

First Filial Generation Performance of the Crossed Native and Kabir Chickens Under Semi-Intensive Rearing System

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Abstract: The study focused on the performance of progenies from crossing native-native and Kabir-native chickens, conducted for an 18-months period. The parameters considered were; the growth performance, laying performance and egg characteristics. Completely Randomized Designed was used in the study and analyzed using T-test. The result indicated significantly higher percentage of egg production, fertility and hatchability for the NC x NC parental stock than the KC x NC parental stock. Progeny of KC and NC crosses showed significantly improved performance than NC x NC cross in terms of body weights and average weight gains, feed consumption, survivability, age at sexual maturity, egg production, and egg characteristics. Results suggest that mating a native chicken with Kabir had a potential for improving growth performance and egg qualities under semi confinement system of production and indigenous feeding practices.

Keywords: Progenies, crosses, parent stock, production performance, egg qualities

1. Introduction

Livestock production in the Philippines has expanded by 4.66 percent accounting for 17.18% of the total agricultural output (PSA-1, 2016). Poultry subsector improved by about 1.01 percent with a total number of about 178.77 million heads; 80.85 million is native or improved chickens (PSA-2, 2016). The poultry industry, specifically chicken and egg production contributes around PhP 29.6 Billion, about 46.4% of the entire value of all livestock and poultry combined (PSA-1, 2016), which plays a significant role in human nutrition and as income sources. Most of the chicken supplies are produced largely by the commercial sector, on the other hand, the backyard sector is made up of many smallholders who keep few native crossbreeds for their consumption (Chang,

2007), most of which are managed under scavenging systems. In 2005, the inventory consisted of 54% native chickens, 30% broilers and 16% layer chickens (ibid). Native chicken production is widespread, highest of which is in Western Visayas contributing about 13,331 metric tons which are about 16.04% of the country's production followed by Central Luzon and Davao Region having 10.51% and 9.85% share for the year 2015 (PSA-2, 2016).

While the native chicken market is a small niche market as most are grown for household consumption, the demand is growing. Increasingly, many consumers now prefer eggs from native chickens because they are believed to be more nutritious due to their diverse diet compared to the uniform poultry diet (Poultry Farming Manual, 2016).

The role of native chicken in Philippine agriculture and the entire economy cannot be ignored. Backyard native chicken production is one of the complimentary farming activities contributing to the overall wellbeing of rural households. It provides income through the sale of birds and eggs.

Native chicken has always been part of the rural sitting often turn loose to scavenge. The age at first egg is about 144-184 days. Average chicks weight was 24.2-26.4 grams. Average egg production, fertility, and hatchability under semi confinement is 24-27%, 70-87%, and 30-46% respectively (Lambio & Grecia, 1998).



Figure 1. The Kabir Chicken (Source *Lopeh Poultry Farm*)

Pinoy Farmer, (2008), described Kabir as superior for meat conversion because of its rapid growth, good body conformation, and efficient feed conversion. The chicken is resistant to disease and heat stress, large and has a "native" taste and texture. When cross-breed with native chickens, the Kabir qualities are retained in the new breed. Feeding cost is low since Kabir chicken can also survive by themselves. They can be raised in the same manner as "native chickens," and their eggs are low in cholesterol.

The reproductive characteristics of Kabir Chicken, one male Kabir is capable of breeding 15 to 20 female Kabir, Normally begins laying after 26 weeks or 6 ½ months and Kabir layer can lay 200 eggs/cycle. Kabir does natural brooding although may be late, thus should be encouraged to brood (Pinoy Farmer, 2008).

Establishment of a strong breeding program to combat constraints related to poultry production is highly essential, for which a wider genetic base of germplasm is a prerequisite. However, the low survivability of chicken production in the Philippines is obvious due to various forms of external factors such as diseases, climate changes and predations especially those chicken raised in the free-range management system. According to Mangesha (2012), semi intensive farming is a way to raise chicken in a small fence space with routine feeding. Thus the growth of the poultry can be observed, and therefore chicken can produce meat and eggs more than traditional ones.

