The Pharma Innovation Journal 2022; SP-11(4): 1133-1138

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; SP-11(4): 1133-1138

www.thepharmajournal.com
Received: 25-02-2022
Accepted: 27-03-2022

Deepti Kiran Barwa
Department of Animal Genetics and Breeding, College of Veterinary Sc. and A.H., Dau Shri Vasudev Chandrakar Kamdhenu Vishwavidyalaya, Durg, Chhattisgarh, India

Mohan Singh
Department of Animal Genetics and Breeding, College of Veterinary Sc. and A.H., Dau Shri Vasudev Chandrakar Kamdhenu Vishwavidyalaya, Durg, Chhattisgarh, India

K Mukherjee
Department of Animal Genetics and Breeding, College of Veterinary Sc. and A.H., Dau Shri Vasudev Chandrakar Kamdhenu Vishwavidyalaya, Durg, Chhattisgarh, India

AK Santra
Department of Livestock Production Management, College of Veterinary Sc. and A.H., Dau Shri Vasudev Chandrakar Kamdhenu Vishwavidyalaya, Durg, Chhattisgarh, India

Ashutosh Tiwari
Department of Veterinary Physiology & Biochemistry, College of Veterinary Sc. and A.H., Dau Shri Vasudev Chandrakar Kamdhenu Vishwavidyalaya, Durg, Chhattisgarh, India

Raina Doneria
Department of Animal Nutrition, College of Veterinary Sc. and A.H., Dau Shri Vasudev Chandrakar Kamdhenu Vishwavidyalaya, Durg, Chhattisgarh, India

Corresponding Author
Deepti Kiran Barwa
Department of Animal Genetics and Breeding, College of Veterinary Sc. and A.H., Dau Shri Vasudev Chandrakar Kamdhenu Vishwavidyalaya, Durg, Chhattisgarh, India

Effect of egg weight on hatchability, fertility and subsequent body weight of Kadaknath chicken

Deepti Kiran Barwa, Mohan Singh, K Mukherjee, AK Santra, Ashutosh Tiwari and Raina Doneria

Abstract
An experiment was conducted on 1740 number of Kadaknath eggs to determine the effect of selection of eggs on the basis of egg weight (Small ≤40gm and Large >40gm) and hatch on hatchability, fertility and subsequent body weight. Chicks from these two groups were weighed from day old to twenty week of age. Egg weight of Kadaknath was found to be 40.72gm ± 0.10 while chick to egg weight percent came to 60.66%. Fertility and hatchability on total egg basis and fertile egg basis were observed 78%, 60.66% and 76.17%, respectively. Results indicated that there is significant effect of egg size and hatch on hatchability and fertility percentage. The large-sized eggs produced chicks with higher (p<0.05) hatch-weight than small-sized eggs and this difference was also seen in the subsequent body weight. Effect of hatch was also found significant on hatchability, fertility and body weight in the present study. It can be concluded that environment affects fertility, hatchability and body weight and making selection for heavy weight egg before incubation may produce chicks with higher body weight which persist upto 20week of age.

Keywords: Kadaknath chickens, fertility, hatchability, egg size, body weight

1. Introduction
Indigenous chickens continue to be the mainstay of self sustaining low input backyard or free range system of production in rural, tribal and semi-urban areas of the country. Indigenous chickens possess unique attributes such as hardiness, ability to adapt to harsh environment, broodiness, aggressiveness to protect their young ones, etc. They are nutritionally, economically, and culturally very important to rural households (King'ori *et al*., 2007; Mtileni *et al*., 2010) [15]. Nowadays, Kadaknath is attracting interest of the poultry farmers because of their delicious meat which fetches higher prices as compared to broiler meat. Though Kadaknath farming has started running on commercial level, there exists very few information on the effect of size of egg and hatch on hatchability, fertility and body weight of chickens. King'ori (2011) [13] suggested that chick weight, fertility and hatchability are interrelated heritable traits that vary among breeds, variety or individuals in a breed or variety there foreit becomes very important to understand the effect of egg weight on these traits in Kadaknath chickens. In the layer production cycle, egg size is highly variable trait, the bird will start with small egg progressing to medium size and eventually to desirable large size egg in a couple of weeks. However other factors like the hen's age, body weight, and yolk weight along with feed intake such as fat levels, protein, and enzymes also alters weight of egg (Iqbal *et al*., 2016). Different researchers showed that there is positive correlation between pre-incubation egg weight, length of storage periods, hatchling weight and growth performance in different species of poultry (Farooq *et al.* 2001, Petek *et al.* 2003) [5, 20]. There is lack of information on the effect of egg weight on subsequent performance of Kadaknath chickens. Therefore, the present study was designed to study the effect of egg weight and hatch on fertility, hatchability and body weight of Kadaknath chicken.

