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PRODUCTIVE AND REPRODUCTIVE PERFORMANCE OF COBB-500, ARBOR ACRE AND LOHMANN BROILER PARENT STOCKS

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ABSTRACT

The available and popular broiler parent stocks; Cobb-500, Arbor Acres, and Lohmann were evaluated based on productive and reproductive performances to identify a suitable broiler parent stock for broiler production. A total of 25093, 18 weeks old broiler parents of Cobb-500 (Female-7460 and Male-1025), Arbor Acres (Female-7282 and Male-1025), and Lohmann (Female-7257 and Male-1044) reared on a littered floor in separate sheds for 44 weeks of age providing standard management given by the breeder. The parents were significantly different in body weight, feed intake, egg production, egg mass, and feed conversion ratio. The highest number of egg and egg mass was observed in Arbor Acres (S2), followed by Lohmann (S3) and Cobb-500 (S1), respectively. The highest albumen height, Haugh unit, and yolk index were observed in S3, followed by S2 and S1, respectively. However, S1 showed the highest egg weight, albumen and yolk weight, and albumen and yolk width, followed by S2 and S3, respectively. Egg quality traits were increased with the increase of the age of the bird, except for the Haugh unit and yolk index ($p<0,001$). Haugh unit and yolk index decreased with the increase of the age of the bird. The highest fertility and net profit were observed in S2, followed by S3 and S1, respectively. The mortality and hatchability of fertile eggs did not differ among the 3 parents. Therefore, Arbor Acres may be a suitable broiler parent in the poultry industry.

Keywords: Broiler parent, Egg production, Egg quality traits, Fertility, Hatchability.

1. INTRODUCTION

The broiler industry is playing a vital role in providing cheaper, essential, and popular food like meat to the people. It is a vital sector of agriculture in the country, which foster agricultural growth and reduce malnutrition providing valuable meat and eggs as an animal protein source required for the people of Bangladesh (Da-Silva *et al.*, 2014). Poultry contributes about 22-27% protein of the total animal protein in the country (Prabakaran, 2003, Islam *et al.*, 2022).

The poultry industry as a livestock avenue, contributes valuable meat, eggs, and other food products, which has already been recognized as the most popular emerging industry in the world. The popularity of the industry is increasing day by day as the supplying institution of nutritious and healthy food items i.e. meat and egg to the consumers. Broiler meat is the cheapest and preferable source of animal protein and is consumed by all kinds of people irrespective of age, caste, and religion. Broiler meat contains high quality protein, essential for the health and

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nutrition of people (Neumann *et al.*, 2002, Amin *et al.*, 2013). It is essential for the growth and development of children and pregnant ladies. It also contains all the essential fatty acids (Linoleic acid, Linolenic acid, and Arachidonic acid). Poultry meat and egg can minimize the risks of diabetes and heart diseases.

Broiler production is being performed by both large and small-scale commercial entrepreneurs under farm conditions to fulfill the protein requirement of the country. Many people are now being encouraged to this enterprise because of the maximum return is achieved shortly by investing minimum capital in broiler production (Sarker *et al.*, 2001, Islam, *et. al.*, 2022). Owing to the above consequences, the continuous effort of the breeding companies is able to produce high quality broiler chick. These chicks are getting rapid growth and the best feed conversion efficiency. Bangladesh is a tropical country where the productivity of the different broiler strains varied significantly due to several environmental factors; temperature, humidity, and incidences of diseases. These have a great impact on the growth performance, survivability, and net profit of the fast-growing broiler strains (Sarker *et al.*, 2001). Fast-growing broiler strains may face extreme heat stresses when they are exposed to high environmental temperatures (Bohren *et al.*, 1982). Few researchers observed the performance of broiler strains in hot-humid environments (Baghel and Pradhan, 1989; Islam, 2000; Sarker *et al.*, 2008). They reported the reduced weight gains, feed efficiency, survivability, and profitability of broiler strains. The performance of poultry production depends mainly on the type of genetic resources, feed and feeding practices, the prevalence of diseases, prevention and control of diseases, the management of flocks, and their interactions (FAO, 2014). The body weight gain of the broiler strains has been markedly increased, with efficient feed utilization because of the advancement of technology applied in poultry nutrition and genetic improvement.

