

## A Study on the Performance of Fayoumi, Rhode Island Red and Fayoumi × Rhode Island Red Chickens under Rural Condition of Bangladesh

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**ABSTRACT:** Two months old Fayoumi, Rhode Island Red, and Fayoumi × Rhode Island Red chickens were reared upto 512 days of their age in the villages surrounding Bangladesh Agricultural University in order to study comparative performances of the 3 genetic groups with or without extra feeding to scavenging system of rearing and also, to study the suitability of these breeds reared under the rural condition. Fayoumi attained earlier sexual maturity (238.5 vs 262.5 d) and laid more eggs than other breeds/types. Rhode Island Red produced the largest eggs, but mortality rates were highest and Fayoumi showed greatest resistance to diseases. Crossbred was heaviest (1,275 g at 247.5 d of age) and

had highest hatchability than parental breeds. Age at sexual maturity (247.5 d), 50% egg production, peak production and mortality in crossbreds were mostly influenced by sire Fayoumi but for the egg weight and body weight, the effect of the dam Rhode Island Red was significant. Extra feeding was found more beneficial to the chickens irrespective of breeds and types. The crossbred Fo × RIR chickens were found more suitable under rural scavenging system than the exotic breeds, Fayoumi and Rhode Island Red in the rural areas of Bangladesh.

**(Key Words:** Fayoumi, Rhode Island Red, Crossbreeding, Laying Performance, Scavenging System, Bangladesh)

### INTRODUCTION

Small scale poultry production is a traditional practice in all Asian countries (FAO, 1987) and chickens are an important component in the integrated rural farming system in this region (Aini, 1990b). In Bangladesh, almost three-quarters of rural families keep poultry in small numbers in backyard or under traditional scavenging system (Panda, 1989). The traditional system of poultry rearing is still considered quite efficient in the rural areas of Asian countries as the capital and labor, and the production cost for per kg of egg or per kg of meat is extremely low (Aini, 1990a). In Bangladesh 78% of total egg and 86% of total meat production come from rural scavenging poultry (Alam, 1995). Bangladesh registered about 7% and 24% of annual growth rates in egg and meat production, respectively, during the past decade and the bulk of increase came from the small rural poultry units (Panda, 1989). Despite these positive indicators, further expansion of poultry production in the country is being severely hampered by lack of suitable

stocks (Panda, 1989), continuing shortages of traditional concentrate feed ingredients (Ravindra and Blair, 1991) and disease prevalence under rural free range condition (Aini, 1990b). The main problem of the indigenous chickens is that they are poor producer of egg and meat. In addition, the adaptability of exotic breeds under the climate of Bangladesh is also a great problem for their susceptibility to heat and diseases than the local chickens. The environmental conditions under which poultry are kept and imbalanced diets do not permit to express the full genetic potentials of exotic breeds (Barua and Howlider, 1990). Therefore, a suitable stock is necessary that will thrive well under all existing natural hazards in the rural free range condition. Considering the problems, crossbreeding or upgrading involving indigenous chickens or alike with standard exotic breeds has been recommended to improve the quality of stocks suitable for rural condition (FAO, 1987). Several attempts had been made in order to evolve a suitable variety by upgrading the indigenous chickens with standard exotic breeds but none of them became successful (Barua and Howlider, 1990).

Fayoumi is an Egyptian native tropical breed improved for egg production and reported to be well

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adapted under farm conditions in Bangladesh (Anisuzaman, 1988). Although the egg size is almost similar in both Fayoumi and local hens, the former produces more eggs than the later ones. As the egg size of Fayoumi is smaller than other standard exotic breeds, it can be improved by crossing with improved breeds like White Leghorn and Rhode Island Red chickens. There are many reported works on crossing of Fayoumi with exotic breeds to improve egg production, egg size, viability and body weight. Ali (1989) indicated that crossing Fayoumi with other standard exotic breeds improved egg size, growth rate, and adaptability in the crossbreds under farm condition of Bangladesh. No investigation has yet been made on the comparative performance of Fayoumi, Rhode Island Red and their crossbreds chickens under free range scavenging system. Moreover, it is unknown whether feed supplementation to scavenging would improve performance of these breeds under free range condition. Therefore, the present study was designed to compare the performance of Fayoumi (Fo), Rhode Island Red (RIR) and their crossbreds (Fo × RIR) with or without extra feeding under rural scavenging condition of Bangladesh.

