

Improving Local Chicken In Taiwan

A commercial flock of 'country chicken' in Taiwan.

Although commercial white feathered broiler strains had replaced most of the native meat-type chickens in Taiwan by 1970, consumers were not satisfied with their meat quality. Attempts have been made to improve the performance of native 'country chickens' to make them more competitive.

In developing countries, most village people keep the native chickens and their eggs and meat are the most important animal protein resource of the country. Before 1960, most of the chickens eaten in Taiwan were local breeds reared in backyards.

The commercial white broiler was first imported into Taiwan in the early 1960's. Because the white broiler grows fast and can be marketed within eight weeks, production costs are low. Production of white broilers increased so fast that by 1970 they represented more than 90% of the meat chickens consumed. The white broiler is meaty, but most consumers in Taiwan tend to feel the meat is too soft, and does not have a good flavour. There thus arose a new interest in the 'backyard' chicken. Since the native chicken was not an efficient bird, some farmers in the early 1970's started to use imported exotic breeds to improve its performance. There are two types of upgraded native chickens in Taiwan. One of them has the typical appearance of the native birds, such

as a large erected single comb, blue shank, reddish-brown plumage and small frame size, and thus is called 'country chicken' (to differentiate from the imported breed). The other, in general the crossbred of the native and the imported breeds, has black or yellow shanks, black or red plumage, smaller comb but larger body size and is called 'simulated-country chicken'. Both the country chicken and simulated-country chicken have coloured plumage and are thus called 'coloured chicken'. According to the survey conducted by the Department of Agriculture and Forestry of the Taiwan Provincial government in recent years, 61 to 66% of the chickens consumed in Taiwan are coloured chickens (Table 1).

The high level of demand of such chickens, coupled with their poor production efficiency, led to a project being initiated in 1982 to study and improve them. This project has been carried out jointly by the National Chung-Hsiung University and the Council of Agriculture. In the first few years, the objective was to set the

breeding goal of the coloured chickens by comparing their performances with the imported breeds. The collection and establishment of the foundation stocks is the second step. The third step is the performance improvement of the male and female lines of chicken by intensive selection. The fourth step is to select two female lines and one or two male line for the production of commercial chickens by diallel crosses.

The Performance Of Coloured Chickens

Compared to white broilers, the coloured chicken grows slowly, but it also eats much less so that its feed efficiency was not much different from



Breeding pens of selected lines under test at the National Chung-Hsiung University.

that of white broilers at the same age. However, the market requires coloured birds to be raised to around 15 weeks of age, when they show sexually matured appearance. This prolonged rearing period requires more feed for maintenance, which reduces the feed efficiency of the coloured chicken from around 2.1 at 8 weeks of age to over 3.0 at 15 weeks of age. Besides its slow growth rate, the coloured chicken lacks uniformity in the flock, as indicated by the high CV value of the bodyweight (Tables 2a and 2b). This lack of uniformity may be caused by the complex genetic constitution of the parent stock, the absence of hybrid vigour, and/or the behavioural problems of sexual mature cockerels.

Compared to the white broiler, the coloured chicken is a more normal chicken. They are better able to adjust their feed intake according to the metabolisable energy level and are more active. The white broiler spends more than 60% of daytime resting, but they only spend 25%. The males of the coloured chicken are five times as aggressive as those of white broilers. Aggressive behaviour and sexual mounting increase dramatically when the male chicken reaches sexual maturity. Since the coloured chicken should be raised to around sexual maturity, these behavioural problems, which do not happen in the conventional broilers, become important. When females are raised with males, they usually stay at the edge or corner of the pen and away from the feeder and their growth is retarded. When only males are raised in a pen, feather damage, injury and even mortality, caused by aggressive fighting and mounting, become serious problems.

