2.42 | 1.03 | 1.44 |

Sources: AHRI

CYC: Chinese Yellow Chicken

Table 6: Total number of eggs, mean egg weight (g), average hen weight (g), fertility and hatchability rate (%) for different chicken lines

| Chicken lines | Total eggs/hen (n=200) | Mean egg weight (g) (n= 55) | Average hen weight (g) | Fertility rate (%) | Hatchability rate (%) |
|---------------|------------------------|-----------------------------|------------------------|--------------------|-----------------------|
| Ac | 95.30 | 29.93 ± 0.21 | 565 | 94.59 | 66.65 |
| Ri | 110.00 | 45.33 ± 0.09 | 1599 | 93 | 84.59 |
| Mia | 75.60 | 47.18 ± 0.60 | 1750 | 89.90 | 73.0 |
| Dongtao | 67.71 | 45.33 ± 0.40 | 1989 | 89.54 | 77.27 |

Sources: AHRI

4. Conclusion

Despite of their lower productivity, the contribution of these lines to household food security is not underestimated. About 70% of Vietnamese population are depended on agriculture. These indigenous lines can play an important role as an affordable protein source.

Through ten years of implementing the conservation of indigenous chicken genetic resources project, we have received the followed results:

+The population of all indigenous lines are increasing :

The population of Ac chicken in 1994 were only 900 hens and were called endangered chicken. They were raised only in the South of Vietnam, but now these chicken are raised widely in whole country and their population is increasing.

For the Ri chicken: in 1994 they were called insecure chicken. we have not so much of pure chicken. They were crossbred with many other chicken breeds. Now we have pure chicken and are raised in whole country.

For the Mia chicken: in 1994, these chicken was called critical chicken with the population of 35 hens and 15 cocks (Grand parent stock) and 200 hens (parent stock). Now the population of Mia Chicken reached from 10.000 to 15 .000 for broiler and 1000-2000 hens for breeding

For the Dongtao chicken. In 1994 they were also called the critical chicken. The number of them are 22 hens and 18 cocks. Now the population of Dongtao chicken are 600 cocks and 2500 hens for breeding and 15.000-17.000 broiler

The other kind of indigenous chickens are conserving such as: Fighting chicken, Bamboo chicken, short chicken..., but the population are increasing not very much because of their too low performances and people used them only for ornamental purpose.

Vietnam is continuing to conserve and use of all indigenous animal genetic resources and It is hoped that, in few years later the population of all kind of indigenous animal will be increasing.

The Animal genetic resources conservation project bring us the opportunity to prepare for cost-effective action on better understanding the roles and values of indigenous animal genetic resources, better using and sustainably developing adapted resources, as well as conserving and accessing genetic material for future benefit of local communities and the environment. These project will bring animal genetic resources to their right place in food security, sustainable development, while maintaining agricultural biodiversity for beneficiaries today and in the future.

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