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Comparative production performance of three crossbreds of Aseel#

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Abstract

An experiment was carried out to assess and compare the production performance of Aseel × Naked neck (ANN), Aseel × New Hampshire (ANH) and Aseel × Rhode Island Red (ARIR) crossbreds under farm conditions. Forty pullets from each crossbred were housed in identical pens and production performance was recorded for five periods (each 28 days) from 21 to 40 weeks of age. The mean body weight at 20 weeks of age was 1480.53 g in ANN, 1507.60 g in ANH and 1548.98 g in ARIR. The overall mean body weight at 40 weeks of age was 2322.17 g in ANN, 2285.27 g in ANH and 2205.43 g in ARIR. The mean body weights of ANN, ANH and ARIR were statistically similar in the three groups at 20 weeks and also at 40 weeks of age. The mean age at first egg was 172.2, 178.8 and 165.4 days in ANN, ANH and ARIR, respectively. The overall egg number on hen housed basis was 39.20, 35.55 and 43.50 in ANN, ANH and ARIR, respectively. The overall mean egg weight of ARIR was 49.10 ± 1.01 g which was statistically higher than the other two groups. The feed conversion ratio per dozen eggs from 25 to 40 weeks of age was 4.50, 6.39 and 4.29 in ANN, ANH and ARIR, respectively. The per cent livability in ANN, ANH and ARIR was 100 per cent from 21 to 40 weeks of age. The crossbred progenies of all the three crossbred groups were multicoloured. From the study it was concluded that all the three crossbred hens possess the characters suitable for backyard system of rearing.

Keywords: *Aseel crossbreds, body weight, egg number*

In India, backyard poultry rearing system plays a significant role in terms of economic development, women empowerment, and nutritional security (Kumar *et al*., 2021). Native chickens

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are the bedrock of backyard or free range systems of farming in India (Haunshi and Rajkumar, 2020). Indigenous chicken have contributed about 11.5 per cent to the total egg production of India in the year 2019 and there has been an increase in backyard poultry by 45.78 per cent (BAHS, 2019). However, because of low production performance, less attention is paid to indigenous chicken (Tajane and Vasulkar, 2014). Development of new crossbred varieties can transform backyard poultry production from subsistence to a more economically productive base with a positive impact on household food security and income generation. Even though the exotic breeds are high producers, they are less resistant to diseases and lack the ability to overcome the attack by predators when kept under backyard system of rearing. Most of the high yielding exotic breeds are of temperate origin or have been developed in temperate climatic conditions. India, being a tropical country having vast area of hot humid coastal regions is not suitable for full expression of their production potential. In the peak summer and humid months, high yielding stocks suffer from decreased feed consumption, low egg production and poor feed efficiency. The native breed, Aseel is well known for its pugnacity, high stamina and intelligent defensive and tactical thinking to keep power for long time in endurance fight. Recent research has revealed that native chicken from rural backyard also provides eggs with more healthy fatty acids (Devavratha *et al*., 2021). The main constraints in backyard system of poultry rearing are losses due to predation and diseases. The Aseel breed is capable of self-defence from predators due to its alertness, longer shank length, camouflagic characters and aggressiveness. Aseel has high immune competence and increased knowledge of the immune status of these birds might be helpful in the selection and development of disease-resistant chickens for backyard poultry farming (Choudhary *et al.,* 2022). This breed can be effectively used for the development of germplasm suitable for backyard poultry farming. Among the desi birds, naked neck fowls have better egg production potential under tropical climate. These birds are having feather colours suited for backyard system of rearing. New Hampshire and Rhode Island Red are two exotic dual purpose breeds which have been extensively used for production of brown eggs. They have coloured plumage and have good production potential that are advantageous for rearing in the backyard system. Considering the above facts, the present study was undertaken to evaluate and compare the production performance of crossbreds of Aseel with naked neck, New Hampshire and Rhode Island Red.