2. Materials and Methods
2.1 Experiment location and selection of birds
Experiment was conducted at poultry unit of College of Veterinary Science and Animal Husbadary, Anjora, Durg, Chhattisgarh, India taking 1740 number of eggs from Kadaknath birds. Sex ratio of 1:10 was kept for these birds. Vaccination, feeding and all other management practices were kept uniform during the research.

2.2 Collection and storage of eggs

A total 1740 eggs were collected twice a day at 10 a.m. and 4pm from four different hatches. Misshaped, cracked, dirty, elongated and very small eggs were rejected and only oval shape good quality eggs were selected for hatching. To determine the effect of egg size and hatch on hatchability, fertility and body weight individual egg was weighted and grouped into two categories small (< 40 gm) and large (>40gm). All the eggs were then fumigated with formalin and potassium permanganate in the ratio 1:2 for 15 min and were set into the incubator at dry bulb temperature of 37 ^{0}C and wet bulb temperature of 28.3 ^{0}C with broad ends pointing upwards. After the end of incubation period fertile and unfertile eggs were identified by breaking the unhatched eggs. The hatchability percentage was calculated by dividing the number of hatched eggs by the total number of eggs set and then multiplied with 100, whereas fertility percentage was calculated by dividing number of egg hatched by total number of fertile eggs.

$$\text{Hatchability on total egg basis} = \frac{\text{No of chicks hatched}}{\text{No of egg set}} \times 100$$

$$\text{Hatchability on fertile egg basis} = \frac{\text{No of chicks hatched}}{\text{No of fertile egg}} \times 100$$

2.3 Body weight

Wing band was put on to hatched chicks and body weight in gram (g) was taken using electronic balance from day old to 20 week of age at weekly interval.

2.4 Statistical analysis

The mean, standard deviation (SD) and standard error (SE) coefficient of variation (CV) for egg weight and body weight was calculated by using the standard statistical formulae (Snedecor and Cochran, 1989) [34]. Statistical analysis was performed in two stages effect of egg size on day old chick and subsequent body weight of Kadaknath chickens were analyzed by one way ANOVA through Microsoft Office Excell, Chi-square test was used to determine the effects of egg weights on chick to egg weight ratio, hatchability and fertility and effect of hatch on body weight was estimated by using SPSS version 25 statistical analysis programme. The statistical model was:

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

Where,
Y_{ij} = Body weight of n^{th} chick in i^{th} hatch
μ = Over all mean.
H_i = Effect of i^{th} hatch
e_{ij} = Random error (0, $\sigma^2 e$).

Duncan test for multiple comparisons was used to test the significance of differences between treatment means at 5% significance level (p<0.05).

3. Results and discussion

3.1 Effect of hatch

3.1.1 Egg weight

The mean and standard error in all hatches and pooled for egg weight, chick to egg weight percent, hatchability and fertility is given in Table 1a. The average egg weight in Kadaknath observed was 40.72g ranging from 39.54g to 41.87g. The mean and standard error in all hatches and pooled for egg weight is given Table 1a. The observed values for egg weight was comparable with the values observed by Parmar *et al* (2006), Ekka (2018), Verma *et al* (2018) and Kumar *et al* (2022) [17, 4, 37, 14] whereas slightly higher than the value observed by Haunshi *et al* (2011) [7] lower than the Jha *et al* (2021) [9] in Kadaknath. Effect of egg hatch on egg weight was found to be significant. Variation in egg weight could be attribute to difference in general management and feeding management.

3.1.2 Chick to egg weight percent

The percentage chick weight of egg weight in Kadaknath obtained in this work is lower as compare to percentage obtained in Rhode Island red and Barred Plymouth Rock (Jull *et al*, 1925, Upp C. W., 1928) [10, 36], Broad Breasted Turkey (Payne *et al*., 1957) [19] and in commercial broiler breed (Pinchasov Y., 1991) [21].