## MATERIALS AND METHODS

The study was conducted in the villages surrounding the Bangladesh Agricultural University at Mymensingh.

### Management condition

#### Birds

Two months old 240 Fayoumi (40 ♂ + 200 ♀), 240 Rhode Island Red (40 ♂ + 200 ♀) and 240 Fayoumi × Rhode Island Red (40 ♂ + 200 ♀) chickens were distributed randomly among 120 previously selected small and marginal farmers who have reared chickens. Each farmer received 1 male and 5 female chickens which were maintained with or without extra feeding under scavenging system for a period of 512 days of age. Each farmer received one breed or type. Prior to the distribution of experimental birds, all the birds possessed by the farmers were removed. Extra feeding to birds was provided by 60 farmers (each genetic group was distributed to 20 farmers), whereas birds of the rest were left without feed. Each genotype of bird replicated into 10 groups in each feeding regime.

#### Housing

Birds in each group were properly identified by wing bending. All birds were kept as scavengers as generally practiced by the villagers. During the day, the birds

roamed freely as far as they liked to scavenge for food and at night they returned to their sheds. Sheds made of materials that were easily available in the area such as bamboo or wooden planks were provided, they were built at the back of the owner's houses. Roof was made of palm thatch or galvanized iron. Feed and water troughs were also made of local materials or old plastic or aluminium basins.

### Feeding and disease prevention

Chickens were usually fed once or twice times in a day (in the morning and in the evening) as generally practiced in the rural poultry rearing. In the morning each bird received an average of 30 g of commercial grower feed mixture (containing 16% CP and 2,700 kcal/kg) until they laid their first egg and then 40 g of commercial layer ration (containing 18% CP and 2,800 kcal/kg) per bird per day. For the rest of the day the chickens were kept free to find their own food. The diet under scavenging usually consisted of earthworms, varieties of insects, young shoots, grasses and fruits. In the evening birds were fed kitchen wastes, left-over of food materials such as rice or other foods as were available in the rural house hold. Birds were vaccinated according to routine procedure and dewormed once in every two months.

### Data collection and statistical analysis

The following records were collected during the experimental period:

- (1) Age at sexual maturity determined by the first egg laid by the pullets belonging to each group, age at 50% egg production; age at peak egg production and egg production upto 512 days of age;
- (2) Body weight and egg weight at sexual maturity, at peak egg production and at 512 days of age;
- (3) Hatchability of eggs collected from 3 groups of birds were hatched by broody hens and mortalities were recorded daily for each group when occurred.

The data collected on various parameters were analyzed for a 3 (breed) × 2 (feeding regime) factorial experiment in Completely Randomized Design. The variance was partitioned into breed, feeding regime, breed × feeding regime interaction and error for comparison.

## RESULTS

### Egg production performances

Fayoumi attained sexual maturity, 50% egg production and peak egg production at an earlier age followed by Fo × RIR and RIR, respectively (table 1). In all the above mentioned parameters the birds fed extra feed to

**Table 1.** Egg production performance of Fayoumi (Fo), Rhode Island Red (RIR) and Fayoumi × Rhode Island Red (Fo × RIR) with or without extra feeding under free range scavenging system

Parameters	Breed (B)	Feeding regime (F)			Level of significance and SED		
		Without extra feed	With extra feed	Mean	B	F	B × F
Age at sexual maturity (days)	Fo	238.5	212.0	225.3	0.87*	0.67*	1.15*
	Fo × RIR	247.5	219.0	252.3			
	RIR	262.5	242.5	252.5			
	Mean	259.5	224.5	237.0			
Age at 50% egg production (days)	Fo	255.0	223.5	239.3	1.17*	1.45*	2.50 <sup>NS</sup>
	Fo × RIR	270.0	235.5	252.8			
	RIR	285.0	261.5	273.3			
	Mean	270.0	240.8	255.1			
Age at peak production (days)	Fo	276.0	237.0	256.5	1.03*	0.84*	1.50*
	Fo × RIR	288.5	244.5	266.5			
	RIR	308.5	280.5	294.5			
	Mean	291.0	254.5	272.5			
Egg production upto 512 days of age (No.)	Fo	57.5	84.5	71.0	0.93*	0.93*	1.31*
	Fo × RIR	54.5	82.5	68.5			
	RIR	51.5	76.0	63.7			
	Mean	54.5	81.0	67.8			

