Effect of breed and egg weight on embryo mortality rate in Kuroiler and Chabro breeds of poultry

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ABSTRACT

Investigations were conducted to study the effect of breed and egg weight on embryo mortality rate in large, medium and small sized eggs of chicken breeds. The study was conducted at poultry farm of SKN College of Agriculture, Jobner, Rajasthan. For the present study eggs were collected daily from sheds and stored at 21°C temperature. A total of 297 eggs of hatchable backyard strain for each breed were collected. These eggs were grouped into three egg size categories viz small (38-44 g), medium (45-52 g) and large (53-59 g). For both breeds, embryo mortality was highest in the large egg class followed by small and lowest in the medium egg class. Among breeds, higher mortality was recorded in Kuroiler as compared to Chabro. The study revealed that Chabro breed was best performing breed for doubling the farmers' income.

Keywords: Mortality; breed; Kuroileras; Chabro; egg weight; poultry; embroy

INTRODUCTION

The Indian poultry industry has made incredible and amazing progress from a small backyard venture to a commercial, full-fledged, self-sufficient and progressive agro-based industry. Poultry makes up more than a third of the animal protein consumed worldwide (Permin and Pedersen 2000). In poultry egg number, egg quality traits, embryo mortality and hatchability are all important factors for production efficiency and profitability (Yahaya et al 2009). Fertility, hatchability and mortality are the key factors that influence the hatchery's profitability (Peters et al 2008). As parent stocks are held to produce final hybrids, these parameters tend to be very significant. Hatchability and mortality are two important traits that are strongly influenced by breed age and egg weight (Elibol and Brake 2008). Many genetic and environmental factors influence hatchability and mortality. Taylor (1949) and Nordskog and Hassan (1971) analyzed and described the embryonic avian development as well as the various factors influencing their survivability and mortality. In a study of different chicken breeds, Ahmad et al (2000) reported that light breeds had higher fertility and hatchability than heavy breeds. Egg weight is another

significant quality indicator that influences broiler performance (Ulmer-Franco et al 2010). The weight of poultry eggs and mortality have significant correlation. Fertility, hatchability, duration of hatching, embryonic mortality, hatching weights and subsequent chick output are all influenced by egg weight (De Witt and Schwalbach 2004, Alkan et al 2008, Alabi et al 2012).

Many studies (Bell and Weaver 2002, King'ori 2011) have found that egg weight has a strong influence on hatchability and mortality because the primary impact of egg size is the mass of residual yolk sac retained by chicks at hatching. The embryos of birds selected for greater body weight are characterized by increased mortality as a consequence of the disrupted embryogenesis even during the early stage of embryonic development (Sawicka et al 2015).

Hence precise knowledge of embryo mortality in correlation with egg weight of a particular variety of birds can be helpful in poultry. The present study was designed to determine the effect of breed and egg weight on embryo mortality rate in large, medium and small sized eggs of broiler chicken.

MATERIAL and METHODS

The experiment was conducted at the poultry farm of SKN College of Agriculture, Jobner, Rajasthan. The climate of this region is typically semi-arid characterized by extremes of temperature during both summers and winters. For the present study, eggs were collected daily and stored at 21°C temperature. After collection of eggs, all the eggs were sampled and eggs with visible external abnormalities were screened out. In this process extra large, very small and abnormal eggs were discarded. A total of 297 eggs of hatchable backyard strain for each strain were collected. The eggs were weighed individually using sensitive weighing balance and later grouped into three egg size categories viz small (38-44 g), medium (45-52 g) and large (53-59 g) of different sizes. There were 3 treatments with 3 replications per treatment. All experimental eggs were incubated in an automated sanitized electrical incubator at 99.50-99.75°F (37.5°C) with 60-65 per cent relative humidity and turning hourly. Candling was done on 18th day to determine infertile eggs and dead in germs. Number of eggs that hatched per replicate within each egg size group was recorded at 21st day of incubation. The hatchability was recorded for each replicate.