The poultry population in Bangladesh has estimated at about 356.318 million of which the chicken population is about 296.602 million (Islam *et al.*, 2022). Most of the high yielding breeds/strains have been developed in temperate regions (Singh, 2005). At present there are 18 GP Farms in Bangladesh, producing day-old broiler parent chicks which are not enough to fulfill the demand for day-old commercial broiler chicks. This is why, some poultry breeding companies in Bangladesh are still importing broiler parent stocks or parent stock hatching eggs from abroad (Karmaker, 2022). They produce commercial broiler chicks and distribute them to commercial farmers. Therefore, several broiler parent stocks/strains are available in Bangladesh. The available commercial broiler strains in Bangladesh are Arbor Acres, Hub chicks, Ross, Starbro, Hubbard classic, Cobb- 500, MPK, Lohman, Hybro G and Hybro N (Latif, 1999, Islam *et al.*, 2019). The reproductive performance of parent lines is varying from parent line to parent line or strain to strain (Islam *et al.* 2000). The parent stocks; Cobb-500, Lohmann, and Arbor Acre are very popular broiler parent stocks/strains in Bangladesh. Therefore, productive and reproductive performance, egg quality traits, and profitability of the three parent stocks were evaluated in the present study to identify a suitable parent stock for profitable broiler production.

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2. MATERIALS AND METHODS

2.1 Experimental Site

The experiments were carried out at the Ghatail-2 farm, Nourish Poultry and Hatchery Ltd, and at the Lab. of the Department of Dairy and Poultry Science, Bangabandhu Sheikh Mujibur Rahman

2.2 Egg Production Performance of Cobb-500, Arbor Acres, and Lohmann broiler parent chickens

A total of 25093 males and females of 3 broiler parent stocks (Cobb-500: Female-7460 and Male-1025, Arbor Acres: Female-7282 and Male-1025, and Lohmann: Female-7257 and Male-1044) was allotted into 3 replicates each to investigate their productive and reproductive performances (Table 1). The birds were reared on the slatted floor management system. The standard management practices as per the standard given by the breeder were provided to the birds during the investigation.

Table 1: Layout for the determination of egg production performance of the Cobb-500, Arbor Acres, and Lohmann parent chickens.

Replication ®	Sex	No. of birds			Total
		Parent chicken (S)			
		S_1	S_2	S_3	
R_1	Female	2487	2428	2419	7334
	Male	342	342	348	1032
R_2	Female	2487	2427	2419	7333
	Male	342	342	348	1032
R_3	Female	2486	2427	2419	7332
	Male	341	341	348	1030
	Total	8485	8307	8301	25093

S_1= Cobb-500; S_2= Arbor Acres; S_3= Lohmann

2.3 Preparation of diet and feeding of birds

The birds were fed a mash of 3 diets as per Table 2 during the investigation. The amount of feed (g/bird/day) offered to the birds is as per the breeder's standard.

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Table2: Composition of diet used in the experiment.

