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Study of reproductive and external egg quality traits of Vanaraja parents under deep litter management system in Chhattisgarh plains

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Abstract

The Vanaraja breeder flock was maintained in three separate experimental pens with 88 to 90 in each pen at 1:8 male to female mating ratio. The eggs were collected daily for four weeks at the age of 48th week, 49th week, 52nd week, and 55th week from each of the experimental pens. Total 450 eggs from the three pens (150 eggs from each pen) were selected randomly at the end of each week. And were set in the incubator for incubation to estimate the fertility%, hatchability on total egg set basis, and fertile egg set basis. The study revealed that the average value of fertility was 88.00%, 90.00%, 90.67%, 90.67% at 48, 49, 52, and 55 weeks of age observed, respectively. Hatchability % (T.E.S.) was 76.00 percent, 78.67 percent, 79.33 percent, and 80.00 percent at 48, 49, 52 and 55 weeks of age, respectively and Hatchability % (F.E.S.) were 86.36%, 87.41%, 87.50% and 88.24% at 48, 49, 52 and 55 weeks of age, respectively. The average mean of egg weight for 48, 49, 52 and 55 weeks of age observed 57.46±0.29, 57.17±0.31, 57.51±0.36 and 56.64±0.37 respectively and shape index were found 63.31±0.64, 60.06±0.28, 64.25±0.53 and 63.84±0.48 for 48, 49, 52 and 55 weeks of age respectively.

Keywords: Vanaraja, fertility, hatchability, egg weight, egg shape index

Introduction

Poultry farming is one of the fastest-growing segments of the agricultural sector in India today. It carries a pivotal position in the current Indian economy and has evolved from subsistence farming to an extremely business oriented enterprise [1]. Poultry production systems in India are characterized by the simultaneous existence of the traditional extensive system of backyard production and the modern intensive method of production [2]. The importance of backyard poultry production has been globally recognized to overcome some of the worsening problems like poverty, hunger, and malnutrition in developing countries, especially in India [3]. However, the rural small-scale poultry, mainly managed by women [4] and it is confined to the economically weaker and tribal people. They rear the birds under the traditional scavenging system. Vanaraja is a dual purpose multi-coloured bird. The Vanaraja birds are light in weight and long shanks and is capable of protecting itself. The female bird lays between 160-180 eggs in the laying cycle. The Vanaraja is a dual purpose bird and does not need any special diet supplement reared under free range in the backyard farming. they feed on worms and other food materials available to it, unlike the poultry bird when specialized care is needed to be taken. The evaluation of the external quality of the egg is essential as consumers prefer better quality eggs. Many factors influence egg quality, i.e., breed, strain, variety, temperature, relative humidity, rearing practices, and season. The success of poultry farming largely depends on the total number of good quality eggs produced, especially in layers. Though number of experiments have been carried out on egg quality traits, the information on varieties developed and being popularized for backyard farming in rural and tribal areas are limited. The present study was executed for evaluating the reproductive and external egg quality traits in Vanaraja birds under the agro-climatic condition of Chhattisgarh plains. Vanaraja is a dual purpose birds developed for backyard poultry farming by crossing random-bred meat birds as female line and Red Cornish as a male line at Project Directorate on Poultry, Hyderabad [5].

Materials and Methods

The current study was carried out at the Poultry Unit of College of Veterinary Science & Animal Husbandry, Anjora, Durg, for the period of two months from March to April 2016.

A total of 270 Vanaraja breeder birds were maintained in three separate experimental pens with 88 to 90 in each pen at 1:8 male to female mating ratio. At the start of the experiment, chickens were of 48 weeks old and were reared under deep litter with standard management practices. Chickens were separated into three different pens, each containing 78-79 females and 10-11 males to maintain an eight to one female to male ratio (table 1). Each pen was a 12 X 20 ft enclosure area. A total of 150 numbers of eggs from each pen were selected for setting in a single-stage incubator for 48th, 49th, 52nd, and 55th week. All the eggs were individually marked. Eggs were manually groups and divided into three groups i.e., below average, average, and above average.

Then eggs were transferred to the automated incubator for incubation. Candling of eggs was done twice during incubation i.e., on 7th and 18th days. Fertility percent, hatchability percent on T.E.S. (total egg set basis) and F.E.S. (fertile egg set basis) calculated by using the following

formulae.

$$\text{Fertility \%} = \frac{\text{Number of fertile eggs}}{\text{Total numbers of eggs set incubation}} \times 100$$

$$\text{Hatchability \% (T. E. S.)} = \frac{\text{number of egg hatched}}{\text{Total number of eggs set}} \times 100$$

$$\text{Hatchability \% (F. E. S.)} = \frac{\text{number of egg hatched}}{\text{Fertile eggs set}} \times 100$$

Percent egg production: At the start of lay, total counts of eggs laid per pen were recorded to calculate percent egg production with the formula.

$$\text{Egg Production \%} = \frac{\text{Total Eggs Laid}}{\text{Number of Hens}} \times 100$$

Table 1: Details of Breeder flock of Vanaraja Parents in different experimental pens

Weeks of Age	Pen I		Pen II		Pen III	
	Male (no.)	Female (no.)	Male (no.)	Female (no.)	Male (no.)	Female (no.)
48	10	78	11	79	10	78
49	10	78	11	79	10	78
52	10	78	11	79	10	78
55	10	78	11	79	10	78

Statistical Analysis

Data were analyzed by the chi-square test for the test of independence and quantification, and variability of each parameter like egg weight and shape index mean standard deviation and standard error were calculated as per standard procedures^[6].

