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CONTENTS

Effect of different indigenous breeds of poultry layers on production and morphological egg quality traits in western U.P.

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ABSTRACT: The present investigation was carried out to study the production performance of different poultry layers at Poultry Research Training Center, SVPUA&T, Modipuram, Meerut. Total 300 poultry layers of three breeds *viz.*,Aseel, Kadaknath and Rhode Island Red in four nests were observed. The traits studied were age at sexual maturity, body weight at sexual maturity, annual egg production, egg weight, shape index, shell weight and shell thickness. The data were analysed by using CRD.The age and body weights at sexual maturity were 187.09±0.16, 182.54±0.15 and 160.21±0.15 days and 1441.74±0.58, 1287.94±0.49 and 1269.93±0.58 gm; the annual egg production and egg weight were 87.14±0.15, 105.32±0.27 and 229.19±0.70 eggs and 47.09±0.13, 42.57±0.41 and 52.42±0.11 gm; egg shape index 75.64±0.12, 75.01±0.11 and 74.67±0.15 per cent, shell weight 5.83±0.19, 5.74±0.01 and 7.08±0.18 gm and egg shell thickness 0.32±0.001, 0.33±0.001 and 0.32±0.001mm in Aseel, Kadaknath and Rhode Island Red breeds, respectively.The analysis of variance showed highly significant differences among breeds for most of the traits except egg shell weight and egg shell thickness.

Key words: Aseel, back yard, Kadaknath, Rhode Island Red, sexual maturity

Poultry farming is one of the fastest growing segments of livestock sector in India. It represents a pivotal position in current Indian economy and has evolved as an extremely business oriented enterprise (Sreenivas D., 2013). Village poultry is of very significant importance as a major source of meat, table egg and as a source of income (Zaman *et al.*, 2004), particularly for the people belonging to the lower strata of the society. Genetic resources making up that aviculture in traditional farming system are formed of a multitude of often poorly characterized populations. Poultry breeds have been artificially selected over many generations for two main economic traits, egg production and growth rate. As growth is a complex phenomenon and it is influenced by various factors, the role of genotype in the control of growth rate need not be overemphasized. In poultry, age and breed are some of the many important factors influencing the rate of body weight gain and egg production.

Country chicken like Aseel and Kadaknath are picking up significance throughout the years because of their unique characteristics. Aseel, a game chicken with multi coloured plumes and long legs and neck is ordinarily utilized for exhibiting game and meat purposes. Kadaknath breed having fibro melanosis character normally utilized both for meat and egg production in tribal and rural areas of India. The dark flesh is very delicious, well known among tribal individuals and utilized for the treatment of numerous diseases by tribal, which needs appropriate logical intercession (Thakur *et al.,* 2006). Whereas, Rhode Island Red as an exotic dual-purpose breed was introduced to crossbred with desi birds in India, a rare white plumage coloured strain of Rhode Island Red (RIR) chicken evolved at the Central Avian Research Institute (Izatnagar), was institutionally named as RIR-White strain (Das *et al.*, 2014a; Das *et al.,* 2014b). It is a brown egg layer strain with yellow skin and shank, single red comb and self-white pattern within feather (Das *et al.*, 2014a).

Indigenous Chicken (IC) are the mainstay of free range and backyard poultry production in rural and tribal areas. They possess unique attributes such as

hardiness, ability to adapt to low input sub-optional rearing conditions under harsh environment, broodiness, perceived desirable taste and flavour of meat and eggs, aggressiveness to protect their young ones, etc. Further, rearing of IC generate subsidiary income by utilizing minimum inputs and minimum human attention. It also helps in gender empowerment and social upliftment of the rural/ tribal people as mostly women and children are involved in rearing of IC besides providing household nutritional security. They cater to the needs of consumers such as coloured birds and brown shelled eggs and they are also reported to have tolerance or resistance to bacterial, protozoal, fungal and parasitic diseases. However, despite these unique qualities they are being replaced with exotic germplasm to improve the productivity of backyard poultry farming. OD_{260} efore, indigenous chicken breeds are increasingly facing the threat of genetic erosion/ dilution due to large scale introduction of high yielding exotic varieties or crosses. Globally this is a gravest concern as 30% of poultry breeds are risk and 9% are already extinct as the proportion of breeds at risk and extinction are highest in chicken as compared other livestock species (Hoffman, 2009). Situation is more or less similar in India as well. Therefore, indigenous breeds need to be conserved at least in ex-situ for future needs. The primary reason behind introduction of improved/ exotic germplasm was that indigenous chickens have slow growth and poor production potential. However, improvement of indigenous breeds through selective breeding could be used to increase the productivity of backyard free range farming without increasing the production cost or loss of biodiversity (Magothe T.M. *et al.,* 2012). Therefore, conservation and studies involving characteristics of indigenous chicken for various growth or production traits is the need of the hour to determine the unique attributes. Therefore, present study was planned to study the performance of different indigenous breeds of poultry layers on production and morphological egg qualities.