3.1.3 Fertility and Hatchability

Fertility and hatchability are two major parameters that influence day-old chicks Javid *et al* (2016). Fertility ranges from 70.75% to 83.31% in four different hatches with the polled value 78%. Fertility recorded in the present study is comparable to values observed in Kadaknath by Ekka (2018) [4], Jena *et al* (2018) [8] and in Aseel by Verma *et al* (2018) [37] whereas higher values for fertility was presented by Biswas *et al* (2010) [2], Haunshi *et al*. (2012) [6] in Kadaknath and Ramaphala and Mbajiorgu (2013) [24] in COBB 500 broiler chicken and Premavilli *et al* (2020) [22] in Aseel hen. Singh *et al* (2018) [32] recorded lower fertility percentage than the Kadaknath in indigeneous Uttara chicken in Pantanagar.

Hatchability percent was calculated on total egg basis and fertile egg basis values ranges between 39.78% to 73.69% and 55.47% to 88.48%, respectively and their mean value came to 60.66% and 76.17%, respectively. Hatchability on total egg basis and fertile egg basis in this study was similar to values observed by Haunshi *et al* (2012) [6], Ekka (2018) [4], Jena *et al* (2018) [8] and higher values were observed by Biswas *et al* (2010) [2], Sharma *et al* (2012) [29].

Effect of hatch was found significant in both the parameters. Significant difference in fertility and hatchability is indicative that these parameters are highly affected by the surrounding environment.

3.1.4 Body weight

The meanand standard error in four hatches and pooled for body weight irrespective of sex at different age is given in Table 1b which is much lower than the weight reported by Thakur *et al* (2006) [17], Chaterjee *et al* (2007), Sharma *et al* (2012) [29], Singh *et al* (2014) [31], Shanmathy *et al* (2018), Ekka (2018) [4], Ranbijuli *et al* (2020) [25], Dubey *et al*. (2021), this might be due to variation in management practices, climate and environmental factors.Body weight from day old to 20 weeks of age was significantly affected by the weight of the egg which is indicative of the fact that the trait body weight is highly influenced by the environmental conditions. Significant hatch effect was also reported by Singh *et al* (2001), Rahman *et al* (2003) and Tomar *et al* (2015) [33, 23, 35] in White Leghorn chicken and in Dahlem red layers by Shivaprasad *et al* (2017) [30].

3.6 Effect of egg size

3.6.1 Fertility and Hatchability

Fertility and hatchability traits were found on higher side for large size egg (p>0.05) (Table 2a). Graph 1 clearly shows the difference in fertility and hatchability due to egg size. Similar results were also obtained by Ng'ambi *et al* (2013) in Venda chickens, Iqbal *et al* (2016) and Olutunmogum *et al* (2018) [16] in broiler breeder and Premavalli *et al* (2020) [22] in Aseel, where there was significant effect of egg weight on hatchability and fertility. The present result was in contrary to the finding of Rashid *et al* (2013) [26] in Rhode Island Red x Fayoumi chicken and Rammaphala and Mbajiorgu (2013) [24] in COBB 500 broiler chicken.

3.6.2 Body weight

There is a linear relationship between age and body weight as shown in the Graph 1. It can also be noticed in the graph that differences in the weight due to egg weight remains constant throughtout the period of research. The slope of the line obtained for large size egg was y = 38.72x – 93.70 with coefficient of determination (R^2) being 0.977 and for small size egg was y = 33.39x – 87.37 with coefficient of determination (R^2) being 0.969 indicating a significant relationship. Similar trend in Kadaknath was also observed by Ranabijuli *et al* (2020) [25].

Effect of egg size on hatch weight and subsequent body weight is significant in first 4 week in Hatch 1 and 2 while in hatch 3, 4 and pooled data egg size effect can be seen upto 20 week of age presented in Table 2a and 2b. Not much work done on the effect of egg size on body weight at different age in Kadaknath but few works are there on other breeds. In the present research result showed that the size of the egg largely determines the chick size at hatch as well as at later stage of life (20week). Chick weight is the most widely used indicator for day-old chick quality assessment (Decuypere *et al.*, 2002) [3]. It is known that a positive correlation exists between chick weight and egg weight in broiler chicken and different domestic birds (Pinchasov 1991, Abiola *et al*., 2008, Shanawany 1987) [21, 1, 28], which is accordance with the present research. The current finding was also supported by Patra *et al* (2016) [18], Iqbal *et al* (2017), Senbeta (2017) [27] and Olutunmogum *et al* (2018) [16]. Willams suggested that large size eggs contained more butrients than small eggs and hence, developing embryos from large eggs tended to have more nutrients for their growth requirements.

