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Study on fertility, hatchability and body weight of chicken in reciprocal crosses

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ABSTRACT

In order to observe the effects of reciprocal crosses on fertility, hatchability and body weight of chicken an experiment was conducted between exotic chicken and locally purchased Indigenous chicken at the Department of Animal Breeding and Genetics, Bangladesh Agricultural University, Mymensingh-2202. Three types of exotic chicken breeds were used as 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 pens as the control group. A total of 43 chicks in 4 genetic groups were raised up to 8 weeks under identical conditions. Same management practices and feed were used for all the treated groups including control. Results revealed that weight at maturity was highest in 24 weeks of White Leghorn and Rhode Island Red but the lowest in Indigenous. Chickens weights varied different types in different types in different ages. The weight gradually decreased in WL and RIR but gradually increased in Fayoumi and Indigenous chickens. It showed that the higher growth rate, growth velocity & body weight (8 weeks) were found in case of Ind X WL, whereas, the lowest value was found in case of RIR×Ind. The average gain in weight of chicks in different stages up to eight weeks of the age of the different genotypes has also been shown in Table 2 where on an average, crossbred chicks Ind × WL, Ind × Fayoumi and Ind × RIR had the maximum gain in eight weeks of age. The general combining ability of the different exotic types which were mated reciprocally for growth rate and eight weeks body weight was non-significant although it was higher in case of WL. The growth rate, growth velocity & body weight were higher in male in case of overall reciprocal cross and lower in lower in case of specific reciprocal cross.

Key Words: *Fertility, hatchability, body weight, chicken and reciprocal crosses*

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I. Introduction

The rural chicken of Bangladesh needs development in aspect of their fertility, hatchability and body weight which might be possible by improved by selection and breeding. The improved strains of birds requires balanced feed and close and careful nursing, adequate defensive mechanist against infectious diseases expenditure incurred in raising exotic birds in this country is tremendously high whereas a portion of such expenditure can adequately be allocate for improvement of local poultry by breeding in this attempt there is no alternative to improve the local birds which are well adaptive to our Bangladesh condition. The question needs serious attention as an urgent piece of business in poultry raising as a matter of fact there is no way out to improve our stock other than by scientific breeding. From this theme there is a clear idea that the local indigenous birds can well be improved by mating with cocks of improved exotic types (Hoque *et al.,* 1975).

From such experience it is thought that for improvement of local birds there is no alternative except to raise birds for commercial use with increased yield and productivity. The genetic principles of talking advantage of heterosis for strain development by reciprocal crossing naturally come to the forefront. 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:

1. To improve the local hen in terms of-
   (a) Fertility
   (b) Hatchability
   (c) Body weight
2. To keep record of eggs and chicks hatched out of such reciprocal mating and compare the result in respect of Fertility, Hatchability, Body weight with control group (Indigenous Chickens).

II. Materials and Methods

The local hens were mated naturally to the exotic cocks and the local cocks were mated to the exotic hens. Also a control group of indigenous type was maintained. The necessary reciprocal crosses are: (1) Indigenous cocks × White leghorn hens, (2) Indigenous hens × White leghorn cocks, (3) Rhode Island Red cocks × Indigenous hens, (4) Rhode Island Red hens × Indigenous cocks, (5) Indigenous cocks × Fayoumi hens, and (6) Indigenous hens × Fayoumi cocks.

Bird Management and Care

The experimental birds were reared accordingly as per normal instruction for other birds and supplied with feed and water *ad libitum*. They were transferred timely to upper bird 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. The ratio of mating was 1 exotic cock to 5 exotic bens and 1 exotic cock to 8 indigenous hens. The birds were vaccinated with various types of vaccines according to the advice of a veterinary surgeon.

Collection and Analysis of Data

Necessary data from every treated and control pen was collected accordingly. Fertility was determined through candling of eggs on day 7 & 14 of in of incubation. The percentage hatchability was calculated on the basis of number of fertile eggs. The individual body weights of chicks were collected weekly including day 0.