Table 1: Type of chickens slaughtered in Taiwan, 1984-1988 (1)

Year	Total No. (1000's)	Broilers (%)	Coloured Chickens (%)
1984	155 000	25.58	65.86
1985	154 686	25.56	65.39
1986	155 917	26.87	64.15
1987	174 400	25.85	65.71
1988	193 018	30.49	61.87

Table 2a: Bodyweight and feed/gain

Trait	Study	Country Chicken		White Broiler		
		Male	Female	Male	Female	
Bodyweight	8 wks	1	1051	858	2536	2014
	8 wks	2	1000	813	2355	1902
	14 wks	1	1817	1469	3786	3176
	16 wks	2	1982	1610	4352	3967
Feed/gain	0- 8 wks	1	2.20		2.13	
	0- 8 wks	2	2.16		2.00	
	0-14 wks	1	3.03		3.72	
	0-16 wks	2	3.36		3.24	

Study 1: Lee and Huang (1985);
Study 2: Fan and Lee (1984).

Table 2b: Coefficient variation (CV %) of bodyweight

Weeks of age	Study	Country Chicken		White Broiler	
		Male	Female	Male	Female
8	1	11.1	13.8	6.6	9.4
8	2	14.1	14.8	8.0	9.2
14	1	14.1	16.0	17.5	9.5
16	2	12.6	12.4	22.2	7.7

Study 1: Lee and Huang (1985);
Study 2: Fan and Lee (1984).

The coloured chicken has smaller proportion of edible carcass than that of the white broiler at 8 or 14 weeks of age. If the white broiler is marketed at 8 and coloured chicken at 14 weeks of age, both have a similar carcass yield. The coloured chicken has

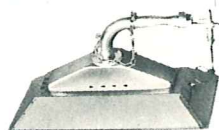
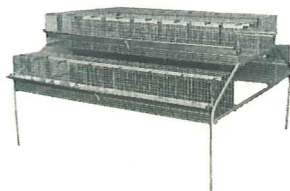
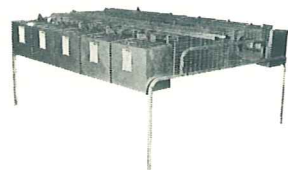
smaller breast, feet, abdominal fat and intestine, but a larger proportion of dark meat (Table 3). A sensory test panel comparing white broilers and coloured chicken indicated only that dark meat was preferred to white meat, but no significant difference



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Table 3: Proportions of different parts of carcase (7)

Body part	Country	Broiler
Edible carcase	65.6	65.2
Breast	17.5	19.1
Thigh and leg	24.6	22.8
Feet	3.9	4.7
Abdominal fat	1.3	2.3
Intestine	2.4	3.7

Note: Males at market age, ie, 8 weeks for broiler and 14 weeks of age for country chicken.

Table 4: Estimates of heritability and phenotypic and genetic correlations, of selected traits of the coloured chickens.

	Body wt 4 wks	Comb area	Testes (%)	Abdml fat (%)	Meat quality	Aggress
Body wt 14 wk	0.93	-0.05	-0.22	1.16	0.19	0.28
Comb area	0.23	0.69	0.59	0.64	0.58	0.57
Testes (1%)	0.03	0.49	0.47	0.11	-0.52	0.79
Abdominal fat (%)	0.20	-0.21	-0.29	0.26	-0.02	-0.71
Meat quality	0.05	0.02	-0.03	-0.04	0.14	0.36
Aggressiveness	0.10	0.44	0.39	-0.19	-0.09	0.40

Heritabilities are on the diagonal; Genetic and phenotypic correlations are above and below the diagonal respectively.

was found between the two breeds. However, the higher proportion of dark meat and less abdominal fat suggested that the coloured chicken seems to have a better quality carcass than white broiler.

As well as poor growing performance and behavioural problems, the parent stock of the coloured chicken is also characterised by its poor production of hatching eggs with only 119 eggs laid to 69 weeks of age, although it matured earlier and its eggs had much better shell quality.

One of the main reasons that the farmer likes to raise coloured chickens is due to their hardiness. They are able to tolerate the hot and humid climate and have a high level

of resistance to prevailing diseases such as Marek's, Newcastle disease, coccidiosis and to the regional disease of leucocytozoonosis.