Table 1a: Effect of hatch on egg weight, chick to egg weight percentage, hatchability and fertility

Variable	Hatch 1	Hatch 2	Hatch 3	Hatch 4	pvalue	Pooled
Egg weight (g)	41.87 ± 0.16^{a}	41.00 ± 0.19^{b}	40.86 ± 0.24^{b}	39.54 ± 0.17^{c}	0.001**	40.72 ± 0.10
Chick to egg wt.%	60.97	63.27	60.84	60.19	NS	60.66^{NS}
Hatchability (TEB, %)	59.13	39.78	73.69	70.03	0.001**	60.66
Hatchability (FEB, %)	76.94	55.47	88.42	83.88	0.001**	76.17
Fertility (%)	74.63	70.75	83.31	83.31	0.001**	78.00

Mean in the same row with different superscript a,b,c are significant (P≤0.01**, P≤0.05*)

Table 1b: Effect of hatch on body weight

Age	Hatch 1	Hatch 2	Hatch 3	Hatch 4	F Value
DOC	$25.63^{b} \pm 0.13$	$25.97^{a} \pm 0.29$	$25.03^{b} \pm 0.20$	$23.98^{c} \pm 0.15$	17.00**
Week 1	$31.6^{b} \pm 0.24$	$31.13^{b} \pm 0.35$	$41.91^{a} \pm 0.43$	$40.76^{a} \pm 0.39$	189.08**
Week 2	$40.93^{c} \pm 0.39$	$40.43^{c} \pm 0.59$	$54.43^{b} \pm 0.71$	$58.52^{a} \pm 0.78$	152.47**
Week 3	$48.65^{c} \pm 0.52$	$48.10^{c} \pm 0.80$	$70.82^{b} \pm 1.06$	$76.57^{a} \pm 1.04$	197.61**
Week 4	$56.86^{c} \pm 0.67$	$59.47^{c} \pm 1.14$	$89.46^{b} \pm 1.40$	$97.00^{a} \pm 1.33$	221.96**
Week 5	$67.71^{c} \pm 0.93$	$76.75^{b} \pm 1.79$	$121.66^{a} \pm 1.77$	$122.45^{a} \pm 1.56$	239.05**
Week 6	$86.35^{c} \pm 1.45$	$97.15^{b} \pm 2.55$	$154.58^{a} \pm 2.34$	$148.62^{a} \pm 2.20$	186.98**
Week 7	$109.16^{d} \pm 2.05$	$118.78^{c} \pm 3.59$	$192.49^{a} \pm 2.97$	$174.81^{b} \pm 2.54$	166.19**
Week 8	$133.64^{c} \pm 2.84$	$144.68^{c} \pm 4.76$	$228.51^{a} \pm 3.57$	$206.49^{b} \pm 2.94$	145.00**
Week 9	$162.47^{c} \pm 3.7$	$171.60^{c} \pm 5.97$	$266.86^{a} \pm 3.95$	$247.75^{b} \pm 3.41$	136.39**
Week 10	$192.19^{b} \pm 4.55$	$202.04^{b} \pm 7.03$	$305.37^{a} \pm 4.49$	$291.61^{a} \pm 3.91$	125.42**
Week 11	$236.27^{b} \pm 5.83$	$233.20^{b} \pm 7.96$	$342.66^{a} \pm 5.34$	$335.08^{a} \pm 4.42$	93.50**
Week 12	$281.87^{b} \pm 6.94$	$269.44^{b} \pm 8.87$	$383.48^{a} \pm 5.90$	$379.11^{a} \pm 4.95$	73.98**
Week 13	$346.95^{b} \pm 8.84$	$315.60^{c} \pm 10.50$	$432.81^{a} \pm 6.40$	$423.09^{a} \pm 5.49$	47.56**
Week 14	$403.31^{b} \pm 9.49$	$366.06^{c} \pm 12.29$	$480.91^{a} \pm 6.86$	$465.72^{a} \pm 6.06$	34.24**
Week 15	$455.00^{b} \pm 10.43$	$412.84^{c} \pm 13.33$	$525.53^{a} \pm 7.33$	$510.39^{a} \pm 6.60$	26.18**
Week 16	$501.29^{b} \pm 11.32$	$466.97^{c} \pm 15.45$	$567.37^{a} \pm 7.66$	$560.55^{a} \pm 7.24$	18.65**
Week 17	$547.31^{b} \pm 12.30$	$514.61^{c} \pm 16.51$	$610.05^{a} \pm 7.96$	$608.00^{a} \pm 7.76$	15.68**
Week 18	$594.38^{b} \pm 13.72$	$561.60^{b} \pm 17.87$	$649.53^{a} \pm 8.29$	$653.53^{a} \pm 8.15$	12.36**
Week 19	$641.88^{b} \pm 14.21$	$607.80^{b} \pm 18.69$	$688.82^{a} \pm 8.78$	$697.7^{a} \pm 8.49$	9.93**
Week 20	$680.19^{b} \pm 15.04$	$654.87^{b} \pm 20.09$	$727.912^{a} \pm 9.15$	$749.63^{a} \pm 9.19$	10.27**