\*  $p < 0.05$ ; NS = Not significant; B= Breed; F= Feeding regime; B × F= Breed and feed interaction.

scavenging had significantly better performances than those without extra feed group ( $p < 0.05$ ). However, data revealed that these parameters in crossbreds were more influenced by the sire Fo than by the dam RIR. Genetic group differences in age at sexual maturity and age at peak egg production were wider with birds on extra feed. Unlike other genetic groups, enhancement of sexual maturity due to extra feeding was negligible in RIR, whereas genetic group effect on age at 50% egg production was not altered by the feeding regime. Fayoumi laid approximately 10.2% more eggs than that of RIR and crossbred was intermediate between their parental breeds during the whole experimental period of 512 days of age (table 1). Extra feeding increased average egg production by approximately 32.7% in all genetic groups. Egg production in crossbreds receiving extra feed was significantly higher than the average of the parental breeds but that was not observed in those birds received no extra feed ( $p < 0.05$ ).

#### Body weight and egg weight performances

Fo × RIR crossbred chicken was the heaviest at sexual maturity, peak egg production and at 512 days of age. RIR was intermediate and Fo was lightest at all ages

(table 2). Provision of extra feed significantly increased live weight ( $p < 0.05$ ), except for body weight at sexual maturity. Egg weight at sexual maturity, at peak production, and at 512 days of age in Fayoumi were approximately 21.6%, 19.2% and 20.9% lighter than that of RIR, respectively (table 2). Average egg weight of Fo × RIR was in between the parental breeds. However, egg laid by crossbred birds had a tendency to be closer or was not significantly different to that of RIR dam. However, feed supplementation increased egg weight at the rate of approximately 13.7%, 12.3% and 12.2% at sexual maturity, peak production and at 512 days of age, respectively (table 2). Figure 1 shows the correlation between body weight and egg weight in 3 groups of birds. A significant positive correlation was observed between the body weight and egg weight parameters in all groups of birds irrespective of feeding regime ( $p < 0.05$ ).

#### Hatchability

Hatchability in Fo × RIR was highest followed by RIR and Fayoumi (table 3). Birds received extra feed had approximately 15.6% higher hatchability than those received no extra feed. Genotypes and feed effects were independent on hatchability.

**Table 2.** Body weight and egg weight performances of Fayoumi (Fo), Rhode Island Red (RIR) and Fayoumi × Rhode Island Red (Fo × RIR) with or without extra feeding under free range scavenging system

Parameters	Breed (B)	Feeding regime (F)			Level of significance and SED		
		Without extra feed	With extra feed	Mean	B	F	B × F
Body weight at sexual maturity (g)	Fo	1,150.0	1,265.0	1,210.0	4.59*	3.74*	6.48 <sup>NS</sup>
	Fo × RIR	1,275.0	1,400.0	1,337.0			
	RIR	1,247.0	1,345.0	1,296.3			
	Mean	1,225.8	1,336.7	1,281.3			
Body weight at peak egg production (g)	Fo	1,275.0	1,350.0	1,303.8	2.03*	1.66*	2.88*
	Fo × RIR	1,510.0	1,660.0	1,585.0			
	RIR	1,480.0	1,597.5	1,538.8			
	Mean	1,415.8	1,525.8	1,475.8			
Body weight at 512 days of age (g)	Fo	1,660.0	1,960.0	1,810.0	3.27*	2.67*	4.62*
	Fo × RIR	1,985.0	2,222.5	2,103.8			
	RIR	1,940.0	2,165.0	2,052.5			
	Mean	1,861.7	2,115.8	1,988.8			
Egg weight at sexual maturity (g)	Fo	30.5	33.0	31.8	0.41*	0.33*	0.58*
	Fo × RIR	34.0	39.5	36.8			
	RIR	37.5	43.5	40.5			
	Mean	34.0	38.7	36.3			
Egg weight at peak egg production (g)	Fo	34.0	37.5	35.6	0.38*	0.31*	0.53 <sup>NS</sup>
	Fo × RIR	38.0	43.5	40.5			
	RIR	41.5	47.0	44.3			
	Mean	37.8	42.5	40.7			
Egg weight at 512 days of age (g)	Fo	35.0	39.0	37.0	0.49*	0.40*	0.70*
	Fo × RIR	40.0	45.0	42.5			
	RIR	44.0	49.5	46.8			
	Mean	39.7	44.5	42.1			

\*  $p < 0.05$ ; NS = Not significant; B = Breed; F = Feeding regime; B × F = Breed and feed interaction.