Results and Discussion

Reproductive traits

Fertility: The fertility percentage of eggs of Vanaraja birds was 88.00 percent, 90.00 percent, 90.67 percent, 90.67 percent at 48, 49, 52, and 55 weeks of age were observed, respectively (table 2). The present findings (fig.1) are in close agreement with those reported by fertility rates of 91.28 percent in Vanaraja chicken of Assam under the backyard system of rearing^[7]. However, lower fertility in Vanaraja birds was reported under the traditional system of rearing (71.13 percent)^[8,9] and (74.85 percent)^[2].

Hatchability on total egg set basis: The hatchability percentage in eggs of Vanaraja birds on a total egg set basis was observed to be 76.00 percent, 78.67 percent, 79.33 percent, and 80.00 percent at 48, 49, 52 and 55 weeks of age

were observed, respectively (table 2). In present study, the hatchability percent on total egg set basis was almost similar to as observed by^[10, 11] (fig.1). The hatchability of Vanaraja birds found to be 68.7 percent under the hill agro-ecosystem of the North-Eastern region^[11], lower than observed in the present study. However, similar hatchability^[12] to the current findings has been reported and the highest hatchability in Vanaraja, on a total egg set basis has been recorded at 89.78 percent^[7].

Hatchability on fertile egg set basis: The hatchability percentage in eggs of Vanaraja birds on fertile egg set basis was observed to be 86.36 percent, 87.41 percent, 87.50 percent, and 88.24 percent at 48, 49, 52 and 55 weeks of age were observed, respectively (table 2). An average hatchability of Vanaraja in several districts of Andhra Pradesh found to be at 80.00 percent^[4]. While in the present experiment, higher hatchability than these stated has been observed that was similar to the as reported by researcher^[12]. In the present investigation, hatchability (T.E.S.) was positively and significantly correlated (< 0.05) with fertility and hatchability (F.E.S.) (table 4).

Table 2: Fertility and hatchability of Vanaraja Parents (control group) from 48 to 55 weeks of age

Particulars	Weeks of age				Overall	Chi ² Value
	48	49	52	55		
	Fertility					
Eggs Set	150	150	150	150		
Fertile eggs	132	135	136	136		
Fertility %	88.00	90.00	90.67	90.67	89.83	1.251 ^{NS}
	Hatchability on T.E.S.					
Eggs Set	150	150	150	150		
No. of chicks hatched	114	118	119	120		
Hatchability (T.E.S.) %	76.00	78.67	79.33	80.00	78.50	1.251 ^{NS}
	Hatchability on F.E.S.					
Eggs Set	150	150	150	150		
No. of chicks hatched	114	118	119	120		

Fertile eggs	132	135	136	136		
No. of embryonic mortality	18	17	17	1519		
Hatchability (F.E.S.) %	86.36	87.41	87.50	88.24	87.38	1,519 ^{NS}
Egg Production						
Egg production (No. of eggs produced)	283	257	304	310		
Egg production %	52.01	47.07	55.68	56.78	52.89	

NS - Not Significant.

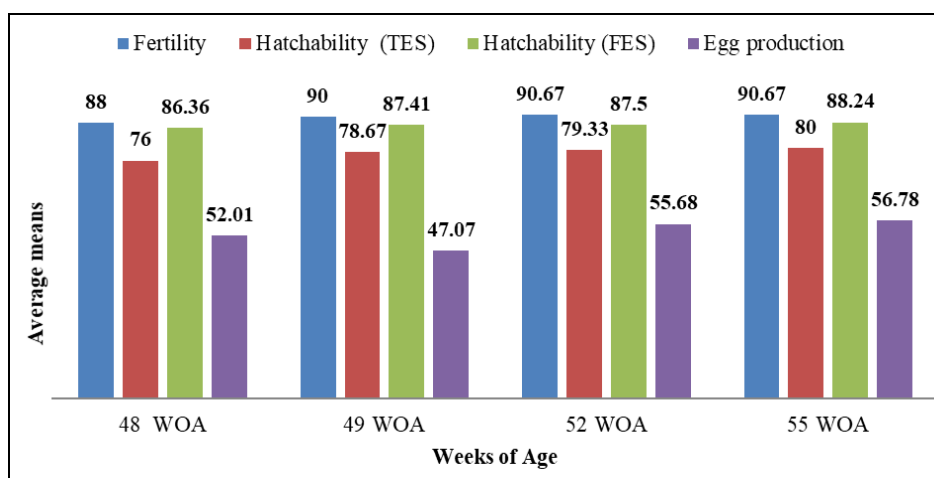


Fig 1: Reproductive traits at different weeks of age in Vanaraja parents

External egg quality traits

The average mean of egg weight was observed as 57.46±0.29, 57.17±0.31, 57.51±0.36 and 56.64±0.37 and shape index were observed 63.31±0.64, 60.06±0.28, 64.25±0.53 and 63.84±0.48 for 48, 49, 52 and 55 weeks of age respectively (table 3). Similarly, the average mean of egg length and egg width was recorded at 4.09±0.01 and 2.59±0.01, 4.26±0.01 and 2.55±0.01, 4.02±0.02 and 2.57±0.01, and 4.06±0.02 and 2.58±0.01 for 48, 49, 52 and 55 weeks of age, respectively (table 3). The present findings (fig.2) are in close conformity with those reported by [13] and Singh [5] was less than observed in the present investigation. The average egg length observed