Mean ± SE in the same row with different superscript a,b,c,d are significant (P≤0.01**, P≤0.05*)

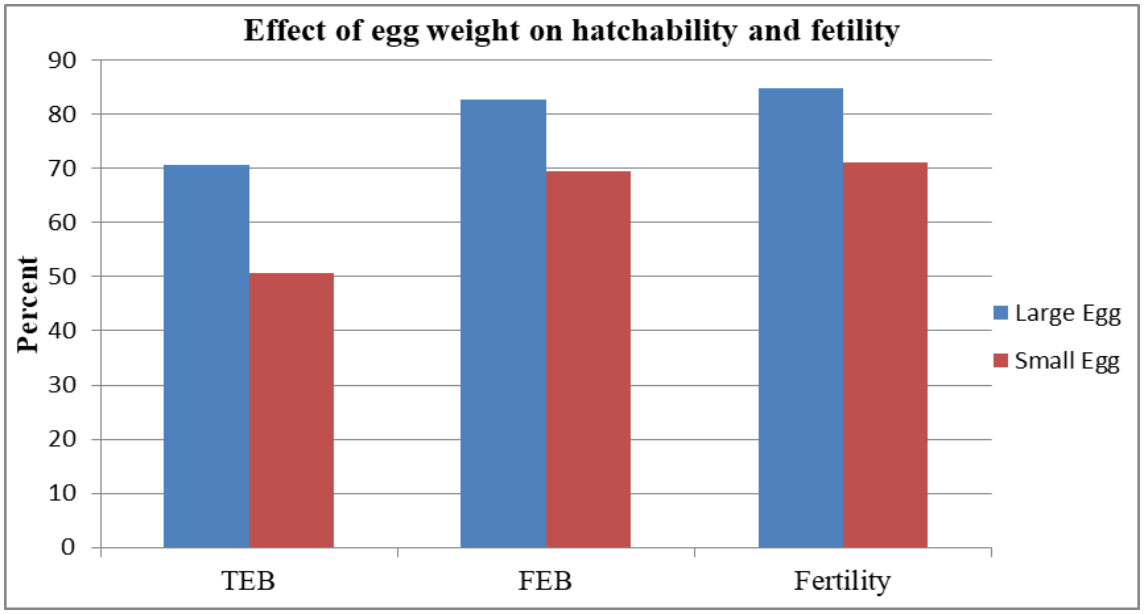
Table 2a: Effect of egg weight on hatchability and fertility

Variable	Large egg	Small egg	Significant level
Hatchability (TEB, %)	70.59	50.65	0.001**
Hatchability (FEB, %)	82.81	69.54	0.001**
Fertility (%)	84.84	71.16	0.001**