The growth velocity was calculated with the following formula as described by Chand *et al.* (1996) using the formula: Growth velocity (GV) = FW-IW (Where, FW = Final body weight & FW = Initial body weight). Also LSD, DMRT and ANOVA were performed.

III. Results and Discussion

Weight at sexual maturity

The average weight at sexual maturity of pullets in different types was recorded when 20 to 25 percent pullets in catch groups started laying. Weight in different ages is show in Table 01. Weight at

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maturity was highest in 24 weeks of White Leghorn and Rhode Island Red but lowest in Indigenous. Chickens the Weight varied different types in different types in different ages. The weight gradually decreased in WL and RIR but gradually increased in Fayoumi and Indigenous chickens. The environmental factors were probably responsible to great urgent for the weight different among the types through the birds were raised under identical feeding and management conditions. Among the types early maturity and lower body weight at maturity were observed in white Leghorn and Fayomi white delay in sexual maturity was noted in RIR and Indigenous chickens. Differences in the body weight at naturally between WL RIR and fayoumi was negligible and significant variation was found at maturity compared to Indigenous.

Table 01. Mean and standard error of body weights of chickens at different weeks of age of four types

Type	Average body weight in graces				
	24 wks body ± SE	28 wks body wt Mean± SE	32 wks body wt Mean±SE	36 wks body wt Mean±SE	40 wks body Mean±SE
WL	1348.75±57.304	1256.25±55.150	1247.50±471	1198. 75±41.203	1245.80±30
RIR	1485.22±464.857	1422.22±73895	136.11±160.632	1372.22±57.319	1384.44±516.22
Fayoumi	1464.00±151.859	1345.00±56.001	1386.00±58.395	484.00±50.929	1479.00±1
Indigenous	903.16±62.907	945.05±60.831	987.89±143.465	1023.58±38.567	1040.53±3

Means with uncommon superscripts differ significantly (p<0.01)

Growth rate, growth velocity and body weight gain

The comparative studies of the growth rate growth velocity and live weight gain of chicks from hatching up to eight weeks of age are presented in Table 02. It showed that the higher growth rate, growth velocity & body weight (8 weeks) were found in case of Ind X WL, whereas, the lowest value was found in case of RIR×Ind. The average gain in weight of chicks in different stages up to eight weeks of the age of the different genotypes has also been shown in Table 02 where on an average, crossbred chicks Ind × WL, Ind × Fayoumi and Ind × RIR had the maximum gain in eight weeks of age.

Table 02. Mean and standard error of body weight of chickens at different weeks of age of four types

Group	Average Body weight (g)		
	Growth rate mean±SE	Growth velocity mean±SE	8 weeks body weight Mean ±SE
WL×Ind	5.243±0.339	12.278±0.433	328.85±19.706
Ind×WL	7.796±0.286	13.579±0.222	479.489±16.851
Fayoumi×Ind	5.822±0.259	9.457±0.429	360.44±14.475
Ind×Fayoumi	7.467±0.121	10.370±0.454	458.943±9.790
RIR×Ind	5.286±0.168	9.005±0.186	328.589±9.790
Ind×RIR	7.150±0.609	10.367±0.703	436.90±35.048

Means with uncommon superscripts different significantly (P<0.01)

General combining ability

In the present study the general combining ability (GCA) of the lines involved in the crosses were undertaken which were presented in Table 03.