Mortality rate was determined in each replicate by dividing the number of unfertilized eggs to the total number of fertile eggs:

$$\text{Mortality} = \frac{\text{Number of unfertilized eggs}}{\text{Total number of fertile eggs}} \times 100$$

The regression analysis was done between average egg weight and embryo mortality rate. For this different regression equations such as linear, exponential, logarithmic or polynomial functions were used and compared. The regression equation with highest correlation coefficient was selected. Data obtained were subjected to statistical analysis using completely randomized design (CRD). Consequently a level of $P < 0.01$ was used as the criterion for statistical significance.

RESULTS and DISCUSSION

The data on embryo mortality for Kuroiler and Chabro breeds are presented in Table 1 (Fig 1). It was observed that large egg weight class had highest mortality as compared to small and medium classes. For Kuroiler breed, the embryo mortality was highest in large class (41.0%) followed by small (21.4%) and lowest was observed in medium class (14.3%). Similar trend was observed for Chabro breed. It was significantly highest in large (29.3%) egg class followed by small (20.9%) and medium (10.2%).

The lower value $P < 0.01$ of embryo mortality in medium egg class indicated that it had higher hatchability and was most suitable for incubation. Similar results were observed by Khati et al (1992) who reported that medium class had higher hatchability and lower embryo mortality. The relatively higher mortality of large and small eggs can be explained by presence of insufficient essential nutrients which are required for embryonic development. Various researchers reported that large sized eggs are associated with higher mortality (Alabi et al 2012, Ng'ambi et al 2013, Rashid et al 2013, Iqbal et al 2014).

Out of two breeds it was higher for Kuroiler for all the three egg classes. The magnitude was higher for large egg weight class than other classes. In this case the embryo mortality increased in Kuroiler breed

Table 1. Effect of egg weight on mortality of Kuroiler and Chabro breeds

Parameter	Kuroiler	Chabro
Small	21.4 (12.37)	20.9 (12.09)
Medium	14.3 (8.21)	10.2 (5.83)
Large	41.0 (24.22)	29.3 (17.04)
SE(m)	1.35	0.49
CD	3.30	1.20
CV	11.06	5.17
S/NS	S	S

