



Estimation of feed efficiency traits in complete diallel cross of Indian native chicken breeds with CARI-Red

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ABSTRACT

A complete 3x3 diallel cross experiment involving three chicken breeds namely Aseel Peela (AP), Kadaknath (KN) and CARI-Red (CR) were used for comparison of performance of pure and crossbred chickens for feed conversion ratio (FCR) and its heterosis percentage. It was quite interesting to note that FCR was low in first few weeks of brooding, but gradually incline thereafter. Among the purebreds CR had lowest FCR values and KN had highest FCR values at 0-8, 0-16 and 0-20 week of age. With respect to FCR values from 0 week to 20 week of age in purebreds CR had lowest values (4.23) followed by AP (4.67) and KN (4.77). Whereas in case of crossbreds CR x KN recorded lowest values (4.69) followed by KN x CR (4.75), AP x CR (4.78), CR x AP (4.97), KN x AP (5.34) and AP x KN (5.39). It was concluded that, in most of the cases crossbreds in general had better FCR than purebreds. The heterosis percentages for FCR are reveals that in most of the cases the heterosis percentages was negative.

Key words: Feed conversion ratio, Heterosis percentage, Diallel cross, Chicken breeds.

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INTRODUCTION

Protein deficiency, especially inadequate animal protein intake is a persistent problem in most of Indian population. According to FAO, India's poultry meat consumption is expected to increase 37% between 2012 and 2021. Therefore, it is highly essential to give attention to the native indigenous birds whose slight improvement will result into the large availability of egg and meat for the rural people at cheaper rate but feed accounts for more than 70% of poultry production costs [1, 2, 5] and one of the most effective ways to improve feed conversion is through breeding. Feed conversion efficiency is higher in poultry crossbred as compared to purebred thus, play very important role in increasing profits in poultry production [8]. India is one of the richest poultry genetic resource countries in the world with 20 indigenous breeds [21, 13]. Among the bio-diverse germplasm of India, Kadaknath (KN), popularly known as "Kaala Maasi", well-recognized indigenous breed, is a native to central India (Madhya Pradesh and few districts of Rajasthan and Gujarat), [3, 17-20]. Aseel is the oldest game breed from Indian subcontinent. The Aseel breeds are available in coastal areas of Andhra Pradesh. These birds are also found among cock fighting lovers throughout the country [7, 14, 16, 22, 23]. It is biggest in size among all the Indian native chickens, which measure 28 inches from back to toe. CARI- Red is dual purpose breed with heavy body weight. It is developed at Humboldt University, Berlin, Germany. The present investigation was aimed to study the feed efficiency traits in a 3 x 3 full diallel cross of two native chicken breeds with CARI- Red.

MATERIAL AND METHODS

138, 96 and 120 females and 23, 16 and 20 male birds of Aseel Peela, CARI-Red and Kadaknath respectively were utilized in a 3x3 full diallel cross experiment which resulted into three crossbred, three reciprocal and three purebred genetic groups which are plotted as follows

Table 1. Mating design and genetic groups

Male Female	AP	KN	CR
AP	AP x AP	KN x AP	CR x AP
KN	AP x KN	KN x KN	CR x KN
CR	AP x CR	KN x CR	CR x CR

As per the mating plan, the hens were inseminated by deep intravaginal technique (approximately 100 million spermatozoa) with the semen collected from the respective males by abdominal massage technique (Burrows and Quinn, 1973). A total of 1837 eggs were incubated and 1298 good chicks were obtained in a single hatch. From this population 720 healthy birds were chosen (80 birds on each group) for present investigation. The chicks were brooded up to 6 weeks of age in battery brooder following standard brooding management practices, then shifted to deep litter and managed with *ad libitum* feeding and watering. Ration of chicks and grower were prepared at CARI Izzatnagar and were allotted to each group throughout the trial period. Body weight and feed intake were recorded biweekly up to 20 week of age. From these records FCR were calculated in each genetic group on combined sex basis at biweekly interval up to 20 weeks of age.

Feed conversion ratio

The weight gain was estimated by subtracting the weight at beginning from the weight at end of particular duration. Similarly, the feed consumed was also measured by subtracting the total residual feed from total feed offered in particular duration to each genetic group. The FCR of each period was calculated by using the formula as follows:

$$FCR = \frac{\text{Feed consumed (g) during the period}}{\text{Total body weight gain (g) during the period}}$$

Estimation of heterosis

The estimation of heterosis for each cross was calculated in terms of percent value over the performance of the purebreds.

Heterosis (absolute value) = average of a crossbreds – average of two purebreds

Heterosis % = 100 x Heterosis (absolute)/ average of two purebreds.