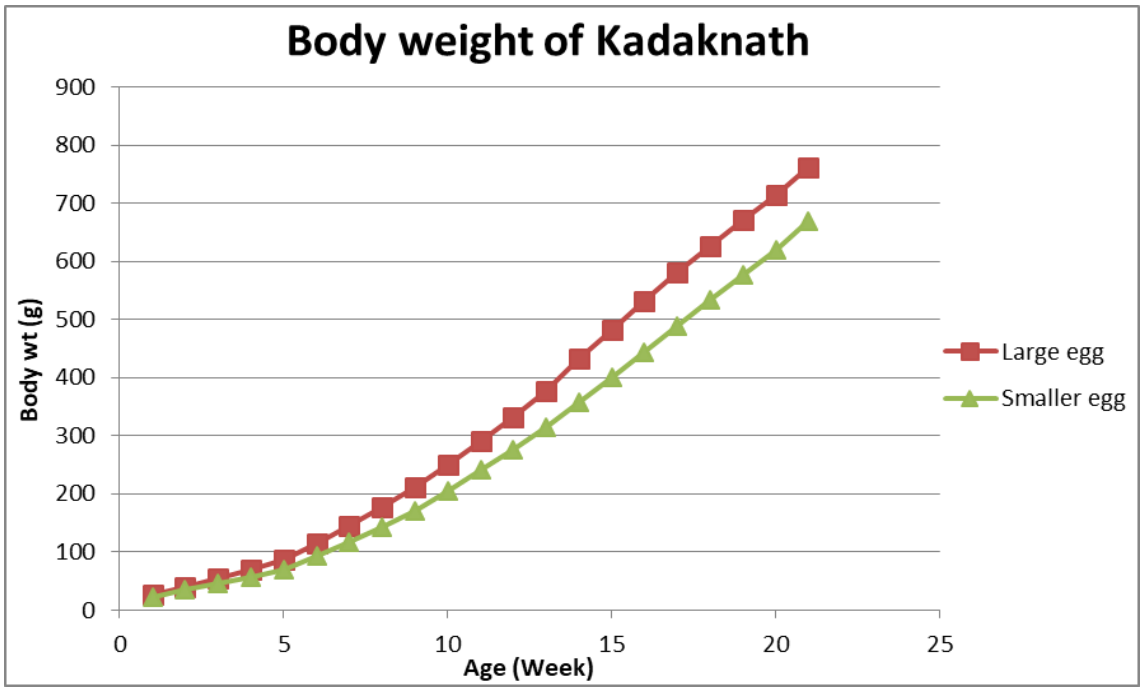
Table 2b: Effect of Egg size on body weight

Week	Body weight (g)	
	Large egg	Small egg
DOC	26.76 ± 0.10 (679)	22.15 ± 0.09 (475)
Week 1	39.80 ± 0.35 (675)	36.13 ± 0.27 (474)
Week 2	54.83 ± 0.63 (672)	45.19 ± 0.35 (473)
Week 3	69.99 ± 0.93 (669)	56.61±0.53 (473)
Week 4	87.32 ± 1.26 (663)	70.04 ± 0.75 (469)
Week 5	113.93 ± 1.74 (620)	93.37 ± 1.20 (458)
Week 6	145.48 ± 2.21 (587)	116.71 ± 1.52 (451)
Week 7	177.80 ± 2.68 (578)	142.88 ± 1.97 (448)
Week 8	211.61 ± 3.15 (567)	170.21 ± 2.31 (440)
Week 9	250.71 ± 3.67 (555)	205.21 ± 2.67 (434)
Week 10	290.07 ± 4.23 (544)	241.75 ± 3.08 (423)
Week 11	332.41 ± 4.82 (524)	275.97 ± 3.41 (405)
Week 12	377.3 ± 5.19 (507)	314.80 ± 3.84 (404)
Week 13	431.93 ± 5.53 (507)	357.85 ± 4.34 (392)
Week 14	482.08 ± 5.76 (504)	400.49 ± 4.83 (388)
Week 15	531.22 ± 6.00 (496)	442.33 ± 5.34 (386)
Week 16	580.77 ± 6.36 (475)	487.52 ± 5.76 (375)
Week 17	626.20 ± 6.64 (471)	532.89 ± 6.31 (371)
Week 18	670.49 ± 6.99 (470)	577.37 ± 6.67 (372)
Week 19	715.06 ± 7.28 (469)	620.62 ± 7.19 (372)
Week 20	762.13 ± 7.93 (463)	669.45 ± 7.75 (369)

Note: 1. Figure in the parenthesis below each mean value indicates the number of observation
2. Mean ± SE in the same row with different superscript (*) are significant ($P \leq 0.01$**, $P \leq 0.05$*)



Graph 1: Effect of egg weight on hatchability and fertility



Graph 2: Body weight of Kadaknath chicken

4. Conclusion

In the present research it can be concluded that the hatch and egg weight affects hatchability, fertility and body weight. Large size egg produce chicks with heavier chicks and selecting larger eggs can improve the quality of the chicks and getting heavier body weight at early age.