In Samar Island, studies to determine the production potential of chickens in semi-confinement system have never been commissioned and documented. Hence, this investigation was initiated to evaluate and compare the growth and production potential of native chicken crossed with Kabir breed and raising them under semi-intensive management system.

2. Objectives

This study aimed to:

- 2.1 Determine and compare the laying performance and egg characteristics of the female native chicken crossed with Kabir and native male chickens (parent stock) under semi-intensive rearing system.

- 2.2 Determine and compare the fertility, hatchability, chicks weight and survival rate of the F1 crosses.
- 2.3 Find out and compare the egg production, and egg qualities of the chickens produced by the F1 cross under semi-intensive rearing system.
- 2.4 Determine and compare the growth rate, feed consumption, body weight at sexual maturity, weight gain, feed efficiency and return on investment of the F1 crosses at maturity age.

3. Methodology

3.1 The Breeder stock/Experimental animals

The two months old male Kabir chicken was purchased from reliable source. They are reared until reaching sexual maturity. At age 8 months old, they are used as breeder to the female native chicken of varied ages. Likewise, the native males were acquired with different plumage colors but almost of the same age. One male to six female ratio was adapted in this breeding study.

3.2 Experimental Design

A total of 36 birds, randomly distributed into two treatments with three replication using Completely Randomized Design (CRD). At the start, each of the 3 males of Kabir and 3 males of native chickens were assigned to the breeding pens containing six female native chickens by drawing lots. Average weight and phenotypic characteristics of the birds was recorded to obtain the desired basic data of the animals.

3.3 Feeding Management

The experimental animals were fed with various local and commercial

ingredients mixed and given to the birds with same levels, time and frequency of feeding. The feed ingredients include rice/corn bran, rice shavings, corn grits, coconut grates and other kitchen refuse collected from the researchers houses. Feeding was made in the morning and afternoon with provision of clean drinking water. Wet and dry feeding was uniformly practiced to all experimental units. Medication program was applied to all experimental animals as it was needed.

3.4 Breeding Management

At the age of 8 months old of the male Kabir, the breeding study started using 1 male and 6 females in each experimental unit. A breeding period took for 3 incubation cycles of the eggs produced from each of the experimental units. Hand mating was often applied with the Kabir and female chicken to avoid breeding failure due to the larger size of the male Kabir.

3.5 Incubation Management

Eggs from every experimental unit was incubated separately with the use of artificial incubator. A 54-egg capacity incubator was used to incubate the eggs produced by the female chicken in each experimental unit. Holding period of eggs was 5 days before loading in the incubator. Uniform incubation management practices was employed to all animals under study.

3.6 Rearing Management

At hatching period, the chicks were brooded separately for a period of 8 weeks. After which, the chicks were hardened and reared in the same pens where the parent stock were housed until they reach sexual maturity or until point of lay. The parental/breeding stock were removed from the experimental pens and transferred to the other rearing areas to give way for the

Table 1. Production performance of the parent stock.

Parameters	Native x Native (Male-Female parent)	Kabir X Native (Male-Female parent)
Body Weight (kg.)	(M) 1.47±0.03 (F) 1.13±0.01	(M) 3.05±0.13 (F) 1.06±0.09
Egg characteristics:		
Egg weight (g)	34.26±2.33	^{ns} 34.87±1.42
Egg Length ((g)	4.92±0.02	^{ns} 4.98±0.10
Egg width (g)	3.58±0.06	^{ns} 3.60±0.05
Shape/size	72.29±0.04	^{ns} 72.76±0.09
Percent Egg Production (%)	**31.0±1.00	26.67±5.03
Fertility (eggs retained after 2 nd candling)	**81.0±3.46	73.67±8.02
Hatchability (%)	**31.0±16.52	18.17±15.22

** significant ($p \leq 0.05$)

^{ns} not significant ($p > 0.05$)

brooded chicks to be hardened and reared until sexual maturity. Both parent stock and progenies were reared in semi-confined environment where each group of six chickens had scavenging area of 3x3 meters and 3x3 meter house for roosting at night.