SL.	Ingredients	Parent stock (S)		
		S_1	S_2	S_3
		Amount (Kg)		
		Cobb-500	Arbor Acre	Lohmann
1	Maize	63.50	65.20	63.00
2	Rice Polish			1.10
3	Soyabean Meals	24.60	24.50	24.50
4	Limestone	8.00	7.80	8.00
5	M.C.P	0.90	0.60	1.00
6	Soya Oil	1.60	0.50	1.00
7	Salt	0.25	0.25	0.25
8	NaHCO3	0.15	0.15	0.15
9	Methionine -99	0.11	0.08	0.15
10	Lysine	0.05	0.06	0.05
11	Lex Breeder Premix (V)	0.15	0.15	0.13
12	Tylovet	0.05	0.05	0.05
13	Salcurb Liquide	0.20	0.20	0.20
14	Allzyme SSF	0.02	0.02	0.02
15	Mycofix Plus	0.10	0.10	0.10
16	Choline Chloride	0.10	0.10	0.10
17	Superliv Con.	0.10	0.10	0.10
18	Biomin phytase	0.01	0.01	0.01
19	Sel-Plex2000ppm	0.01	0.01	0.01
20	Protexin Con.	0.01	0.01	0.02
21	Kemtrace Breeder	0.15	0.15	0.05
22	Eskavit E40% premix	0.01	0.01	0.01
23	Shellvit D3	0.01	0.01	0.01
24	Endox C Dry	0.01	0.01	0.01
25	Mintrex			
	Total	100.00	100.00	100.00
	Calculated composition:			
	CP%	16.90	17.00	16.90
	ME Kcal/Kg	2817.00	2790.00	2788.00
	Ca%	3.00	2.80	3.00
	P%	0.30	0.30	0.30
	Lysine %	0.80	0.80	0.80
	Methionine %	0.43	0.46	0.45

S_1= Cobb-500; S_2= Arbor Acre; S_3= Lohmann

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Data Recording

The following data were recorded during the investigation.
Body weight and feed intake (g/bird)- recorded monthly
Egg production (No./bird)- recorded monthly
Egg weight (g/bird)- recorded monthly
Dead bird- when occurred
Egg mass was calculated as per the following formula:
Egg mass (g/bird) = No. of eggs × Av. egg weight (g)
The following parameters were calculated using the formula of Onunkwo and Okoro (2015)
Feed conversion ratio (FCR) was calculated using the following formula

$$\text{FCR (Feed intake/dozen egg)} = \frac{\text{Total feed intake (Kg)}}{\text{Total egg produced}} \times 12$$

$$\text{FCR (Feed intake/kg egg)} = \frac{\text{Kg of feed consumed}}{\text{Kg of egg produced or egg mass}}$$

Hen-day and hen-housed egg productions were calculated using the following formula:

$$\text{HDEP (\%)} = \frac{\text{Total number of eggs produced during the period}}{\text{Total number of hens at the end of period x duration of laying period}} \times 100$$

$$\text{HHEP (\%)} = \frac{\text{Total number of eggs laid during the period}}{\text{Total number of hens housed at the beginning of laying period x duration of laying period}} \times 100$$

Production cost was calculated (Taka/dozen eggs) and (Taka/kg egg) considering bird, feed, labor, medicine, and other costs, etc.
Net profit was calculated using the following formula:
Net profit (Taka/dozen eggs) = Price per dozen eggs – production cost per dozen eggs

2.4. Egg quality traits of Cobb-500, Arbor Acres, and Lohmann broiler parent stocks at different ages

A total of 72 eggs from 3 different parent stocks (Cobb-500-24, Arbor Acres-24, Lohmann-24) at 28 and 42 weeks of the age of the bird were taken to evaluate the egg quality traits (Table 3).

Table 3: Layout for the determination egg quality traits of three broiler parent stocks at 28 and 42 weeks of the age of the bird.

Age (weeks)	Replication ®	No. of eggs			Total
		Parent chicken (S)			
		S_1	S_2	S_3	
28	R_1	1	1	1	3
	R_2	1	1	1	3
	R_3	1	1	1	3
	R_4	1	1	1	3
	R_5	1	1	1	3
	R_6	1	1	1	3
	R_7	1	1	1	3
	R_8	1	1	1	3
	R_9	1	1	1	3

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	R_{10}	1	1	1	3
	R_{11}	1	1	1	3
	R_{12}	1	1	1	3
	R_1	1	1	1	3
	R_2	1	1	1	3
	R_3	1	1	1	3
	R_4	1	1	1	3
	R_5	1	1	1	3
	R_6	1	1	1	3
42	R_7	1	1	1	3
	R_8	1	1	1	3
	R_9	1	1	1	3
	R_{10}	1	1	1	3
	R_{11}	1	1	1	3
	R_{12}	1	1	1	3
Total		24	24	24	72

