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Effect of egg weight on hatching performance of Aseel

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Abstract
A study was conducted to find out optimum egg weight for better hatching performance of Aseel birds. Aseel hatching eggs were divided into four egg weight classes (41 – 43 (T1-Small), 44 – 46 (T2-Medium), 47 – 49 (T3-Medium) and 50 – 52g (T4-Large)) and set for hatching in six consecutive batches. The medium size egg had significantly (P≤0.01) higher per cent fertility. The per cent total hatchability was significantly (P≤0.01) higher for medium and large sized eggs. The egg weight classes 47 – 49g and 50 – 52g had significantly (P≤0.01) higher per cent fertile hatchability and lesser per cent total embryonic mortality. It can be concluded that significantly higher per cent fertility, total hatchability, fertile hatchability and lesser per cent total embryonic mortality was observed from large and medium eggs. Hence, selection of hatching eggs weighing between 44 - 52 g is best suitable for obtaining better hatching performance of Aseel birds.

Keywords: Aseel, egg weight, hatching performance

Introduction
India is having 20 recognized indigenous poultry breeds and Aseel is the most popular native chicken being reared in many states mainly for egg, meat and fighting purpose because of its stamina, pugnacity, majestic gait, dogged fighting qualities, hardiness, ability to thrive well under adverse climatic conditions, ability to utilize locally available feed, minimum requirement of care and management and less input technology and its egg and meat is considered to have a desirable unique taste and flavor. In Tamil Nadu, rearing of Aseel under intensive system is gaining momentum to meet the growing demand for its eggs, meat and day old chicks. The production of day old chick is influenced by fertility and hatchability of the eggs which is again influenced by genetics, environment and nutrition. A number of factors including nutritional, bird, egg, incubation factors and environmental factors have been shown to influence the hatchability of poultry eggs [1]. Egg weight is an important parameter that influences hatchability. Egg size affects hatchability [2, 3, 4, 5, 6, 7]. Published literature on the effect of egg size on hatching performance of Aseel birds in India is limited. Therefore, a study was undertaken to find out the effect of egg size on the fertility and hatchability of Aseel and also to study the optimum egg size for good hatchability. This study would enable good hatchability through optimum egg weight for better profitability.

Materials and Methods
A biological trial was conducted at the Poultry Research Station, Tamil Nadu Veterinary and Animal Sciences University, Chennai, to find out optimum egg weight for better hatching performance of Aseel birds. Aseel breeder birds were reared under deep litter system with a mating ratio of 1;8 and maintained under standard managemental conditions. Birds were fed with Native chicken brooder, grower and breeder ration (22.30, 18.41 & 18.35% Crude protein, 2701, 2630 & 2709 kcal Metabolizable Energy, 1.19, 1.15 & 3.10% Calcium and 0.41, 0.52 & 0.57% Available phosphorus) adlibitum and had free access to wholesome water throughout the experimental period. The hatching eggs were collected twice a day from 35–40 weeks old Aseel breeder birds and immediately placed in the egg cold storage room after cleaning and fumigation and stored for 7 days with 15-18ºC temperature and 70-75% RH. After 7 days of storage, hatching eggs were moved to ambient temperature, kept for one hour and divided into four egg weight classes (41 – 43 (T1), 44 – 46 (T2), 47 – 49 (T3) and 50 – 52g (T4)) and set for hatching in six consecutive batches under standard incubational conditions.

The setter was maintained at 99.5ºF and 87ºF in dry and wet bulb reading so as to provide an ideal temperature and relative humidity for first 17 days of incubation. The eggs were turned at hourly interval by an automatic turner. On 18 th day of incubation, the eggs were transferred to hatcher, in which 98.5ºF in dry bulb and 90ºF in wet bulb reading were maintained so as to provide an ideal temperature and relative humidity for the hatching to take place. Hatching started on day 20 and was completed by the end of the 21st day of incubation. Infertile eggs and dead germs were recorded on 7th day & 18thday by candling and dead in shell was recorded after each hatch. Number of chicks hatched was recorded. Unhatched eggs were examined for early and late embryonic mortality. The per cent fertility, total hatchability, fertile hatchability and total embryonic mortality were recorded. The data were analyzed statistically [8].