3.7 Data Collection

Data collected during breeding period includes laying performance of the native chicken in terms of percent egg production, egg characteristics produced by the parental stock in terms of color, egg size/shape ($SI = W/L \times 100$, a formula used by Carter, 1975), egg weight, egg length, egg width, shell thickness, surface area ($SA = 4.5118 \times L^{.289} \times B^{.3164} \times (EW)^{.4882}$, formula adopted from Carter, 1975) and breaking strength ($BS = 50.86 \times (EW)^{.915}$ formula adopted from Ar, et al. cited by Arad and Marder, 1982. At brooding period onward, the data collected includes; egg fertility, hatchability, chicks weight, survival/mortality rate, age and body weight at sexual maturity, egg qualities produced by the F1, and its growth performance. Data gathering was made until the end of the breeding study.

3.8 Data Analysis

All observations in each parameter were subjected to analysis of variance, and comparison was made using t-test.

4. Results and Discussion

4.1 Production Performance of the Experimental Animals (Parent Stock)

Table 1 presents the body weight, egg weight, length, width, size or shape index of the eggs, egg production and hatchability of the parent stock used in the study.

As indicated, the body weight of the male stock which was significantly higher or heavier for the Kabir male (3.05 kg.) than the native male (1.47 kg.) breeders. During mating time, the native female was tossed to the Kabir male to effect breeding and fertilization, while the native chicken pairs were just on its natural way of mating in the area where they were confined.

Eggs produced from the two crosses did not vary significantly in terms of egg

weight, length, width and egg size or shape. Female layers of the two groups were all native females. Thus, egg characteristics produced may not be affected even if the male breeder of the other group was Kabir. It can be deduced from this study that egg characteristics is not heritable from the male parent no matter how large it is unless the female parent is the one larger than the male. Female chicken has the greater influence on the eggs characteristics produced considering its maternal characteristics being responsible for egg formation and development. The result conforms with the idea of Niknafs, (2012), that magnitudes of heritability for egg production traits showed smaller heritability compared with growth traits.

In terms of the percentage of egg production, fertility and hatchability, the result showed significantly higher in both native parent stocks than the Kabir and native parent stocks. As indicated NC x NC parent obtained significantly higher egg production (31.0 ± 1.00), fertility (81.0 ± 3.46) and hatchability (31.0 ± 16.52) than the KC x NC parent stock.

The result corroborates with the study of Bondoc, 1998, on the performance of the native chicken under semi confinement system of production. The result can be implicated to the fact that native chicken can perform well if management is altered by doing semi-confinement. The result on the lower fertility and hatchability of the KC x NC parental stock can be reflected to the less aggression of the Kabir male on mating with female native chicken due to its heavier weights as compared to the female counterpart and production was only effected as a consequence of hand mating or teasing the female to the male Kabir to enhance mating.

4.2 Performance of the F1 Progenies Body weights and sexual maturity

Table 2 shows the body weights and weight gains, age at sexual maturity, feed consumption, feed conversion ratio, feed cost, survivability, and percent egg production of the two groups of progenies from mating NC x NC and KC x NC. The result indicated very close initial weights obtained (27.97 ± 7.41 vs. 28.33 ± 5.03 g) from the two groups of progenies, but significantly higher body weights, weight gain, and average daily gain for the progeny between KC x NC than those siblings of NC x NC. The observation on these parameters was all apparent from the start of the study up to the age at sexual maturity of the chickens under study. The result can be implied by the fact that Kabir is fast growers than their native counterpart. This result corroborates with the study of Leotarakul and Pimkamlai, (1999), revealing that improved breeds of chicken grow faster than the pure native chicken. Native, hybrid chicken can reach a marketable live weight of 1.2-1.4 kg after 8-12 weeks while pure native chicken reaches the same weight after reaching 16 weeks of age given the same feeding management.

