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## Effects of reciprocal crosses on egg production and egg weight of chicken

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### ABSTRACT

*In this study reciprocal mating was conducted between exotic chicken and locally purchased indigenous chicken from at the Department of Animal Breeding and Genetics, Bangladesh Agricultural University Mymensingh. The exotic chicken included White Leghorn (WL), RIR and Fayomi cocks and local cocks were mated to WL, RIR and Fayoumi hens naturally. Local cocks were mated to local hens in the pen as the control group. A total of 43 chicks in 4 genetic groups were raised up to 8 weeks under identical conditions. The objectives of the study is to keep record of egg production & egg weight of chicks hatched out of such reciprocal mating and compare the results in respect of egg production egg weight with control group (indigenous chickens). In conformity the performance of chicks produced by reciprocal mating among the two types in terms of egg production and egg weight were recorded. Egg production of the WL and Fayoumi was about double than that of indigenous and RIR, WL and Fayoumi compared to WL, Fayoumi and RIR. Growth rate, growth velocity and weight gain in Indigenous male × WL female, Indigenous × Fayoumi female and Indigenous male × RIR female was found by higher than that of WL male × Indigenous female, RIR male × Indigenous female and Fayoumi male × Indigenous female. Among the genotypes, Indigenous male × WL female had the maximum gain in body weight. The results obtained indicated that male line of indigenous chickens crossed with females of other breeds was significantly higher than the female line of indigenous chicken crossed with male of their breeds in their growth performance.*

**Key Words:** Egg production, egg weight, indigenous, chicken and reciprocal crosses

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### I. Introduction

The chicken of Bangladesh is indigenous in nature, small in size low producing. They are reared under rural conditional system of animal of Bangladesh in the coops of the villagers by following traditional system of animal husbandry. The birds are good scavengers and little or no concentrate was fed to

them by the farmers. They are susceptible to various infectious diseases and parasitic infestation. If the birds are saved from one or two infectious diseases they can survive well and adapt to the conditions under the existing husbandry practices in the rural area, But their productivity cannot be increased to any significant scale unless they are improved by selection and breeding.

Our birds are indigenous and have identical productive performance. But when observed minutely there is variation among indigenous birds in respect of egg production, egg size & egg weight. The little variation in the phenotypic characteristics of the birds in terms of body weight and size of eggs, demands emphasis but such in –depth observation in the productive performance of the birds is hardly met with in this country in connection with, poultry breeding. The enthusiasm and emphasis now are given to poultry raising is again limited to import of improved strains of birds or chicks from abroad. No attempt so far been taken to improve local chicken population of the country by means of scientific breeding. As a result the strategy to improve the local indigenous birds are out of sight and in this way no type of variety or strain suitable to our conditions to be developed is possible.

In the past, attempts were made to upgrade the indigenous birds by mating with cocks of white leghorn, Rhode red, New Hampshire, Plymouth Rock and White curnish in the Bangladesh Agricultural University Poultry Farm. In this endeavor, several grades of the birds were developed. But the grades developed could not exceed the productivity level of the pure exotic types. The first generation grades of different types recorded maximum improvement in respect of egg production & egg weight and the subsequent grades recorded a decline (Islam, 1969). From this experiment there is a clear indication that the local indigenous birds can well be improved by mating with cocks of improved exotic types (Hoque *et al.*, 1975). In an attempt to raise such birds such birds by using to local indigenous cocks and hens and improve variety cocks and hen, this piece of research was undertaken in poultry with the following objectives to:

1. Improve the local hen in terms of- (i). Egg Production; (ii). Egg Weight
2. Keep record of eggs and chicks hatched out of such reciprocal mating and compare the result in respect of egg production, egg weight with control group (Indigenous Chickens).