Results and Discussion

The result of the effect of egg weight on the hatching performance of Aseel is presented in Table 1. Statistical analysis revealed that the egg size had a significant influence (P≤0.01) on per cent fertility. The egg weight classes 44 – 46g and 47 – 49g had significantly (P≤0.01) higher per cent fertility (87.60±0.52; 86.07±1.05) than other classes. Haunshi *et al.*, [9] reported similar fertility in Aseel (86.96%). The present study indicated that the higher per cent fertility was observed in medium sized eggs, followed by small and large sized eggs, respectively. The significant difference observed among fertility and hatchability in this experiment could be attributed to the size of the egg. Similar observations were made by *Abiola et al.*, [3] who observed 96.67% hatchability for medium sized eggs from broiler breeders; Premavalli *et al.*, [5] in Beltsville small white turkey breeders. The mean per cent fertility found in this study was higher than the values (77%, 84% and 80%) reported by many researchers in Aseel chickens [10, 11, 12]. However, maximum fertility ($P \leq 0.05$) was noticed in small egg size group (96.67%), followed by medium (93.33%) and large (90.33%) egg size groups in broiler breeders [13].

Table 1: Effect of egg weight on hatching performance of Aseel

Egg Weight(g)	Small (T1) 41-43g	Medium (T2) 44-46g	Medium (T3) 47-49g	Large (T4) 50-52g
No. of eggs set	5006	5579	4062	2195
No. of Chicks hatched	3171	3825	2329	1523
Fertility %**	81.90 b ±0.50	87.60 a ±0.52	86.07 a ±1.05	81.17 b ±2.30
Total hatchability%**	56.39 b ±5.33	63.54 a ±1.89	68.50 a ±2.18	71.58 a ±2.24
Fertile hatchability%*	68.86 b ±6.47	72.59 b ±2.46	79.51 a ±1.79	88.33 a ±2.47
Dead in germ NS	18.03±5.81	11.78±1.31	8.43±1.00	5.45 ±1.75
Dead in shell*	13.11 b ±1.17	15.64 b ±3.56	12.06 a ±1.08	6.21 a ±0.77
Total embryonic mortality% **	31.14 b ±6.47	27.41 b ±2.46	20.49 a ±1.79	11.67 a ±2.47

*Means bearing different superscripts in the same column differ significantly

Egg size had a significant influence (P≤0.01) on hatchability on total eggs set. The per cent total hatchability was significantly (P≤0.01) higher for 50 – 52g (71.58±2.24), 47 – 49g (68.50 ±2.18), 44 – 46g (63.54±1.89) egg weight classes than 41– 43 g (56.39 ±5.33). In this study, the per cent total hatchability of the incubated eggs increased as egg weight increased to large egg-size group of 50 – 52g. Similarly, Mohan *et al*. [10] recorded 67% hatchability on the basis of total egg set. Significantly higher per cent total hatchability recorded in medium sized eggs in the present study is in line with the results of earlier researchers [3, 14, 15] in Anak broiler and Fayoumi, Desi and crossbred (Rhode Island Red × Fayoumi) chickens and Potchefstroom Koekoek chick, respectively. The mean per cent total hatchability recorded in this study was higher than the values (55%, 66%, 77%, 84% and 80%) reported by many researchers in Aseel [10, 11, 12]. However, these workers recommended that where carcass traits are of special consideration, the large eggs would be preferred for setting. On contrary, lower hatchability was recorded in Cobb 500 broiler eggs that were larger than the average egg [16]. Maximum hatchability percentage (out of set eggs) was achieved ($P \leq 0.05$) in small egg size group (89.67%), followed by medium (83.63%) and large (78.33%) egg size groups [13].