S_1= Cobb-500; S_2= Arbor Acre; S_3= Lohmann

Data Recording

The following egg quality traits were recorded using the different digital devices

Egg quality traits:	Device used:
Egg weight	Digital balance
Yolk color	DSM yolk color fan
Albumen width	Digital slide calipers
Albumen height	Digital spherometer
Albumen weight	Digital balance
Yolk width	Digital slide calipers
Yolk height	Digital spherometer
Yolk weight	Digital balance
Eggshell weight	Digital balance
Eggshell with membrane thickness	Digital eggshell thickness gauge/meter
Eggshell thickness	Digital eggshell thickness gauge/meter
Haugh unit	Calculated (100xLog10 (h-1.7$^{w0.37}$+7.6)
Yolk index	Calculated (Yolk Height/Yolk Diameter)

2.5 Reproductive performance of the Cobb-500, Arbor Acres, Lohmann broiler parent stocks at different ages of the birds

A total of 187251 eggs (Cobb-500- 50827, Arbor Acres- 100437, Lohmann- 35987) at different ages of the birds were hatched at different batches (Table 4).

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Table 4: Layout for the determination of the reproductive performance of Cobb-500, Arbor Acres, Lohmann broiler parent stocks at 28, 35, and 42 weeks of the age of the birds.

Age (A)	No. of eggs set			
	Parent chickens (S)			Total
	S_1	S_2	S_3	
A_1	22237	33600	13407	69244
A_2	15082	33237	3380	51699
A_3	13508	33600	19200	66308
Total	50827	100437	35987	187251

S_1= Cobb-500; S_2= Arbor acres; S_3= Lohmann; A_1 = 28 weeks; A_2 = 35 weeks; A_3 = 42 weeks

Data Recording

Fertile and Infertile eggs (%) – no. of fertile and infertile eggs at 10 days of incubation period and then calculated as a percentage.

Hatchability (%) – no. of hatched out chicks at the end of incubation and then calculated as a percentage.

Dead embryo (%)- no. of the dead embryos at the end of incubation and then calculated as a percentage.

Abnormal chicks (%)-at the end of incubation and then calculated as a percentage.

Cost (Tk/chick) – calculated considering the hatching egg production cost and hatchery operational cost

Sale/Price (Tk/chick) – the price of the day-old chicks is fixed by the hatchery

Net profit (Tk/chick): calculated from the sale/price day-old chick and the production cost of the day-old chick.

Statistical Analysis

The collected data were analyzed in a Completely Randomized Design (CRD) using the Statistix10 computer package program.

Statistical model

The following statistical model for the productive and reproductive performance of the 3 parent stocks was used for data analysis

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

Where Y_{ij} is the observation of the i^{th} replication in the j^{th} treatment group

μ is the overall mean

S_i is the fixed effect of the i^{th} parent (i=1, 2, 3)

it is the random error

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The following statistical model for the egg quality traits of the three parent stocks was used for data analysis

$Y_{ijk} = \mu + S_i + A_j + (S \times A)_{ij} + e_{ijk}$

Where Y_{ijk} is the observation of the k^{th} replication in the i^{th} parent and the j^{th} age group

μ is the overall mean

S_i is the fixed effect of the i^{th} parent (i= 1, 2, 3)

A_j is the effect of the j^{th} age group (j = 1, 2)

$(S \times A)_{ij}$ is the interaction effect of i^{th} strain and j^{th} age group

e_{ijk} is the random error

3. RESULTS AND DISCUSSION

3.1 Productive performance of Cobb-500, Arbor Acres, and Lohmann parents at 44 weeks of age

Cobb-500, Arbor Acres, and Lohmann broiler parent stocks were significantly different for body weight (p<0.05), feed intake (p<0.05), egg production (p<0.001), egg mass (p<0.01), feed conversion ratio (p<0.01), but not different for mortality (p>0.05).