## II. Materials and Methods

The experiment was conducted in the Pot house of the Department of Crop Botany of Bangladesh Poultry breeding project on Reciprocal Recurrent Selection (RRS) is being worked out at the department of Animal Breeding and Genetics with the financial assistance of the BAURES. As a part of this project. this piece of poultry breeding experiment was conducted in the poultry shed established in the vicinity of Genetics Laboratory Reciprocal mating was conducted between exotic types and (included white leghorn (WL), Rhode Island Red (RIR) and Fayoumi). The indigenous adult birds were purchased (32 numbers) from the local market. The local hens were mated naturally to the exotic cocks and the local cocks were mated to the exotic hens.

The proposed reciprocal mating plan of indigenous with exotic is given below:

Indigenous cocks × White leghorn hens

Indigenous hens × White leghorn cocks

Rhode Island Red cocks × Indigenous hens

Rhode Island Red hens × Indigenous cocks

Indigenous cocks × Fayoumi hens

Indigenous hens × Fayoumi cocks

Also a control group of indigenous type was maintained.

## Management and Rearing

The day – old chicks were leg- banded and were transferred to the brooder house. After the brooding period was over, the chicks were transferred to growing house. The pullets of different types used in the experiment were of similar age and to uniform condition. They were raised separate pens according to genotype. Males of the respective pure types were used in the ratio of 1 exotic cock to 5 exotic hens and 1 exotic cock to 8 indigenous hens. The birds were fed with identical ration formulated with locally available ingredients. They were immunized against Ranikhet and Fowl pox and strict preventive measures were taken against other common infectious and parasitic diseases.

### Collection of Data

Eggs were collected once in a day and pen wise records were maintained weight off egg of different grades was taken daily. Before scuttling eggs, the incubator was properly disinfected. Both kerosene and electric incubators were used according to availability. Fertility was determined through candling of eggs at 7th and 14th day of in of incubation. The percentage hatchability was calculated on the basis of number of fertile eggs. The individual body weight of chicks at day -old and on subsequent weeks were kept up to eight weeks of age the records that were catalogued during the experimental period are:

1. Daily pen wise records of the first year egg production,
2. Egg weight and
3. Weekly body weight of chicks starting from day-old to eight weeks of age

The growth velocity was calculated with the following formula as described by [Chand et al. \(1996\)](#) for the different genetic groups.

$$\text{Growth velocity (GV)} = \text{FW} - \text{IW}$$

Where,

FW = Final body weight

IW = Initial body weight

### Method of data analysis

Analysis of variance was done to find out different the genotypes LSD/DMRT least squares analysis of variance was considered for the study (LS-ANOVA) and SAS package for body weight or growth performance of chicks in different crosses. The data obtained from the experimental chickens were analyzed for variances by Least-squares Method ([Steele and Torrie, 1980](#)) using SAS and MS Excel ("Version 7.0") computer program. The models for different parameters of the chicken in the least-squares analysis of the variances were:

$$Y_{ij} = \mu + \beta_i + e_{ij}$$

Where

$Y_{ij}$  = Record on the  $j^{\text{th}}$  observation of  $i^{\text{th}}$  genetic group

$\mu$  = Population mean

$\beta_i$  = Effect of  $i^{\text{th}}$  genetic group (WL, RIR, Fayoumi and Indigenous)

$e_{ij}$  = Error term

Student t-test was done to compare the effect of reciprocal cross (all genotypic performances). The formula for t-test was:

$$t(n_1 + n_2 - 2) = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\sigma^2 \left( \frac{1}{n_1} + \frac{1}{n_2} \right)}}$$

Where

$\bar{x}_1$  = Population mean of the 1<sup>st</sup> sample

$\bar{x}_2$  = Population mean of the 2<sup>nd</sup> sample

$n_1$  = Sample size of the 1<sup>st</sup> sample

$n_2$  = Sample size of the 2<sup>nd</sup> sample

$\sigma^2$  = Population variance of the two samples

$\sigma^2$  was estimated using the following formula:

$$\sigma^2 = \frac{\sum X_1^2 - \frac{(\sum X_1)^2}{n_1}}{n_1 - 1} + \frac{\sum X_2^2 - \frac{(\sum X_2)^2}{n_2}}{n_2 - 1}$$

## III. Results and Discussion

### Egg Production

The egg production of forty-three weeks starting from February to November for first generation of WL × ind, RIR × ind, fayoumi × ind and indigenous as shown in the [Table 01](#).