Sexual maturity age was significantly lower for the KC/NC progeny with 190.33 ± 23.54 days than the NC/NC progeny with 247.67 ± 14.74 days. The result can be implicated to the fact that chicken near to sexual maturity is with reddish face and complete plumage, this characteristic is favored by various areas or regions. Most chemical constitutions of animal muscles other than moisture increase with age (Lawrise, 1985). At sexual maturity, there is considerable amount of vitamins, amino acids, minerals and (intramuscular) fat in bird's body. Therefore, meat from chicken close to sexual maturity is especially

nourishing and nutritive and has good taste and flavor (Chan and Sun, 1997). Selection for earlier sexual maturity would favor production efficiency and also marketing value of the chicken.

4.3 Feed Consumption, FCR and feed cost

Table 2 presents the feed consumption, feed conversion ratio and feed cost at sexual maturity of the two groups of F1 progenies. As indicated, feed consumption from the first month of age to sexual maturity between the two crosses were significantly higher in the Kabir-native group than the native-native progeny. Feed efficiency was significantly lower in the crossbred (progeny of the Kabir and native) with 7.5 g as compared to 8.93 g for the progeny from the native-native parent stock. The lower feed efficiency value signifies better response in body weight out of the feed consumed by the animals. Thus, the result indicated better feed efficiency of KC/NC progeny than the NC/NC progeny. Feed cost was very much higher for the progeny of Kabir and native chicken than

the opposite group of progeny. Based on computed feed consumption up to sexual maturity age, cost of feeds, and with the assumption of selling the chicken to an equal price of 140 pesos per kilo live weight, both showed negative return over feed cost. However, lower negative values was shown by the Kabir-native crossed. The higher feed cost of 243.15 pesos per head for the Kabir-native group is attributed to their higher feed consumption being noted in its inherent characteristics as voracious eaters and being also raised in semi-confinement where natural food is limited which makes the chicken more dependent on the feeds are given during the day. Pinoy Farmer, (2008), described Kabir as superior for meat conversion because of its rapid growth, good body conformation and efficient feed conversion and the present study conform with the idea.

4.4 Survival Rate

As also presented in Table 2, the two groups of progenies had a very acceptable survival rate from the first month throughout

Table 2. Performance of the F1 Crosses

Parameters	Native x Native (Pure bred)	Kabir x Native (Cross bred)
Initial weight (g)	27.97±7.41	^{ns} 28.33±5.031
Weight at sexual maturity (g)	1020.0±45.23	**1586.0±84.36
Weight gain @ sexual maturity	992.03±50.00	**1557.67±158.79
Ave. daily gain (g)	4.02±0.43	**8.34±1.90
Age at sexual maturity (d)	247.67±14.74	**190.33±23.54
Feed Consumption	8821.7±640.34	**11486.0±1644.89
FCR	**8.93±1.03	7.5±1.82
Feed cost at sexual @ sexual maturity(Php)	184.28±13.13	**240.51±34.76
Return over feed cost (Php)	** -41.48±0.04	-21.11±0.11
Survivability (%)	86.67±4.27	**93.33±2.85
% egg production	58.67±10.26	**74.0±6.56

** significant (p≤0.05) ^{ns} not significant (p>0.05)

sexual maturity. The crossbred (KC/NC progeny) had significantly higher survivability of 93.33 ± 2.85 percent survival rate than the NC/NC progeny having only 86.67 ± 4.27 percent from the first month up to sexual maturity, The result of this study is in contrary to the study of Namkhun et al., 2001 by which laying, growth and survival rates of improved native chicken were lower than the pure native chicken. The result of the present study may be attributed to the fact that chickens were confined in a partition, modified or altered management practice were applied which probably affected the natural fitness of the native chickens. Kajaroen et al., (1989), revealed that indigenous chicken is well-adapted to the conditions of typical resource-poor small-scale farms. Their resistance to hot climate and diseases is considerable higher than high-performance breeds or hybrids if they are reared naturally. Lambio, (2000), also claimed that native chickens are predominantly raised under the free-range system. And most farmers prefer to raise native chickens over the exotic breeds because of the low inputs and their inherent ability to survive in harsh environment.