The lowest body weight, feed intake, feed conversion ratio (FCR: Feed intake/dozen of eggs), and FCR (FI/kg of eggs) was observed in parent S_3, followed by S_2 and S_1, respectively. The highest number of egg and egg mass was observed in parent S_2, followed by S_3 and S_1, respectively. However, the highest egg weight was observed in S_1, the lowest in S_2, and the moderate in S_3. The mortality tended to decrease in S_2, followed by S_1 and S_3, respectively.

The parent stock S_2 (Arbor Acres) performed the best among the 3 parent stocks in terms of egg production, egg mass, feed conversion ratio, and mortality which was consistent with the findings of Hossain *et al*. (2011). A previous study reported that Arbor Acre parent stock was superior to Cobb-500, MPK, Lohmann, Hybro-G, and Hybro-N in terms of egg production performances (Hossain *et al*., 2011) which was consistent with the present findings. Another work was performed by Denli et al. (2018) and they observed better egg production in Lohmann brown than in Atak-S, which contradicted the findings of the present study. Of the two parents, S_3 (Lohmann) showed better performance than the S_1 (Cobb-500) in terms of egg and egg mass production, and feed conversion ratio (FCR). Therefore, Arbore Acre Parent stock was superior to Lohmann and Cobb 500 parent stocks because of the egg production performance.

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Table 5: Egg production performance of Cobb 500, Arbor Acres, and Lohmann broiler parent stocks at 44 weeks of age.

Traits	Parent stock (S)			LSD value and level of significance+
	S_1	S_2	S_3	
Body weight (g/bird)	4384.00	4275.30	4001.30	290.230*
Feed intake (g/bird)	33933.00	34567.00	32533.00	1984.500*
Egg production (No./bird)	80.67	98.00	94.33	5.729***
Egg weight (g/egg)	67.59	64.22	65.92	0.820***
Egg mass (g/bird)	5452.20	6293.20	6218.20	384.180**
FCR (Feed intake/dozen eggs)	5.05	4.24	4.14	0.402**
FCR (Feed intake/kg egg)	6.23	5.50	5.23	0.523**
Mortality (%)	17.46	16.23	19.84	10.598NS

+NS, $p>0.05$; *, $p<0.05$; **, $p<0.01$; ***, $p<0.001$; S_1=Cobb-500; S_2=Arbor Acres; S_3= Lohmann parent chicken.

3.2 Egg quality traits of Cobb-500, Arbor Acres, and Lohmann parent at different ages of the chickens

There was a significant difference among the 3 broiler parent stocks for egg quality traits of egg weight ($p<0.001$), albumen width and height ($p<0.001$), yolk width ($p<0.001$), albumen weight ($p<0.001$), yolk weight ($p<0.001$), Haugh unit ($p<0.001$), and yolk index ($p<0.001$), except for the traits; yolk color, yolk height, eggshell with membrane weight, eggshell with membrane thickness, eggshell thickness, and eggshell membrane thickness which did not differ significantly among 3 parent stocks ($p>0.05$). The highest egg weight, albumen weight, yolk weight, albumen width, and yolk width were observed in parent S_1, followed by S_2 and S_3, respectively. Whereas, the highest albumen height, Haugh unit, and yolk index were observed in the S_3, followed by S_2 and S_1, respectively. The egg quality traits; yolk color, yolk height, eggshell with membrane weight, eggshell with membrane thickness, eggshell thickness, and eggshell membrane thickness were almost similar among the 3 parent stocks ($p>0.05$).

As for the effect of the age, the 3 broiler parents were significantly different for the egg quality traits, except for albumen and yolk height, eggshell membrane thickness, and Haugh unit which did not differ significantly among 3 parents ($p>0.05$). Egg quality traits were increased with the increase in the age of the bird, except for the yolk index which was decreased with the increase of the age of the birds ($p<0.001$).

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The interaction effect between broiler parent and age was significant for the traits of egg weight (p<0.001), yolk color (p<0.01), albumen width and height (p <0.001), albumen weight (p<0.01), and yolk weight (p<0.001), eggshell with membrane weight (p <0.05), and Haugh unit (p<0.001), but not significant for the yolk height, eggshell with membrane thickness, eggshell thickness, eggshell membrane thickness, and yolk index (p>0.05).