Table 03. General combining ability of chicks produced by reciprocal mating

Group	Average Body weight (g)		
	Growth rate mean±SE	Growth velocity mean±SE	8 weeks body weight Mean±SE
WL	6.955±0.395	13.059±0.270	419.003±33.292
Fayoumi	6.782±0.273	9.990±0.334	417.90±16.287
RIR	6.218±0.273	9.686±0.424	382.875±26.475

Means with uncommon superscripts differ significantly (p<0.01)

The general combining ability of the different exotic types which were mated reciprocally for growth rate and eight weeks body weight was non-significant although it was higher in case of WL. The

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variation on general combining ability is attributable to additive variance in the population. The specific combining ability (SCA) has been found to account for very little of the genetic variance in commercial trains in Poultry Specific combining ability is attributable to the non –additive genetic variation (Hate and Claytom 1964). Production and adult mortality and found that only in egg weight could a significant portion of the genetic variance be attributed to SCA in all the other traits the additive traction plus reciprocal effects accounted for almost all the genetic variances Goto and Nordskog (1960). In an investigation of combining ability amongst meat type strains of fowl found general and specific components of genetic variance to be small.

Measurement of reciprocal effects of male and female lines

Overall and specific reciprocal effects of male and female lines were presented in Table 04 & 05.

Table 04. Overall reciprocal effect of indigenous male and female mated to different types reciprocally

Type	Growth Rate (gd)	Growth Velocity	8 weeks body weight(g)
	Mean=SB	Mean±SE	Mean=SE
Male line	7.633±0.186	11.813±0.427	463.78±10.586
Female Line	5.519±0.167	10.465±0.453	339.18±9.851

Means with uncommon superscripts differ significantly (p<0.01)

Table 05. Effect of specific reciprocal cross among four types

Type	Genotypes	Growth rate (g/d)	Growth Velocity	8 weeks body weight (g)
		Mean ± SE	Mean= SE	Mean=SF
Male Line	WL×Ind	5.42±0.339	12.28±0.433	328.35±19.7.6
	Fay×Ind	5.82±0.168	9.01±0.429	360.40±14.475
	RIR×Ind	5.29±0.168	9.01±0.186	328.85±9.790
Female Line	Ind ×WL	7.98±0.286	13.58±0.222	479.19±16.685
	Ind×Fay	7.47±0.121	10.37±0.454	458.94±7.750
	Ind×RIR	7.15±0.609	10.37±0.703	436.9±35.048

Means with uncommon superscripts differ significantly (p<0.01)

The growth rate, growth velocity & body weight were higher in male in case of overall reciprocal cross and lower in lower in case of specific reciprocal cross. It may be inferred that WL, RIR , Fayoumi and Indigenous and their crosses exhibited significant direct genetic effects and specific heterosis in growth where reciprocal mating would be suitable for commercial production.

IV. Conclusion

The average percentages of fertility obtained in WL, RIR, Fayoumi and Indigenous were higher compared to WL, RIR and Fayoumi. But the proportion of fertility between types was statistically significant (p<0.01). The poor hatchability obtained in the present study was possibly due to poor incubator management and care. The live weight gain of the experimental chicks was proportionate to the increase in weight at different stages of growth of chicks. The weight of chicks obtained by mating sires to other types of darns was almost similar but much higher than that of the sires of the other types mated to respective dams (WL, RIR and Fayoumi) at all ages from hatching to eight weeks of age. The general combining ability of the different exotic types which were mated reciprocally for growth rate and eight weeks body weight was non-significant .On the other hand growth velocity was found to be significantly higher for WL. The overall reciprocal effects of Indigenous males and females mated to different types have been presented. The analysis of variance effect on growth rate, growth velocity and 8 weeks body weight. The mean variances and t value among male line (Indigenous) and female line (Exotic types) are presented. The significant heterotic effect was observed for all the traits. Chicks of Indigenous male × WL female Indigenous male × Fayomai female and Indigenous male × RIR female crosses weighed heavier than their counterparts of reciprocal crosses. The growth rate, growth velocity & body weight were higher in male in case of overall reciprocal cross and lower in lower in case of specific reciprocal cross. The significant he exotic effects were observed for all the trains. It may be inferred that WL, RIR , Fayoumi and Indigenous and their crosses exhibited significant direct

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genetic effects and specific heterosis in growth where reciprocal mating would be suitable for commercial production, but it needs more in-depth investigation.

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