5. References

1. Abiola S, Meshioye O, Oyerinde B, Bamgbose M. Effect of egg size on hatchability of broiler chicks. Archivos de Zootecnia. 2008;57:83-86.
2. Biswas A, Mahan J, Sastry KVH. Effect of vitamin E on productive performance and egg quality traits in India native Kadaknath hen. Asian - Australian Journal of Animal Science. 2010;23(3):396-400.
3. Dacuypere EK, Tona F, Bamelis C, Careghi B, Kemp B, De Ketelaere J *et al*. Broiler breeders and egg factors interacting with incubation conditions for optimal hatchbility and chick quality. Archive Fur Geflugelkunde. 2002;66:56-57.
4. Ekka P. Studies on growth, reproductive and productive performance of Kadaknath fowl raised under intensive management system in Chhattisgarh. Ph. D thesis. Chhattisgarh Kamdhenu Vishwavidayala, Durg, 2018.
5. Farooq M, Aneela K, Durrani FR, Muqarrab AK, Chand N, Khurshid A. Egg and shell weight, hatching and production performance of Japanese broiler quail. Sarhad Journal of Agriculture. 2001;17:289-93.
6. Haunshi S, Shanmugan M, Padhi MK, Niranjan M, Rajkumar U, Reddy MR *et al*. Evaluation of two Indian native chicken breeds for reproduction traits and heritability of juvenile growth traits. Tropical Animal Health and Production. 2012;44:969-973.
7. Haunshi S, Niranjan M, Shanmugan M, Padhi MK, Reddy MR, Sunitha A *et al*. Characterization of two Indian native chicken breeds for production, egg and semen quality and welfare traits. Poultry Science. 2011;90(2):314-320.
8. Jena PK, Panigrahi B, Panda N, Mohapatra LM, Mallik BK, Bagh J. Reproductive performance and egg quality traits of Kadaknath in intensive managemental condition under hot and humid climate. International Journal of Livestock Research. 2018;8(12):105-112.
9. Jha BK, Chakrabarti A, Yadav VK, Kumar P. Comparative performance of different varieties of chicken in Eastern Hill and Plateau region of India. International Journal of Livestock Research. 2021;11(1):184-189.
10. Jull MA, Quinn JP. The relationship between the weight of eggs and the weight of chicks according to sex. Journal of Agriculture Research. 1925;31(3):223-227.
11. Khan JSH, Mukhtan N, Ahmed T, Pasha RA. Effects of egg size (weight) and egg on hatching performance and chick quality of broiler breeder. Journal of Applied Animal Research. 2016;44(1):54-64.
12. King'ori AM, Tuitoek JK, Muiruri HK, Wachira AM. Protein requirements of growing indigenous chickens during the 14-21 weeks growing period. South African Journal of Animal Science. 2003;33:78-81.
13. King'ori AM. Review of the factors that influence egg fertility and hatchability in poultry. Indian journal of poultry Science. 2011;10:483-492.
14. Kumar M, Dahiya SP, Ratwan P, Sheoran N, Kumar S, Kumar N. Assessment of egg quality and biochemical parameters of Aseel and Kadaknath indigenous chicken breeds of India under backyard farming. Poultry Science. 2022;101(2):1-7.
15. Mtileni BJ, Muchadeyi FC, Maiwashe A, Phitsane PM, Halimani, TE, Chimonyo M *et al*. Characterisation of production systems for indigenous chicken genetic resources in South African. Applied Animal Husbandary and Rural Development. 2010;2:18-22.
16. Olutunmogun AK, Umar AU, Adejoh-Ubani EO, Nwagu BI, Adeyinka IA, Muhammad SM. Nigerian Journal of Animal Production. 2018;45(1):18 -25
17. Parmar SNS, Thakur MS, Tomar SS, Pillai PVA. Evaluation of egg quality traits in indigenous Kadaknath breed of poultry. Livestock Research for Rural Development. 2006;18(9):1-5.
18. Patra MK, Sanchu VS, Ngullie E, Hajra DK, Deka B.