The parent stock S_3 (Lohmann) and S_2 (Arbor Acres) performed better than S_1 (Cobb-500) in terms of egg quality traits. However, S_3 (Lohmann) was superior to S_2 in terms of albumen height, Haugh unit, and yolk index, which corroborate the findings of Denli *et al*. (2018). The yolk color, yolk height, eggshell with membrane weight and thickness, and eggshell thickness were statistically similar among the 3 parent chickens. Egg quality traits increased with the increase of the age of the birds. However, the Haugh unit and yolk index were reduced with the increase in the age of the birds, which was consistent with the previous findings (Fasenko e*t al., 2009*).

Table 6: Egg quality traits of Cobb 500, Arbor Acres, and Lohmann broiler parent stocks at 28 and 42 weeks of the age of the birds.

Traits	Age (A)	Patent (S)				LSD value and level of significance+		
		S_1	S_2	S_3	Mean	S	A	S×A
Egg weight (g/egg)	A_1	58.19	47.31	48.42	51.31	2.447^{***}	1.998^{***}	3.461^{***}
	A_2	63.21	63.29	62.00	62.84			
	Mean	60.70	55.30	55.21	57.07			
Yolk color (DSM yolk fan)	A_1	8.00	8.08	8.17	8.08	0.344^{NS}	0.281^{*}	0.487^{**}
	A_2	8.67	8.67	7.83	8.39			
	Mean	8.33	8.38	8.00	8.24			
Albumen width (mm)	A_1	86.43	76.66	72.00	78.36	2.696^{***}	2.201^{*}	3.813^{***}
	A_2	80.54	81.62	81.16	81.11			
	Mean	83.48	79.14	76.58	79.73			
Albumen height (mm)	A_1	7.69	10.21	9.68	9.19	0.655^{**}	0.535^{NS}	0.926^{***}
	A_2	9.83	9.26	10.00	9.69			
	Mean	8.76	9.73	9.84	9.44			
Yolk width (mm)	A_1	39.94	36.21	34.54	36.90	1.561^{***}	1.274^{***}	2.207^{*}
	A2	42.60	42.17	40.84	41.87			
	Mean	41.27	39.19	37.69	39.38			
Yolk height (mm)	A_1	18.03	18.07	17.86	17.98	0.482^{NS}	0.393^{NS}	0.681^{NS}
	A_2	17.84	18.12	18.69	18.22			
	Mean	17.94	18.09	18.27	18.10			

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Albumen weight (g/egg)		A_1	36.04	29.40	30.09	31.84	1.856^{***}	1.515^{***}	2.625^{**}
		A_2	39.64	39.59	37.77	38.99			
		Mean	37.84	34.50	33.93	35.42			
Yolk weight (g/egg)		A_1	15.80	12.13	12.43	13.45	0.803^{***}	0.655^{***}	1.136^{***}
		A_2	16.45	16.37	17.15	16.66			
		Mean	16.12	14.25	14.79	15.05			
Eggshell membrane weight (g/egg)	with	A_1	6.04	5.32	5.51	5.62	0.398^{NS}	0.325^{***}	0.563^{*}
		A_2	6.81	7.09	6.79	6.90			
		Mean	6.43	6.20	6.15	6.26			
Eggshell membrane thickness (mm)	with	A_1	0.40	0.39	0.40	0.40	0.014^{NS}	0.012^{***}	0.021^{NS}
		A_2	0.44	0.46	0.44	0.45			
		Mean	0.42	0.43	0.42	0.42			
Eggshell thickness (mm)		A_1	0.37	0.36	0.37	0.36	0.016^{NS}	0.013^{***}	0.023^{NS}
		A_2	0.40	0.42	0.40	0.41			
		Mean	0.39	0.39	0.38	0.39			
Eggshell membrane thickness (mm)		A_1	0.03	0.04	0.04	0.04	0.006^{NS}	0.005^{NS}	0.008^{NS}
		A_2	0.04	0.04	0.04	0.04			
		Mean	0.04	0.04	0.04	0.04			
Haugh unit		A_1	87.70	102.84	100.51	97.02	2.941^{***}	2.401^{NS}	4.159^{***}
		A_2	97.74	95.02	98.87	97.21			
		Mean	92.71	98.93	99.69	97.11			
Yolk index		A_1	0.45	0.50	0.52	0.49	0.022^{***}	0.018^{***}	0.032^{NS}
		A_2	0.42	0.43	0.46	0.44			
		Mean	0.44	0.47	0.49	0.46			