Materials and methods

The experiment was conducted at University Poultry and Duck Farm, Mannuthy to evaluate and compare the production traits of chicks from Aseel × naked neck (ANN), Aseel × New Hampshire (ANH) and Aseel × Rhode Island Red (ARIR) crossbreds under deep litter system of rearing (Fig 1, 2 and 3). The experimental chicks required for the study were hatched out by mating males of Aseel with naked neck, New Hampshire and Rhode Island Red female lines. Chicks were hatched out and reared on deep litter under standard management conditions. At 18 weeks of age, 40 females from each cross were housed in five replicates in deep litter layer pens of size 1.5x1.8 m. The birds were fed with standard layer mash as per BIS (1993), *ad libitum* throughout the experimental period. Standard routine management practices were followed in the study. A total of 120 females were tested in three experimental groups for egg production traits from 21 to 40 weeks of age. The total experimental period was divided into five periods, each of 28 day duration and the production performance of birds for five periods was recorded.

Body weights of birds at 20 and 40 weeks of age were recorded individually to the nearest 10 g (BW 20 and BW 40). The age at first egg and age at 50 per cent production (days) were recorded replicate wise and from the data, mean age at sexual maturity was determined. Egg production was recorded daily in each replicate from 21 to 40 weeks of age. From the data, egg production was calculated on hen-housed and hen day basis, week wise and period wise for the three crosses. Individual weight of all eggs laid during last three days of each 28-day period was weighed to the nearest 0.01g and the mean egg weight was arrived

Fig. 1. Aseel x Naked neck hens

Fig. 2. Aseel x New Hampshire hens

Fig. 3. Aseel x Rhode Island Red hens

at in the experimental groups. The mean egg weight was calculated for each replicate and the mean value of the five replicates was considered to be the mean egg weight for that particular period. The weight of feed issued was recorded for each replicate. The balance feed available in the feeders at the end of each period was recorded. From this data, period-wise mean daily feed consumption per bird was worked out. Feed conversion ratio (per dozen eggs) was calculated replicate wise in each period. The data were analysed statistically as per the method described by Snedecor and Cochran (1994). All the tests of difference between means were conducted at the five per cent probability level and period-wise per cent livability was recorded based on the number of birds alive during each period.

Results and discussion

Body weight

The mean body weights recorded at 20th and 40th week of age are presented in Table 1. There was no statistically significant difference in body weight between the groups at 20th and 40th week. The crossbred in the experiment appear to be heavier than similar crossbreds as reported by Jain and Sharma (1977) in desi × Rhode Island Red and Jayanthy (1992) in desi × New Rock and desi × Austra White, but lower than that reported in naked neck × New Hampshire by Jomy (2000). The body weight of the crossbred pullets of the present study is comparable to the body weight reported by Jomy (2000) in naked neck × White Leghorn (1496.1 g), Sasikumar (2003) in Colourline (1493.65 g) and Malik and Singh (2010) in Aseel × CARI red pullets (1414 g). As per Rajkumar *et al*. (2015) the crossbreeds had superiority over pure breeds for body weight at different ages. Thangadurai *et al*. (2020) reported BW20 and BW40 as 820 g and 1400 g, respectively in TANUVAS Aseel which were lower than the present estimates of Aseel crossbreds. The variations found in the body weights as recorded in different studies might be due to the combined effect of various genetic and environmental factors.

Age at sexual maturity

The mean age at first egg was 172.2 ± 5.72, 178.8 ±2.92 and 165.4 ± 4.95 days in ANN, ANH and ARIR, respectively. Even though ARIR hens attained sexual maturity earlier when compared to the other two crosses, the difference was statistically non-significant. The mean age at 50 per cent production was 185.2 ± 5.88, 200.00 ± 3.86 and 185.60 ± 4.36 days in ANN, ANH and ARIR, respectively. These results showed that Aseel × New Hampshire

attained 50 per cent production 15 days later than other two crosses. Statistical analysis of data on age at first egg and age at 50 per cent production did not show any significant difference between the crosses. Age at 50 per cent production was similar to that reported by Jayanthy (1992) in desi × New Rock and Malik and Singh (2010) in Aseel × CARI Red birds. Islam (1981) reported a higher ASM of 220 days for cross involving desi × New Hampshire. Contrary to this, Jomy (2000) reported a lower mean age at sexual maturity and 50 per cent production in naked neck × White Leghorn (152 and 162.4 days) and naked neck × New Hampshire (146.8 and 164.6 days). The delayed age at first egg and 50 per cent production recorded in the crossbreds might be due to the higher age at first egg in Aseel as reported by Singh *et al*. (2000a), Rajkumar *et al*. (2017) and Dalal *et al*. (2022).