ranged from 4.02 to 4.26 cm, and the average egg width ranged in between 2.47 to 2.66 cm among different treatment groups and weeks of collection. The present findings of Vanaraja are comparable with average egg weight of 58 g obtained under the traditional rearing system in Manipur [14]. Some researchers have reported less average egg weight than observed in the present investigation [5]. In this investigation, among the egg quality traits, the shape index was found positively and significantly (< 0.01) correlated with egg length.

Table 3: Average Means (X±S.E.) of external egg quality traits at different W.O.A. in Vanaraja parents

W.O.A.	Egg weight (g)	Egg length (cm)	Egg width (cm)	Shape Index
48	57.46±0.29	4.09±0.01	2.59±0.01	63.31±0.64
49	57.17±0.31	4.26±0.01	2.55±0.01	60.06±0.28
52	57.51±0.36	4.02±0.02	2.57±0.01	64.25±0.53
55	56.64±0.37	4.06±0.02	2.58±0.01	63.84±0.48
Overall	57.20±0.33	4.11±0.02	2.57±0.01	62.87±0.48

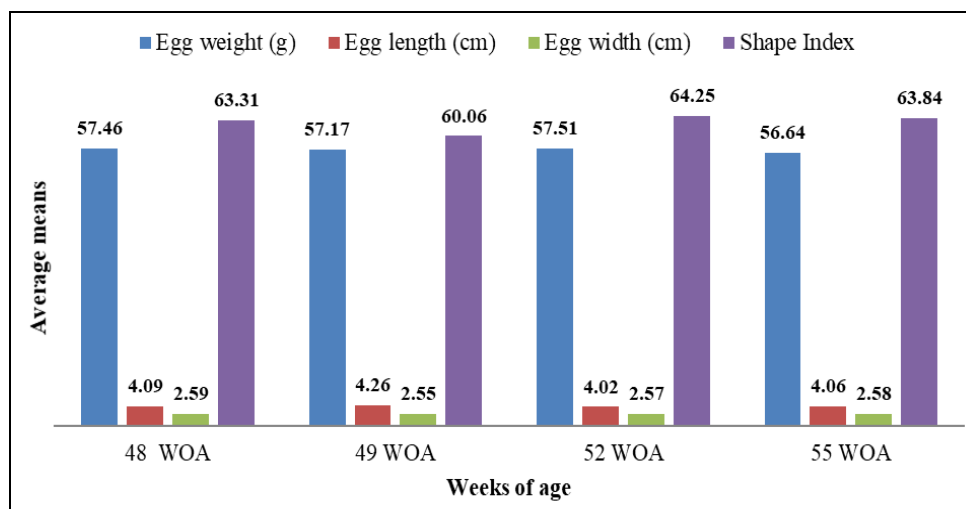


Fig 2: External egg quality traits at different weeks of age in Vanaraja parents

Table 4: Correlation between different reproductive and external egg quality traits of Vanaraja parents

	Fertility	Hatchability T.E.S.	Hatchability F.E.S.	Egg Production	Egg Weight	Egg Length	Egg Width	Shape Index
Fertility	1							
Hatchability T.E.S.	.988*	1						
Hatchability F.E.S.	.919	.970*	1					
Egg Production	.375	.406	.433	1				
Egg Weight	-.457	-.590	-.767	-.261	1			
Egg Length	-.138	-.134	-.118	-.937	-.076	1		
Egg Width	-.489	-.428	-.312	.614	.012	-.716	1	
Shape Index	.096	.102	.105	.940	.036	-.997**	.764	1

*Correlation is significant (< 0.05) level. **Correlation is significant (< 0.01) level.

Conclusion

In the present investigation, the overall fertility, hatchability (T.E.S.), hatchability (F.E.S.) and egg production was observed at 89.83%, 78.50%, 87.38%, and 52.89%, respectively whereas the overall values for egg weight, egg length, egg width, and shape index was recorded at 57.20±0.33 gm, 4.11±0.02 cm, 2.57±0.01 cm and 62.87±0.48 in Vanaraja parents, respectively. It can be concluded from present findings that out of reproductive traits, hatchability (T.E.S.) was found positively and significantly correlated (< 0.05) with fertility and hatchability (F.E.S.) whereas among the egg quality traits, shape index was found positively and significantly (< 0.01) correlated with egg length. However other reproductive and external egg quality traits were found negatively correlated.

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