### Mortality

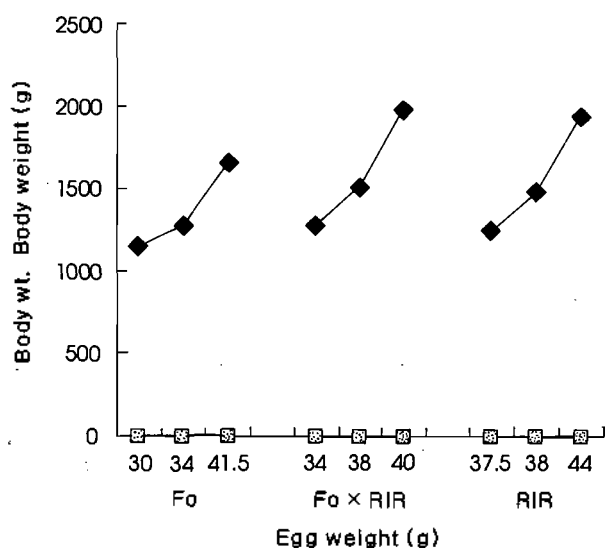
Mortalities of birds were highest in RIR, intermediate in Fo × RIR and lowest in Fayoumi (table 3). Extra feeding decreased mortality rate by approximately 35.5%. Genotype and feed supplementation were independent in effect on mortality.

### DISCUSSION

The major findings of this study are: (1) Fayoumi achieved sexual maturity and reached peak egg production earlier as well as produced highest number of eggs with lowest mortality rate than that of RIR, while their crossbreds were in intermediate in all these traits; (2) crossbreds showed heterosis in body weight and

hatchability, while heterosis in egg production was observed only when birds were provided with extra feed; (3) RIR laid largest eggs and the egg weight of crossbreds was in between their parental breeds.

Earlier sexual maturity in Fayoumi than RIR and intermediate position of Fo × RIR as observed in this study have also been reported by previous workers (Amer, 1965; Badreldin et al., 1961; Ragob et al., 1961). Crossbreds from Fo × RIR had closer tendency in attaining sexual maturity with that of sire breed Fayoumi. Badreldin et al. (1961) reported that Fayoumi attained sexual maturity earlier than that of RIR and White Leghorn, and crossbred sired by Fayoumi showed closer tendency in attaining sexual maturity towards the sire Fayoumi than dam breeds under Egyptian tropical condition. Similar results were also reported by Warren



**Figure 1.** Correlation between body weight and egg weight of Fayoumi (Fo), Fayoumi  $\times$  Rhode Island Red (Fo  $\times$  RIR) and Rhode Island Red (RIR) laying hens reared on without extra feed to scavenging condition. Values for egg weight represent at age at sexual maturity, at peak production and at 512 days of age, respectively for each group of genotype.

(1953). In addition, feed supplementation to scavenging led to the improvement of these traits under rural conditions of Bangladesh. Published literature on age at 50% egg production and age at peak egg production are very scanty and difficult to compare with those obtained in the present study. However, it was found that these traits showed similar trends to that of the age at sexual maturity. Therefore, crossbreeding with sire Fayoumi and dam RIR reduced the age at sexual maturation, 50% egg

production and peak egg production in crossbred birds.

Crossbred birds were heavier at sexual maturity than birds of parental breeds. Kamar et al. (1978) reported that crossbred from Fayoumi and RIR showed heterosis in body weight. Lighter body weight of Fayoumi than RIR as obtained in the present study are also in agreement with the findings of Amer (1965) who reported the body weight of Fayoumi and RIR at the age at sexual maturity was 1,092.1 g and 1,516.4 g, respectively. The results of the present study also indicate that expression of heterosis in body weight was enhanced in improved nutritional condition. The same trend was also observed in the body weight at peak production and at 512 days of age where both the breed and feeding regime acted in additive manner. Therefore, it is suggested that breed and feed influenced body weight of crossbred birds.