Egg production

There was no mortality during the entire period of study and hence the egg production was expressed only in terms of HHN and HHP. Period-wise HHN and HHP in ANN, ANH and ARIR birds are presented in Table 2. The data on HHN and HHP did not show any statistical significance between the groups. A 50 per cent Hen Housed Production during the experimental period should have yielded 70 eggs per bird cumulatively. Though the three female lines NN, NH and RIR had higher egg production capacity (Jayasree, 2000; Kataria *et al.*, 2000) than Aseel breed (Singh *et al.*, 2000b), the crossbred progenies could exhibit only a low egg production comparable to that of Aseel as per the studies of Rajkumar *et al*. (2017) and Chitra (2021).

Egg weight

The mean egg weight for ANN, ANH and ARIR birds for the different periods is represented in Table 3. The mean egg weight recorded during the period from 21 to 40 weeks of age was 45.14, 45.91 and 49.10 g, respectively, in ANN, ANH and ARIR. The mean egg weight of ARIR was significantly higher ($p<0.05$) than the other two crossbred groups. The egg weight of the crossbred groups recorded in the present study is lower than their corresponding female parent lines as reported in naked neck (53.36 g) and New Hampshire (50.44 g) by Jayasree (2000) and in Rhode Island Red (54.32 g) by Jilani *et al*. (2007). This might be due to the lower egg weight of Aseel birds used as sire line in this study. Low egg weight in Aseel breed has been reported by Mahapatra *et al.* (1982) and Singh *et al.* (2000a). Contrary to this Dalal *et al*. (2022) reported an egg weight of 47.23 g in Aseel breed at forty weeks of age.

Table 1. Overall mean body weight (g) at 20 weeks of age and 40 weeks of age in Aseel × naked neck (ANN), Aseel ×New Hampshire (ANH) and Aseel × Rhode Island Red (ARIR)

Body weight at 20 weeks of age (g)			Body weight at 40 weeks of age (g)		
ANN	**ANH**	**ARIR**	**ANN**	**ANH**	**ARIR**
1480.53 ± 25.67	1507.60 ± 29.94	1548.98 ± 24.39	2322.17 ± 47.42	2285.2 ± 47.06	2205.43 ± 58.49

Table 2. Period-wise hen housed egg number and per cent in ANN, ANH and ARIR, from 21 to 40 weeks of age

Period	Age in weeks	HHN			HHP		
		ANN	**ANH**	**ARIR**	**ANN**	**ANH**	**ARIR**
I	21-24	0.3	0	0.6	1.07	0	2.14
II	25-28	8.93	3.3	8.18	31.88	11.79	29.2
III	29-32	10.88	12.25	13.98	38.84	43.75	49.91
IV	33-36	9.48	11.45	12.5	33.84	40.89	44.64
V	37-40	9.63	8.55	8.25	34.38	30.54	29.46
Overall	21-40	39.2	35.55	43.5	28	25.39	31.07

Table 3. Period-wise mean egg weight (g) in ANN, ANH and ARIR

Period	Age in weeks	Egg weight (g)		
		ANN	ANH	ARIR
I	24	36.22 ± 0.59		38.34 ± 0.75
II	28	42.15^{b} ± 1.70	42.72^{b} ± 0.90	46.81^{a} ± 0.62
III	32	46.15^{b} ± 0.43	45.58^{b} ± 0.65	50.61^{a} ± 0.77
IV	36	47.48^{a} ± 1.06	47.96^{a} ± 1.29	51.28^{a} ± 1.37
V	40	48.59^{ab} ± 0.99	47.39^{b} ± 0.62	52.01^{a} ± 2.04
Overall	21-40	45.14^{b} ± 0.97	45.91^{b} ± 0.62	49.10^{a} ± 1.01