Influence of egg weight on fertility and hatchability of backyard poultry varieties mainted under institutional farm conditions. Indian Journal of Animal Science. 2016;86(8):869-872.
19. Payne Y, Siegel PB, Ortman L. Correlation of dam, egg, poult and adult weights in Broad Breaset Bronze Turkeys. Poultry Science. 1957;36(3):572-575.
20. Petek M, Baspinar H, Ogan M. Effects of egg weight and length of storage on hatchability and subsequent growth performance of Quail. South African Journal of Animal Science. 2003;33:242-47.
21. Pinchasov Y. Relationship between the weight of hatching eggs and subsequent early performance of broiler chicks. British Poultry Science. 1991;32(2):109-115.
22. Premavalli K, Churchul RR, Omprakash AV. Effect of egg weight on hatching performance of Aseel. Journal of Entomology and Zoology Studies. 2020;3:71-74.
23. Rahman M, Roy TC, Das B. Genetic studies on some economic traits of White Leghorn chickens of Meghalaya, Indian Veterinary Journal. 2003;80:999-1001.
24. Ramaphala NO, Mbajiorgu CA. Effect of egg weight on hatchability and chick hatch-weight of COBB 500 broiler chickens. Asian Journal of Animal and Veterinary Advances. 2013;8(7):885-892.
25. Ranabijuli S, Garanayak N, Samantrat SK, Sahu S. Body weight gain performance of poultry breed Kadaknath in semi-intensive rearing system of Ganjam District, Odisha. Journal of Entomology and Zoology Studies. 2020;8(3):1515-1518.
26. Rashid A, Khan SH, Abbas G, Amer MY, Khan MJA, Iftikhar N. Effect of egg weight on hatchability and hatching weight in Fayoumi, Desi and crossbred (Rhode Island Red X Fayoumi) chickens, Veterinary World. 2013;6:592-595.
27. Senbeta EK. Effect of egg size on hatchability and subsequent growth performance of Fayoumi chicken. Journal of Agriculture Science. 2017;9(7):116-122.
28. Shanawany MM. Hatching weight in relation to egg weight in domestic birds. World. Poultry Science Journal. 2012;43:107-115.
29. Sharma P, Tripathi SM, Vishwakarma N, Jain A, Rai HS. Performance of Kadakanth and Krishna-J birds as backyard system of farming in Mandla district of M.P., International Journal of Livestock Research. 2012;2(2):241-244.
30. Shivaprasad CH, Gupta RB, Chatterjee RN. Genetic study on the performance of Dahlem Red layers. The Pharma Innovation Journal. 2015;6(8):394-397.
31. Singh DP, Narayan R, Bhadauria P, Sharma RD. Inheritance of body weight and body measurements in Kadaknath. Indian. Journal of Poultry Science. 2014;49(2):152-154.
32. Singh MK, Kumar S, Singh DV, Singh B, Singh SK, Sharma RK. Genetic parameters for reproductive traits in Indigenous Uttara chickens, Journal of animal Research. 2018;8(2):237-241.
33. Singh S, Chhikara BS, Dalal DS, Malik CP. Estimation of gnetic and phenotypic parameters of economic traits of White Leghorn. Indian Journal of Poultry Science. 2001;36(2):163-168.
34. Snedecor GW, Cochran WG. Statistical methods, Eigth Edition, Iowa state University Press, Ames, Iowa, 1989.
35. Tomar AK, Poonia JS, Chaudhari M, Kumar P. Evaluation of production performance of some economic traits in White Leghorn birds. Haryana Veterinarian. 2015;54(1):19-21.
36. Upp CW. Egg weight, day old chick weight and rate of growth in single comb Rhode Island Red chicks. Poultry science. 1928;7(4):151-155.
37. Verma, AK, Pramanik PS, Singh KD, Panday G, Verma HC, Verma RK. Comparative Assessment of Fertility and Hatchability of Kadaknath and Aseel Fowls. International Journal of Current Microbiology and Applied Science. 2018;7:1238-1243.
38. Williams TD. Intraspecific variation in egg size and egg composition in birds: effect on offspring fitness. Biological Reviews of Cambridge Philosophical Society. 1994;69:35-59.