It is established that egg weight is negatively correlated with the age at sexual maturity but positively correlated with the body weight of birds. Kheireldin et al. (1978) reported that breed has a significant effect on egg weight. The lightest egg weight of Fayoumi than that of RIR are also in accordance with the findings of other researchers. Amer (1965) reported that the egg weight of Fayoumi was 39.6 g and that of RIR was 50.1 g. The egg weight of Fo  $\times$  RIR were in between the parental breed both in the without feed supplementation group and extra feeding group. This result supports the findings of Mostageer and Kamar (1961) who obtained a similar trend in egg weight of Fayoumi, Fo  $\times$  RIR and RIR chickens, however, smaller eggs obtained in the present study in all genetic groups might be due to the nutritional stress in free range system. Heuser (1936) also reported such stress in chicken to occur. The closer tendency of the egg weight of crossbred to that of dam RIR as found

**Table 3.** Hatchability and mortality rates of Fayoumi (Fo), Rhode Island Red (RIR) and Fayoumi  $\times$  Rhode Island Red (Fo  $\times$  RIR) with or without extra feeding under free range scavenging system

Parameters	Breed (B)	Feeding regime (F)			Level of significance and SED		
		Without extra feed	With extra feed	Mean	B	F	B $\times$ F
Hatchability of eggs on total eggs (%)	Fo	70.0	80.0	75.0	0.12*	0.10*	0.24 <sup>NS</sup>
	Fo $\times$ RIR	80.0	95.0	87.5			
	RIR	75.0	85.0	80.0			
	Mean	75.0	86.7	80.8			
Mortality upto 512 days of age (%)	Fo	20.0	10.0	15.0	0.28*	0.16*	0.28*
	Fo $\times$ RIR	20.0	15.0	17.5			
	RIR	30.0	20.0	25.0			
	Mean	23.3	15.0	19.2			

\*  $p < 0.05$ ; NS = Not significant; B = Breed; F = Feeding regime; B  $\times$  F = Breed and feed interaction.

in the present study also revealed that egg weight inheritance is predominantly maternal. This was also reported by Hays (1941) and Mostageer and Kamar (1961). It is suggested that crossbreeding as well as provision of additional feed to scavenging may improve egg weight.

There is no published information on the egg production of Fayoumi, Fo × RIR and RIR under rural scavenging condition. However, the egg production rate obtained in the present study corresponds with the findings of Azizul (1980) under the farm condition of Bangladesh. This author reported that Fayoumi laid more eggs than that of RIR. In contrast to the egg production of birds without extra feed group, heterosis in egg production was observed in birds which received extra feed. Hartman (1991) reported that crossbreeding may influence the expression of heterosis in egg production of laying hens. Therefore, the results indicate that under the rural scavenging condition of Bangladesh additional provision of feed substantially increased the egg production of Fo × RIR crossbred chickens. Results on the hatchability of eggs of Fayoumi on total eggs basis as observed in the present study are in line with the findings of Kamar et al. (1978). EL-Gamal and Hassan (1980) reported that breed and crossing had significant influence on the hatchability of eggs. Higher hatchability of eggs of Fo × RIR crossbred chickens than their parental breeds are also in agreement with that reported by Lax (1965) and Trail (1962).

Mortality rate for Fayoumi found in this study was similar to that reported by Anisuzzaman (1988) who obtained approximately 17% mortality under farm condition. On the other hand, mortality (per cent) for RIR recorded in this study agreed well with the findings of Chowdhury et al. (1983). An intermediate mortality in the crossbreds compared to parental breeds is in accordance with the observation of Azizul (1980) and Ghostly and Nordskog (1951). Provision of extra feeding reduced the mortality of birds significantly in all groups of birds.

As observed in the present study, under the similar rural scavenging condition without extra feeding the Fo × RIR crossbred chickens produced approximately 55 eggs in 265 days, had a mature body weight of approximately 2.0 kg in 290 days of age. In contrast, indigenous Bangladeshi chickens laid 35-40 eggs per year (Sazzad et al., 1990) with a mature body weight of 1.0-1.2 kg (Okada et al., 1987). It appears that Fo × RIR had the advantage for larger egg size, body weight of RIR, and precocity, egg production and disease resistance of Fayoumi to perform satisfactorily under the rural scavenging system of management. It also reveals that Fo

× RIR crossbred chicken with extra feeding to scavenging performed better than indigenous chickens under the same rural condition and may be a good stock for rural farmers to rear economically under their condition.

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