S= Significant at 1% LoS, NS= Non-significant, Figures in parentheses are arc sine values
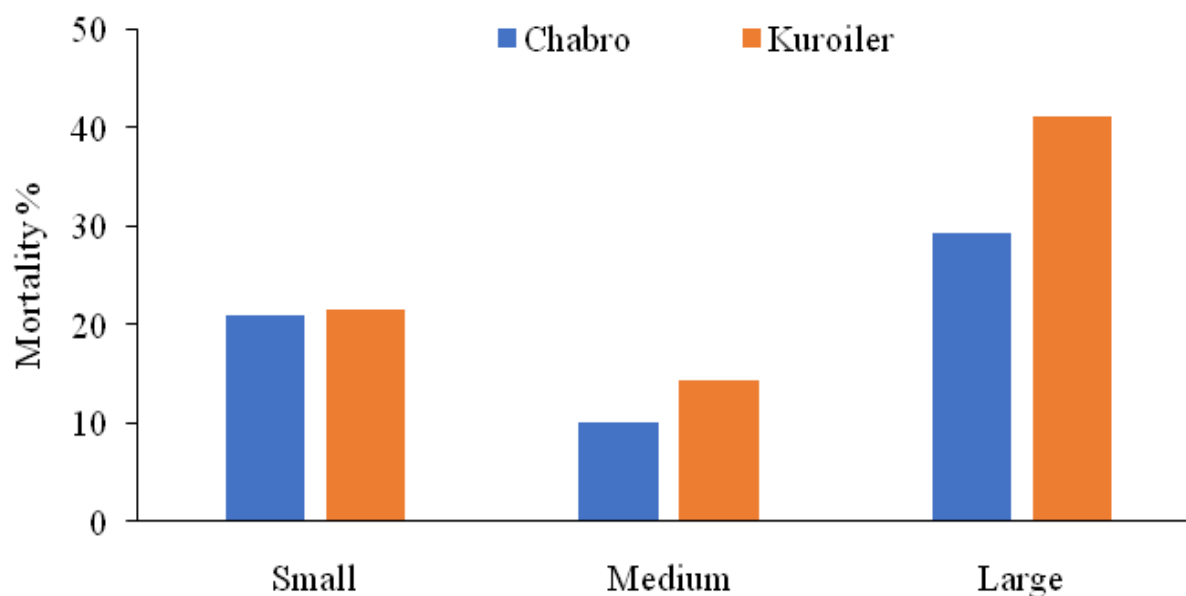
Fig 1. Embryo mortality for different egg classes of Chabro and Kuroiler breed
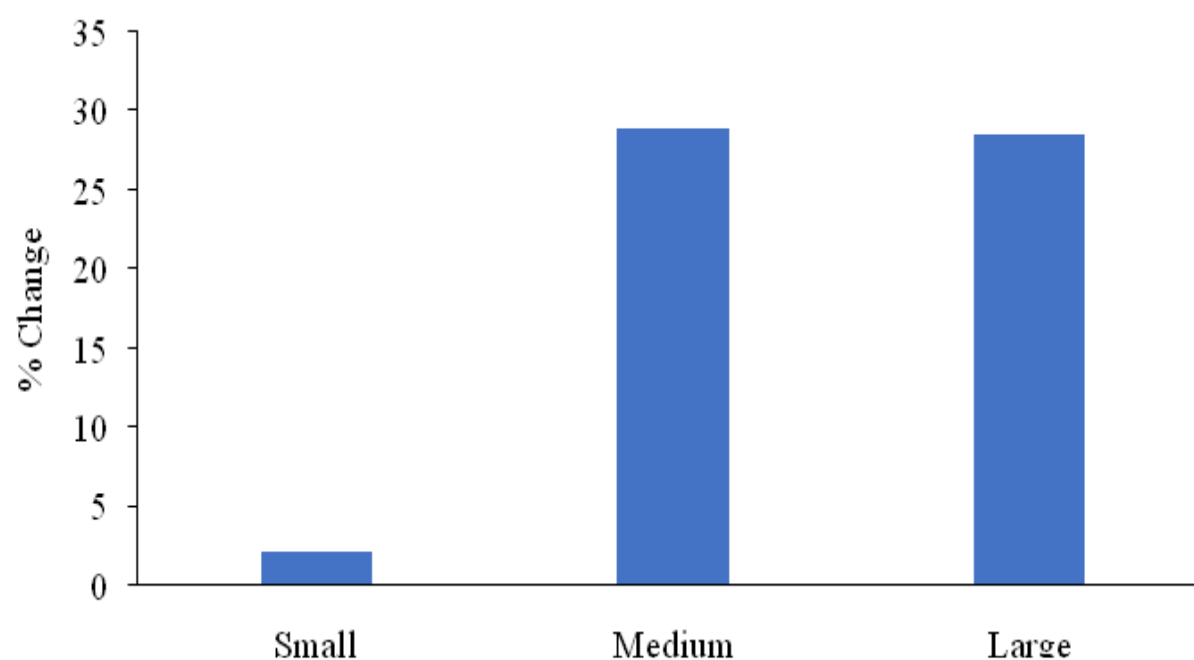

Fig 2. Changes in embryo mortality of Chabro breed over Kuroiler breed

Table 2. The regression equation between mean egg weight and embryo mortality

Trend line name	Regression equation	R^2
Exponential	$y = 4.2236e^{0.0327x}$	0.19
Linear	$y = 0.9319x - 22.343$	0.31
Logarithmic	$= 42.101\ln(x) - 140.22$	0.27
Polynomial (2nd order)	$y = 0.2837x^2 - 26.583x + 634.26$	0.85
Power	$y = 0.0791x^{1.4364}$	0.16

by 2.20, 28.9 and 28.5 per cent for small, medium and large classes respectively over Chabro breed (Fig 2).

The regression equations and R2 of exponential, linear, polynomial, logarithmic, polynomial and power models are represented in Table 2. The relationship between mean egg weight and embryo mortality was well fitted by polynomial equation (R2= 0.85) followed by linear (0.31). Least correlation was observed for power equation with R2= 0.16.

CONCLUSION

It was concluded from the study that the embryo mortality was highest in large class as compared to other classes for both the breeds. The mortality increased in Kuroiler breed by 2.20, 28.9 and 28.5 per cent for small, medium and large classes respectively over Chabro breed. It was thus concluded that medium egg weight class performed better and it was most suitable egg class for rural poultry. In case of breed, Chabro was better performer than Kuroiler.

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