MATERIALS AND METHODS

The present investigation was carried out during the year 2018 at Poultry Research and Training Centre, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut, U.P., India.Geographically Meerut is situated between 29^0 latitudes in North and 77^0 longitudes in the East. The climate of this region is sub-tropical with maximum temperature at about 45^0C during summer and minimum 1^0C during winter with occasionally frost during Western disturbances. The monsoon begins during first week of July and ceases by the end of September with average annual rainfall 862.7 mm and relative humidity varies from 65 to 87%.

A total of 300 chicks,100 each from Aseel, Kadaknath and Rhode Island Red white strain isolated and nested into four groups, each nest consisting of twenty-five birds were included in the study. All the birds were provided feed, water, vaccine and other management practices as per recommendation for poultry layers.

Observations

The observations were recorded on following traits:

Age at sexual maturity

The age of sexual maturity is considered as the age of pullets when they laid their first egg and average age at sexual maturity was calculated breed wise and nest wise.

Body weight at sexual maturity

The body weight was measured on each bird on the day pullet laid their first egg and average body weight was calculated breed wise and nest wise using digital balance with 10 gm accuracy.

Annual egg production

Eggs were collected daily in the evening per nest and averaged as per number of birds and finally summed up and averaged after 72 weeks.

Egg weight

The average egg weight was calculated on daily average egg weight of one year basis nest wise and breed wise as per the following formula:

$$\text{Average egg weight} = \frac{\text{Total weight of eggs in gm}}{\text{Total number of eggs}}$$

and finally computed as weighted average breed wise, nest wise of each bird.

Shape Index

The egg shape index derived in per centage as 100 times the ratio of maximum breadth to maximum length on five eggs per nest randomly selected on two days per week namely Monday and Friday with the help of Vernier calliper.

$$\text{Shape index} = \frac{\text{Maximum breadth of egg (mm)}}{\text{Maximum length of egg (mm)}} \times 100$$

Egg shell weight

The same five eggs per nest measured for shape index were broken and the egg shells were dried at room temperature after removing the shell membrane. The shell weight was recorded individually with digital balance having 0.1 gm accuracy and finally averaged.

Shell thickness

The shell thickness was measured on the five broken eggs at three positions viz, narrow end, broad end and middle with shell thickness measuring Spherometer (Mitutoyo no. 7301) with the precision of 0.01 mm and then finally averaged by these three values as the mean shell thickness per egg for that particular day nest wise and finally averaged.

Body weight measurement of chicks

Electronic balance (MSI Model no. TTB-10, The Modern Scientific Industries Meerut) was used for weighing chicks/birds were weighted at same time. Average weight of birds of each group after 72 weeks by adding weight of all birds and dividing it by number of birds of that group.

Managemental Practices for chicks

Each group of chicks were provided with weighted quantity of feed in the morning hours daily prepared for that particular replication group in separate feeder and waterer. The residue of the feed in each group was collected daily and weighted separately after a week to find out feed consumption during the week and the same bird was also weighted for its body weight gain.

Statistical analysis

The experiment was conducted in complete randomized design (CRD)Data recorded were subjected to the simple analysis of variance technique (Snedecor and Cochran, 1994) using Statistical Package for the Social Sciences. Homogenous subsets were separated by using Duncan's multiple range test. Differences among treatments were considered to be significant, when Pd"0.05.

The statistical model used was:

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

Where,

Y_{ij} = the value associated with i^{th} breed and j^{th} replication (nest)

μ = general mean of the trait

B_i= the value associated with i^{th} breed as effect of i^{th} breed

e_{ij}= error associated with Y_{ij}^{th} observation

RESULTS AND DISCUSSION

The experimental results of the present investigation on various growth and egg quality traits are presented in Table 1 and 2.