RESULT AND DISCUSSION

Feed conversion ratios of combined sex for different genetic groups from 0 wk to 20 wk of age are presented in table (2). It was evident that among the purebred CR had lowest FCR values and KN had highest FCR values at 0-8, 0-16 and 0-20 wk of age. With respect to FCR values from 0 wk to 20 wk of age in purebreds CR had lowest values (4.23) followed by AP (4.67) and KN (4.77). Whereas in case of crossbred cross CR x KN recorded lowest values (4.69) followed by cross KN x CR (4.75), AP x CR (4.78), CR x AP (4.97), KN x AP (5.34) and cross AP x KN (5.39). In most of the cases crossbreds in general had better FCR than purebreds. The magnitudes of FCR obtained in present study are in agreement with the report of Sakthivel, [12] and Bhatti, *et al.*, [4]. The present finding of differences among genetic group for FCR was also reported by Jha and Prasad, [10]; Singh *et al.*, [15]; Elangovan *et al.*, [9] Cahaner *et al.*, [6]; and Reddy *et al.*, [11].

Table 2. Feed conversion ratio (FCR) for different genetic groups (upto 20th wk)

GG	FCR						
	0-2wk	3-4wk	5-6wk	7-8wk	9-10wk	11-12wk	13-14wk
Pure							
AP x AP	2.56	3.27	3.69	4.34	4.85	5.04	4.89
KN x KN	3.93	3.67	4.15	5.32	5.99	4.17	4.86
CR X CR	2.13	2.69	3.01	2.6	5.32	4.13	4.47
Crossbred							
KN x AP	2.61	2.59	3.59	4.55	7.46	5.6	5.27
CR x AP	2.39	2.83	3.38	3.25	6.23	6.19	4.79
AP x KN	2.59	3.35	3.68	4.75	5.44	5.38	5.09
CR x KN	2.87	3.09	3.55	3.93	5.67	4.35	4.51
AP x CR	2.53	2.74	2.9	3.8	6.2	4.42	4.47
KN x CR	3.04	3.06	3.42	3.57	6.52	4.8	5.08

Table 2. Contd....

GG	FCR					
	15-16wk	17-18wk	19-20wk	0-8wk	0-16wk	0-20wk
Pure						
AP x AP	6.19	7.24	3.66	3.71	4.6	4.67
KN x KN	7.26	6.08	3.04	4.39	4.99	4.77
CR X CR	6.99	6.85	4.27	2.71	3.97	4.23
Cross bred						
KN x AP	8.7	8.93	4.45	3.61	5.16	5.34
CR x AP	7.67	5.87	5.46	3.13	4.79	4.97
AP x KN	8.92	7.43	5.35	3.9	5.12	5.39
CR x KN	6.86	7.96	4.16	3.53	4.44	4.69
AP x CR	7.04	8.01	4.98	3.14	4.38	4.78
KN x CR	7.36	7.48	3.9	3.37	4.64	4.75

The heterosis percentages for FCR are presented in table (3), which reveals that in most of the cases the heterosis percentages was negative.

Table 3. Heterosis (%) for Feed conversion ratio (FCR) in different crosses

Cross	FCR						
	0-2wk	3-4wk	5-6wk	7-8wk	9-10wk	11-12wk	13-14wk
KN x AP	-0.2	-0.25	-0.08	-0.06	0.38	0.22	0.08
CR x AP	0.02	-0.05	0.01	-0.06	0.23	0.35	0.02
AP x KN	-0.2	-0.03	-0.06	-0.02	0	0.17	0.04
CR x KN	-0.53	-0.51	-0.5	-0.5	-0.5	-0.48	-0.52
AP x CR	0.08	-0.08	-0.13	0.1	0.22	-0.04	-0.04
KN x CR	-0.5	-0.52	-0.52	-0.55	-0.42	-0.42	-0.46

Table 3. Contd.....

Cross	FCR					
	15-16wk	17-18wk	19-20wk	0-10wk	0-16wk	0-20wk
KN x AP	0.29	0.34	0.33	-0.11	0.08	0.13
CR x AP	0.16	-0.17	0.38	-0.02	0.12	0.12
AP x KN	0.33	0.12	0.6	-0.04	0.07	0.14
CR x KN	-0.52	-0.38	-0.43	-0.5	-0.5	-0.48
AP x CR	0.07	0.14	0.26	-0.02	0.02	0.07
KN x CR	-0.48	-0.42	-0.47	-0.53	-0.48	-0.47

The negative heterosis percentage value indicated that the crossbred had less FCR value than pure bred, which is mostly desired. The finding of Jha and Prasad, (2013); Singh *et al.*, (2005) and Sakthivel, (1999) are similar to the above research findings.

CONCLUSION

The present study was conducted to compare the feed efficiency of Aseel, Kadaknath, CARI – Red and their cross under intensive system of management. This study showed that crosses birds showed much better performance in terms of FCR and its heterosis percentage as compare to their purebreds.

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