The mean values carrying a common superscript within a row did not differ significantly *(p<0.05)*

Table 4. Mean daily feed consumption (g) and feed conversion ratio (per dozen eggs) in ANN, ANH and ARIR, from 21 to 40 weeks of age

Age in weeks	Mean daily feed consumption (g)			Feed conversion ratio (per dozen eggs)		
	ANN	ANH	ARIR	ANN	ANH	ARIR
21-40	132.98 ± 3.19	127.38 ± 5.39	127.29 ± 1.57	4.5 ± 0.28	6.39 ± 2.70	4.29 ± 0.58

Feed consumption and feed conversion ratio (FCR) per dozen eggs

Mean daily feed consumption and feed conversion ratio per dozen eggs in ANN, ANH, and ARIR birds from 21 to 40 weeks of age is represented in Table 4. Statistically there was no significant difference between the three crossbred groups in the overall mean daily feed intake. The mean daily feed consumption of ANH and ARIR birds in the present study is in agreement with the report of Jayasree (2000) in New Hampshire (123.06 g) and in naked neck (123.46 g) and that of Jomy (2000) in naked neck × New Hampshire (125.14 g). Malik and Singh (2010) reported a higher mean daily feed consumption of 160.22 g per bird in CARI Nirbheek (Aseel × CARI Red) birds from 39-40 weeks of age. The feed consumption recorded in ANN birds (132.98 g) is comparable to that reported by Aggarwal and Sapra (1972) in naked neck (137.78 g) and Aseel (135.73 g).

The mean feed conversion ratio per dozen eggs from 25 to 40 weeks of age was 4.50 ± 0.28, 6.39 ± 2.70 and 4.29 ± 0.58 in ANN, ANH and ARIR, respectively, and the mean values were not significantly different. The overall FCR of ANN and ARIR were comparable to the results of Jayanthy (1992) in desi × New Rock (4.09) and desi × Austra –White (4.93) crosses. The poor FCR of ANH cross could be clearly attributed to its low egg number. The FCR values obtained in the present study are higher than those reported by Jomy (2000) in NNNH and Sasikumar (2003) in Colourline birds.

Livability

The livability in all the three crossbred groups during the period of study from 21 to 40

Table 5. Economics of egg production over feed cost from 20 to 40 weeks of age in ANN, ANH and ARIR

Particulars	ANN	ANH	ARIR
Feed intake (kg) 20-40 weeks	715.98	697.8	720.86
Total number of eggs produced (20-40 weeks)	1568	1427	1743
Feed consumed per egg (g)	456.62	488.99	413.57
Cost of feed (Rs/kg)	15.36	15.36	15.36
Cost of feed per egg (Rupees)	7.01	7.51	6.35

weeks of age was 100 per cent. Jomy (2000) and Sasikumar (2003) reported a livability of 100 and 99 per cent in naked neck × New Hampshire and Colourline chicken, respectively. The livability per cent could be considered excellent when compared with the livability reported by Howlider and Ahmed (1984) in Aseel × Australorp (80.96) and Jayanthy (1992) in desi × New Rock (69.39).

Economics

The economics of egg production over feed cost for the period 21 to 40 weeks of age in the three crossbred groups are presented in Table 5. The results of the present study are not agreeing with that of Jomy (2000) and Sasikumar (2003) in other desi-exotic crossbreds. The higher cost might be due to lower egg number. Although cost of feed per egg is high in this study, it could be reduced considerably under backyard conditions.

Conclusion

Considering the production performances in Aseel × naked neck, Aseel × New Hampshire and Aseel × Rhode Island Red, it was concluded that all the three crossbred progenies are similar in almost all the traits like body weight, age at sexual maturity, egg number, FCR and per cent livability. However, ARIR cross has an edge over the other two groups with respect to overall mean egg weight. All the three crossbred hens possess the characters suitable for backyard system of rearing. Hence further studies should be carried out in backyard system for assessing the production potential of these birds.

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Conflict of interest

The authors declare that they have no conflict of interest.

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