Significant differences (P≤0.01) were observed in per cent fertile hatchability among different egg size groups. The egg weight classes 50 – 52g (88.33±2.47) and 47 – 49g (79.51±1.79) had significantly (P≤0.01) higher per cent fertile hatchability than other classes. The present study indicated that the higher per cent fertile hatchability was observed in large and medium sized eggs than small sized eggs. Similar hatchability (88% and 68.36%) on the basis of fertile egg set was recorded in earlier studies of Aseel chickens [10, 12]. Salahuddin *et al.*, [17] recorded higher fertility and hatchability of heavier eggs in Desi chickens. However, medium sized eggs (50- 60g) had better hatchability (81.82%) than either too small (60g) sized chicken eggs [2]. Gul *et al.*, [18] observed lower hatchability (40.98±0.02%) for heaviest eggs (>55g) and higher (around 85%) for small and medium sized eggs (>28 to ≤ lessor or >55g to in non-descript indigenous (desi) chicken. On contrary, Elibol and Brake [19] reported that the fertile hatchability decreased in the large egg weight group primarily due to an increased percentage late dead. However, maximum hatchability percentage (fertile eggs) was achieved ($P \leq 0.05$) in small egg size group (92.74%), followed by medium (89.61%, respectively) and large (86.72%) egg size groups [13]. Umesh *et al.*, [20] reported lower hatchability (37.93%) on total egg set and higher hatchability on fertile egg set than the present study.

Egg size did not have any influence on per cent dead germs and had a significant influence (P≤0.05) on per cent dead in shell and per cent total embryonic mortality (P≤0.01) which were significantly lesser in the egg weight classes of 50–52g (11.67±2.47) and 47 – 49g (20.49±1.79). Significantly lesser per cent total embryonic mortality recorded in large and medium sized eggs than small sized eggs in the present study is in agreement with the findings of Alabi *et al.*, [14] who reported that smaller eggs had higher ($P \leq 0.05$) embryonic deaths (45%) than those of larger eggs (36%) and medium eggs (31%). Smaller size eggs were associated with greater

embryo mortality, resulting in a lesser hatchability in the Cobb strain [21]. In small eggs, there may be insufficient nutrients and pores, which could affect the embryo development and the hatching process; in fact, embryonic metabolism, such as lipid utilization and respiration, increases with embryonic growth [22]. However, Javid Iqbal *et al.*, [13] reported maximum embryonic mortality ($P \leq 0.05$) during incubation and higher percentage of infertile eggs in large size egg group, followed by medium and small egg size groups. The reason for the differences in fertility, hatchability and embryonic mortality among egg size groups in all above studies might be due to breed / strain differences.

The present study showed that the significant better hatching performance was recorded in large and medium sized eggs than small sized eggs. It was explained that medium-sized eggs could be expected to have enhanced ability to lose weight and breathe during incubation because of more pores in the shell surface area [23]. The effect of egg size on hatchability could be due to a reduction in the surface area to volume ratio with increasing egg size making the gas heat exchange more difficult. Medium size eggs have lower shell thickness which enhances hatchability whilst large and small size eggs have higher shell thickness in indigenous Lakha aseel chicken [24]. On contrary, Javid Iqbal *et al.*, [13] reported that the maximum fertility and hatchability ($P \leq 0.05$) was noticed in small egg size group, followed by medium and large egg size groups. Wilson [25] also recommended that hatchability is a distinctive fitness trait with low heritability which may indicate that improvement by selection will take a long time to produce measurable results and hence optimization of hatching egg weight and hatchery management is therefore the most promising route for improvement.

Conclusion

The results of the present study indicated that the egg size had significant ($P<0.01$) effect on the hatching performance of Aseel chicken. Significantly higher per cent fertility, total hatchability, fertile hatchability and lesser per cent total embryonic mortality was observed from 44 – 46g (63.54±1.89), 47 – 49g (68.50±2.18) and 50 – 52g (71.58±2.24) egg weight classes. It can be concluded that the large and medium size hatching eggs hatched better than the small size Aseel eggs and hence, selection of hatching eggs weighing between 44 - 52 g is best suitable for obtaining better hatching performance of Aseel birds.

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