+NS, $p>0.05$; *, $p<0.05$; **, $p<0.01$; ***, $p<0.001$; S_1=Cobb-500; S_2=Arbor Acres; S_3= Lohmann parent

3.3 Reproductive performance of Cobb-500, Arbor Acres, and Lohmann parents at 44 weeks of the age of the birds

A significant difference was observed among 3 broiler parent stocks for the traits; fertility, hatchability on set eggs ($p<0.01$), the dead embryo ($p<0.05$), chick production cost ($p<0.001$), price of chick ($p<0.001$), and net-profit ($p<0.001$), but not for sexual maturity, hatchability on fertile eggs, and abnormal chick production in the hatchery ($p>0.05$). The parent S_2 showed the highest fertility, hatchability, price of chick, and net profit, moderate in S_1, and lowest in S_3. The traits of sexual maturity, hatchability on fertile eggs, and abnormal chick production were statistically similar among the 3 broiler parent stocks. Therefore, considering the reproductive performances, S_2 was found to be the most suitable and profitable broiler parent among the 3 parents thereof S_1 showed the lowest reproductive performance and net profit.

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The best performer parent stock in the present study was S_2 (Arbor Acres) among the 3 broiler parents in terms of fertility and hatchability of egg, followed by S_1 (Cobb-500) and S3 (Lohmann), respectively which contradicted with a previous study (Islam *et al*., 2010). They found the lowest fertility and hatchability in Cobb-500 compare to Hubbard Hi-Yield and Ross broiler parents. The parent S_2 (Arbor Acres) in the present study showed the highest net profit among the 3 parents. The lowest profit was found in S_1 (Cobb-500) which was consistent with the findings of Hossain *et al.* (2011).

Table 7: Reproduction performance of Cobb 500, Arbor Acres, and Lohmann broiler parents at 44 weeks of the age of the bird

Traits	Parent stocks (S)			LSD value and level of significance+
	S_1	S_2	S_3	
Sexual maturity (days)	172.33	172.67	173.67	1.631^{NS}
Fertility (%)	87.34	94.58	94.53	2.946^{**}
Hatchability on set egg (%)	80.61	87.88	88.53	6.114^{*}
Hatchability on fertile egg (%)	91.86	92.92	93.66	4.944^{NS}
Dead embryo (%)	17.66	10.59	9.94	6.101^{*}
Abnormal chicks (%)	1.73	1.53	1.53	0.231^{NS}
Cost (Tk/Chick)	30.45	28.48	29.40	0.446^{***}
Sale (Tk/Chick)	35.27	40.03	39.06	0.463^{***}
Net profit (Tk/Chick)	4.82	11.55	9.66	0.774^{***}

+NS, $p>0.05$; *, $p<0.05$; **, $p<0.01$; ***, $p<0.001$; S_1=Cobb-500; S_2=Arbor Acres; S_3= Lohmann parent chicken; Tk = Bangladeshi taka

4. CONCLUSION

The present study reveals that the parent stock Arbor Acre performed the best among the 3 parent stocks in terms of egg production and reproduction performances. Of the two parents, Lohmann performed better than the Cobb-500 parent in terms of productive and reproductive performances. The highest albumen height, Haugh unit, and yolk index were observed in Lohmann, moderate in Arbore Acre, and lowest in Cobb-500. Therefore, Arbor Acre may be a suitable and profitable parent stock for broiler production.

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