Age at sexual maturity

The average age at sexual maturity of the three breeds named Aseel, Kadaknath and Rhode Island Red was recorded as 187.09±0.16, 182.54±0.15 and 160.21±0.15 days respectively. The age at sexual maturity of commercial layers is much lower than recorded in the present investigation since the chicks were procured form unselected stock and the purpose of the trial to identify the breed that can be raised in back yard. The results obtained in the present investigation was found to be in accordance with the observations recorded by the Malik *et al.* (2009) and Jha *et al.* (2013). However, Singh D.A. *et al.* (1999)recorded much higher age at sexual maturity in poultry birds.

The Table 2 revealed that the difference in age at sexual maturity among three breeds were highly significant.

Body weight at sexual maturity

The Table 1 revealed that the average body weight

Table 1: Breed and nest wise average values of the different traits

Breed/Nest		Age at Sexual Maturity	Weight at Sexual Maturity	Annual Egg Production	Egg Weight	Shape Index	Shell Weight	Shell Thickness
Aseel	1	186.96±0.30	1436.57±0.69	87.48±0.29	47.20±0.26	75.88±0.28	5.80±0.05	0.32±0.002
	2	187.08±0.37	1442.59±1.05	86.68±0.24	46.90±0.23	75.85±0.27	5.89±0.03	0.32±0.002
	3	187.08±0.33	1441.73±1.30	87.28±0.29	46.85±0.30	75.18±0.23	5.76±0.04	0.33±0.002
	4	187.24±0.33	1446.07±0.65	87.12±0.33	47.43±0.25	75.66±0.22	5.88±0.14	0.32±0.002
Average		187.09±0.16	1441.74±0.58	87.14±0.15	47.09±0.13	75.64±0.12	5.83±0.19	0.32±0.001
Kadaknath	1	182.48±0.32	1285.51±0.53	105.32±0.49	42.95±0.44	75.24±0.23	5.71±0.18	0.33±0.002
	2	182.40±0.35	1287.50±0.80	104.88±0.55	43.28±0.27	74.87±0.24	5.73±0.18	0.34±0.002
	3	182.84±0.28	1287.48±1.01	105.72±0.61	42.72±0.24	74.99±0.19	5.72±0.14	0.34±0.002
	4	182.44±0.28	1291.25±1.14	105.36±0.53	41.35±1.56	74.95±0.21	5.77±0.10	0.33±0.002
Average		182.54±0.15	1287.94±0.49	105.32±0.27	42.57±0.41	75.01±0.11	5.74±0.01	0.33±0.001
Rhode Island Red	1	160.00±0.33	1268.39±1.17	225.28±0.68	52.44±0.27	74.50±0.30	6.96±0.03	0.33±0.002
	2	160.08±0.29	1269.40±1.14	228.72±1.03	52.33±0.23	74.15±0.31	7.14±0.04	0.34±0.002
	3	160.56±0.30	1267.37±0.99	230.76±2.03	52.26±0.19	74.68±0.29	7.08±0.33	0.33±0.002
	4	160.20±0.31	1274.56±0.76	232.00±1.18	52.67±0.16	75.35±0.25	7.13±0.32	0.32±0.003
Average		160.21±0.15	1269.93±0.58	229.19±0.70	52.42±0.11	74.67±0.15	7.08±0.18	0.32±0.001

Table 2: Analysis of variance of different traits by pooling of the nests.

Traits		df	Sum of Squares	Mean Square
Age at Sexual Maturity (days)	Between Groups	2	1255.821	627.91
	Within Groups	297	400.346	1.35
	Total	299	1656.167	
Weight at sexual maturity (g)	Between Groups	2	67329.943	35664.97
	Within Groups	297	4094.153	13.78
	Total	299	71424.096	
Annual egg production (Nos.)	Between Groups	2	43503.322	21751.66
	Within Groups	297	4526.572	15.24
	Total	299	47829.895	
Egg weight (g)	Between Groups	2	144.499	72.25
	Within Groups	297	52.477	0.18
	Total	299	196.976	
Shape Index	Between Groups	2	0.044	0.22
	Within Groups	297	2.053	0.008
	Total	299	3.096	
Shell weight (g)	Between Groups	2	0.484	0.242
	Within Groups	297	4.035	0.014
	Total	299	4.519	
Shell Thickness (mm)	Between Groups	2	0.000	0.000
	Within Groups	297	0.000	0.000
	Total	299	0.000	