4.5 Egg Production

Egg production between the two progenies was evaluated and compared. The result showed a significantly higher egg

production of 74 percent for the BC x NC crossbred compared to the NC x NC progeny with only 58.67 percent egg production closer to 57 percent as revealed in the study of Coligado, (1985). Namkhun et al., (2001), also revealed that the native chicken does not lay eggs continuously but tend to produce eggs in clutches, typically 2 to 4 per year.

4.6 Egg characteristics of F1 crosses

As indicated in Table 3, the shell color of the native-native chicken F1 as evaluated by a panel of evaluators was able to obtain a shell color values of 1.0-1.3 classified as white, while the Kabir-native F1 eggs were rated 2.0-2.4 which are the brown color. The color of eggs of both groups was pattern to their ancestral egg color dominance were native chicken usually produce white to creamy shell eggs while Kabir produces brown shelled eggs. The weight of eggs produced by the F1 crosses was significantly heavier for Kabir-native cross with 38.78 ± 2.68 g, while native-native cross was 33.88 ± 0.96 g eggs weights. This result may be attributed to the bigger

Table 3. Characteristics of the Eggs Produced by the F1 Crosses

Egg Characteristics	Native x Native (Pure bred)	Kabir x Native (Crossbred)
Egg shell color	1.0-1.3 (white)	2.0-2.4 (brown)
Egg weight (g)	33.88 ± 0.96	** 38.78 ± 2.68
Egg Length (cm)	4.83 ± 0.08	^{ns} 5.06 ± 0.06
Egg width (cm)	3.62 ± 0.04	^{ns} 3.84 ± 0.08
Shape/size	74.04 ± 1.75	** 76.82 ± 1.51
Shell thickness	0.045 ± 0.005	^{ns} 0.05 ± 0.007
Breaking Strength (g)	1277.45 ± 33.24	** 1448.65 ± 86.71
Surface Area	59.91 ± 1.51	** 65.59 ± 2.14

** significant ($p \leq 0.05$) ^{ns} not significant ($p > 0.05$)

size of the crossbred layer than the native chicken layers, Koelkebeck, (1999), claiming that hen's size and age primarily affect egg qualities being laid. Other egg characteristics such as egg length, egg width, shell thickness, did not vary significantly between two groups of F1 crosses, but egg size/shape, breaking strength and surface area were all significantly different and highly shown by the Kabir-native F1 group as compared to the native-native F1 group. The result was attributed to the larger size and younger age of the Kabir-native F1 than the native-native F1 which has a direct influence on their eggs produced. The same idea was reported by Koelkebeck, (1999), claiming that hen's size and age primarily affect egg qualities being laid.

Based on the results of the study, breeding/mating Kabir male with female native chicken needs teasing the female to effect mating to improve fertility and hatchability to avoid refusal of the native female chicken due to heavier weights of the Kabir. Weight increase and weight gains were notably shown by the F1 crosses from Kabir, and native chicken since weight characteristics of the Kabir breed is considered heritable trait. Feed consumption and costs were also highly performed by the progeny of Kabir and native chicken as influenced by its voracious eating habit. As to the egg qualities produced, progenies of Kabir and native chicken improved the physical qualities of the eggs as a result of the combination of the ideal egg characteristics of both parents. Crossbred of Kabir and native chickens elicit improvement of egg production and egg qualities performance under semi-confinement systems.

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