**Table 01. Egg Production of different genetic groups**

Crossbred	Number of eggs	number of hens	Mean $\pm$ SL
WL $\times$ Indigenous	465	8	58.125
RIR $\times$ Ind	292	9	32.444
Fayoumi $\times$ Ind	471	8	58.875
Indigenous	409	12	34.083

Mean indicated by the same alphabet was not statistically significant ( $p < 0.05$ )

The average number of eggs produced per type in the first generation was 58, 32, 58 and 34, respectively in WL $\times$  Indigenous. Egg Production of WL and Fayoumi was significantly higher than that all Indigenous and RIR Chicken raised under similar feeding and other management condition, increased egg production was found in Fayoumi and WL birds probably due to better adaptability to the local environment and the suitable combination of favorable genes egg production.

Analysis of variance on the data of egg production was done to test for the differences among the types and the results indicate that the difference in egg production for WL, RIR Fayoumi and Indigenous was significant (Table 02).

**Table 02. Analysis of variance (ANOVA) of egg production among four types**

Source of variation	d. f.	SS	MS	F	Significant level
Between groups	3	6007.7575	2002.5858	9.295	0.001
Within groups	33	7109.9722	215.4537		

Least significance different (LSD) test showed that egg production of WL and Fayoumi was significantly higher than that of RIR and indigenous. But there were no significant differences between RIR and indigenous and between WL and Fayoumi.

### Egg weight

The results obtained on egg weight of different genetic groups are presented in Table 03.

**Table 03. Average egg weight of forty-three weeks of different types**

Types	Months	Sun of 10 months off egg wt (g)	Average egg weight Mean $\pm$ SE
WT	Feb to Nov.	480.930	48.093 $\pm$ 0.588
RIR	Feb to Nov.	489.510	48.951 $\pm$ 0.875
Fayoumi	Feb to Nov.	48.851	48.851 $\pm$ 0.365
Indigenous	Feb to Nov.	41.216	41.216 $\pm$ 0.808

The average egg weight of indigenous, RIR, Fayoumi and WL and the lowest in Indigenous ( $p < 0.01$ ). These findings were in agreement with statement of Warren (1953) and Kamar (1960) who reported that egg weight inheritance was predominantly maternal egg weight being highly heritable, will response to selection and breeding for egg weight in any variety of laying flock selection and breeding programs for higher egg weight should be undertaken. Analysis of variance on the data of egg weight was done to test for the differences among the types and the results indicated that the difference was significant. Least significance difference (LSD) test showed that the egg weight of indigenous chickens was significantly different from exotic types. Egg of indigestions birds were significantly lower in weight that other types but were in significant among the eggs of RIR, Wl and Fayoumi.

**Table 04. Analysis of variance (ANOVA) of egg in four types**

Source of variation	Degrees of Freedom	Sun of squares	Mean square	Significant level
Between groups	3	416.843	138.948	
Within groups	36	184.725	5.131	0.001
Total	39	601.568	15.425	

## IV. Conclusion

It might be assumed that the Egg Production of WL and Fayoumi was significantly higher than that all Indigenous and RIR Chicken raised under similar feeding and other management condition, increased egg production was found in Fayoumi and WL birds probably due to better adaptability to the local environment and the suitable combination of favorable genes egg production. The average egg weight obtained in Indigenous, RIR, Fayomi and WL was 41.22, 48.95, 48.85 and 48.10, grams respectively. The average egg weight was significantly higher in RIR, WL and Fayoumi compared to Indigenous.

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