In summary, the coloured chicken in Taiwan is characterised by the following advantages and disadvantages.

Advantages:

1. Hardiness and resistance to some diseases;
2. Good meat and egg shell quality.

Disadvantages:

1. Eat less, grow slowly and prolonged rearing period reduces feed efficiency;
2. Poor uniformity of the flock;
3. Poor production of hatching egg due to broodiness.

Improvement Of Local Chickens For Commercial Production

Table 4 shows some of the genetic parameters of the coloured chickens analysed in our laboratory. Of the six traits shown in the table, bodyweight had the highest heritability and meat quality had the lowest, which suggests that it is not difficult to change the size of the chicken, but that it may not be easy to improve meat quality by direct selection. The heritability of the comb area and size of the testis was also rather high, which implies that the period required by the coloured chicken to reach sexual maturity could be shortened by selection for comb size. Genetically, the size of the testis, the proportion of abdominal fat, meat quality and aggressiveness were all positively correlated with comb area. This implies that selection for comb area would mean that the chicken would mature earlier and have better meat quality, but that there would be the negative consequences of a larger abdominal fat pad, more aggressive behaviour and more serious sexual abuse. Another finding worth mentioning is the conflicting results of the phenotypic and genetic correlation between comb area and abdominal fat. It indicates that chickens with larger combs were usually heavier and had comparatively little abdominal fat. However, selection for a bird with a larger comb might result in a smaller bird with more abdominal fat.

The ideal chicken would be able to satisfy every consumer at every level of the production-marketing system. This means that the breeder pullet would be able to produce a large number of excellent quality chicks. Meat birds should grow very fast, and have excellent feed efficiency and carcass quality. However, in practice it is not possible to have excellence in every trait. A successful breeder must know which are the most important traits of the animal in question. Although the feed efficiency of the coloured chicken is poor, it is the meat quality which is the most important trait in this chicken. Feed efficiency should thus have a lower priority than meat quality. Feed efficiency should be achieved by selecting for comb size, which would shorten the rearing period and thus indirectly improve feed efficiency. Furthermore, the positive genetic correlation between comb size and meat quality suggests that meat quality might even be indirectly

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improved. The undesirable consequences of selection by comb size are that the bird might become too fat and too aggressive.

Since the determination of the breeding goal, coloured chickens with better characteristics were collected from around the islands and several flocks were founded for future improvement. Among them, lines with better body conformation were

destined to be the male lines, and lines with better egg production were destined to be the female lines. The male lines were selected for earlier sexual maturity only, but the female lines were selected for both earlier sexual maturity and egg production to 40 weeks of age. After a few generations of selection, the diallel cross was conducted among female lines and two were chosen to be the

female lines for the production of parental stock.

Utilisation Of Genetic Resources

Besides the preference of Chinese people, for coloured chickens, the genetic merits of them in disease resistance and egg quality might be useful in improving laying chickens in a warm, humid and intensive husbandry environment such as Taiwan and other southeastern Asian countries. Tremendous heterosis in egg production traits suggests that crossing the imported exotic laying breeds with the coloured chicken might be a good production system. The heterosis from crossing between brown-egg and white-egg birds was not a new finding. Heterosis had been reported in the cross between Rhode Island Red and White Leghorn and between Australorp and White Leghorn. However, the large bodyweight and tinted egg shell colour are not desirable in the developed countries. In the oriental countries, the spent hen is valuable, the large bodyweight might be able to cover the excess cost of feed, and the tinted egg shell is either acceptable or even preferable. Furthermore, the disease resistance benefits, especially to Leucocytozoonosis, might be the best way to ensure the production of clean eggs and clean chicken meat. —Y.P. Lee, Department of Animal Science, National Chung-Hsing University, Taichung, Taiwan 40227, Republic of China.

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This research, at Visaya State University, was reported by B.B. Cocjun at the recent AAAP Animal Science Congress in Taipei.



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