at sexual maturity of Aseel, Kadaknath and Rhode Island red was 1441.74±0.58, 1287.94±0.49 and 1269.93±0.58 gm respectively. Singh *et al.* (1999) and (2000), Sharma and Khedkar (2004) also reported the similar body weight at sexual maturity and similar pattern as Aseel gain higher weight at sexual maturity.The Table 2 also revealed that the body weight at sexual maturity of these breeds is significantly different and nesting did not show any effect on body weight at sexual maturity.

Annual egg production

The Table 1 revealed that the average annual egg production of Aseel, Kadaknath and Rhode Island red were 87.14±0.15, 105.32±0.270 and 229.19±0.70 eggs respectively.

The Table 2 revealed that the difference among

breeds for annual egg production was highly significant. Bhardwaj *et al.* (2006) and Mondal *et al*. (2007) also observed similar trends of egg production. However, Kumar (2002) and Mohan *et al.* (2008) observed higher annua egg production while Jilani *et al*. (2007) found lower annual egg production.

Egg weight: The egg weight is the primary criterion used in the grading of eggs and influences egg's retail value.

The Table 1 revealed that the annual egg weight in seel, Kadaknath and Rhode Island red were found to be as 47.09±0.13, 42.57±0.41 and 52.42±0.11 gm respectively. Singh and Johari (2000), Parmar *et al.* (2006), Haunshi *et al*. (2013) reported lower egg weight. While, Katariya *et al.* (2000) and Sharma *et al.* (2000), Sharma and Hazary (2002), Jilani *et al.* (2007) and Haunshi *et al.* (2009) reported higher egg production than the present investigation.

Table 2 revealed that the difference between breeds for egg weight was highly significant.
Egg shape indexEgg shape index is an important criterion for egg quality estimation.

The average egg shape index in Aseel, Kadaknath and Rhode Island Red were found to be as 75.64±0.12, 75.01±0.11 and 74.67±0.15 per cent, respectively (table 1).SinghD.P. *et al.* (2000), Iqbal *et al.* (2012), Haunshi *et al.* (2013) also reported the shape index in accordance with the findings in present investigation. However, Singh *et al.* (2003) andKumar P., (2014) observed higher shape index.The Table 2 revealed that the egg shape index inAseel, Kadaknath and Rhode Island Red was found to be non-significantly different.

Egg shell weight
The table 1 revealed that the average egg shell weight in Kadaknath, Aseel and Rhode Island Red were as 5.74±0.01, 5.83±0.19 and 7.08±0.18 gm, respectively. Johri (1978), Sreedharan and Mukundan (1972), Rahmatullah *et al.* (1978), Mahato *et al.* (1980), Chatterjee *et al.* (2007), Mohan *et al.* (2008), Niranjan *et al.* (2008) and Kumar P., (2014) observed lesser egg shell weight. However, Khatkar *et al.* (2000) and Chourasia *et al.* (2011) reported egg shell weight as higher as 8.6±0.003 and 11.04±0.08 gm respectively.The Table 2 revealed that the egg shell weight differences among breeds were found to be non-significant.

Egg shell thickness
The Table 1 revealed that the average egg shell thickness was observed as 0.32±0.001, 0.33±0.001 and 0.32±0.001 mm, in Aseel, Kadaknath and Rhode Island Red, respectively. The Table 2 also revealed that the difference among breed for egg shell thickness was found to be non-significant. Parmar *et al.* (2006), Mohan *et al.* (2008), Biswas *et al.* (2010) and Chourasia *et al.* (2011) also observed similar shell thickness in various studies. However, Chatterjee *et al.* (2007), Iqbal and Pampori (2008), Mohan *et al*. (2008), Jha and Prasad (2013), Sreenivas D. (2013) and Kumar P.*,* (2014) reported higher egg shell thickness in various Indigenous poultry breeds.

CONCLUSION

The present investigation carried out to study the production performance of different poultry layers showed highly significant differences among breeds for most of the traits except eggshell weight and eggshell thickness.

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