INFLUENCE OF JAPANESE QUAIL EGG SHAPE INDICES ON CHICK SEX RATIO

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ABSTRACT
Japanese quails are still in the domestication process and it has been observed that while in captivity, they do not sit on their eggs to hatch them. Separation of the males and females such that the recommended ratio is kept in a covey, is necessary for-profit maximization. Presently, sexing in quails is only possible at post hatch even, with the most popular Japanese vent examination technique. Besides, these techniques may be inaccurate, require expertise, facilities and may not be affordable by many farmers hence, the need to use egg shape to predetermine Japanese quail chicks. Egg length, width and indices were used to categories the egg shapes into Round (44), Oval (139), Spherical (9) and Elliptical (60). The 252 Japanese quail eggs were set in an artificial incubator. At hatch, the number of eggs hatched was recorded per egg shape. At 3 weeks of post hatch, the chicks' sex was identified using the breast feather colour and the number of male and female chicks was recorded. Out of the 252 Japanese quail eggs incubated, 191 representing 75.8% hatched, whereas in 44 Round eggs incubated 36 hatched, 139 Oval eggs (102 hatched), 9 Spherical eggs (7 hatched) and in 60 Elliptical eggs, 46 hatched. While hatchability varied between 73.3 and 81.9% in all the egg shapes examined, the male to female chick sex ratio was 13:23, 20:31, 7:0 and 11:12 in Round, Oval, Spherical and Elliptical eggs, respectively. Since both sexes were recorded in all the egg shapes (except, Spherical eggs), Japanese quail egg shape may not influence chick sex. Thus, use of egg indices may not be a veritable technique to predetermine Japanese quail chick sex.
Keywords: Egg width and length, plumage colour, sex predetermination

INTRODUCTION

Quails belong to the family *Phasianidae* in the Order *Galliformes* of the *Aves* Class including species like European *Coturnix* and Asiatic *Coturnix japonica*. In China, quail domestication began with a migratory subspecies raised as pets (Braga *et al*., 1995). Japanese quails were introduced to Nigeria by National Veterinary Research Institute, Vom, through the Directorate of Food and Rural Infrastructure in 1992 (Haruna *et al*., 1997). Unfortunately, challenges arise as quail chicks cannot be identified at hatch like other poultry hatchlings and the hens do not sit on the eggs to hatch them in captivity. Meanwhile, studies show that egg quality impacted on hatchability with characteristics like egg weight, shell thickness, and shape influencing embryonic development (Peruzzi *et al*., 2012).
The egg shape index representing width to length ratio, is examined for its correlation with hatching parameters. For example, normal-shaped eggs (oval shape) were suggested to have better hatching performance (Narushin and Romanov, 2002). In some Nigerian cultures, it is speculated that egg shape determines the chick sex. If this speculation is feasible, Japanese quails' farmers will maintain the required sex ratio in a convoy, in other to improve production efficiency. Hence, this study explored the use of egg shape indices to predetermine Japanese quail chick sex.

MATERIALS AND METHODS

Study location

The research was carried out at the Poultry Unit, Teaching and Research Farm, Nasarawa State University, Keffi, Shabu-Lafia Campus, located in the Guinea savanna zone of North Central Nigeria, with latitude 080 35' N, longitude 080 33' E and mean temperature (32.75°C), relative humidity (79.00%), rainfall (207.45mm) and evaporation of 2.5ml (NIMET, 2023).

Experimental design, data collection and statistical analysis

A total of 252 freshly laid Japanese quail eggs, were collected from a flock raised in a deep litter. The eggs were weighed, using sensitive weighing balance and categorized into ranges of 4 – 6g, 7 – 9g, 10 – 12g and >12g. The egg length and width values were obtained using digital Vanier Calliper. The egg weight and the corresponding egg length and width values were used to group the eggs into Round, Oval, Spherical and Elliptical shapes with 44, 139, 9 and 60 eggs, in that order.

Plate 1: Round egg shape

Plate 2: Oval egg shape

Plate 3: Spherical egg

Plate 4: Elliptical egg shape

All the eggs were incubated in the same incubator but, with the different egg groups on separate egg trays within the incubator, following Ferguson (1996) guidelines. At hatch, the chicks were taken to the brooding pen and after 3 weeks of age, the breast feather plumage was used to identify the sex and the sex ratio was obtained according to Idahor (2021). The egg indices values were correlated and the number of eggs hatched, male chicks and female chicks were analysed using simple descriptive statistics adopting SPSS (2019) statistical package.

RESULTS AND DISCUSSION

Table 1 shows the relationship among Japanese quail egg shape indices. It was observed that the egg width and length values were positively correlated and significant at 0.001% confidence level. Meanwhile, all the values varied between 0.289 (egg shape index) and 0.944 (average chick weight), which seemingly implied that there was a close interrelationship among the egg width and length indices. These values are somewhat similar to a range of 0.15 – 1.00 reported elsewhere in Japanese quails, when internal and external egg qualities were evaluated (Abbaya *et al*., 2018; Kul and Seker, 2004).

Table 1: Relationship among Japanese quail egg shape indices

Parameters	Egg weight (g)	Egg width (mm)	Egg length (mm)	Egg shape index	Average chick weight (g)
Egg weight (g)	1	.568**	.860**	-.483**	.851**
Egg width (mm)		1	.473**	.289**	.489**
Egg length (mm)			1	-.705**	.944**
Egg index				1	-.632**
Average chick weight (g)					1

**: Significant at 0.001% confidence level

The effect of Japanese quail egg shapes on hatchability and chick sex ratio is presented in Table 2. In a total of 252 Japanese quail eggs incubated, 191 representing 75.8% hatched. The male (42.9%) to female (57.1%) chicks ratio recorded in the present study, partly agreed with the observation of Sati *et al.* (2019) that "pointed-end" and "blunted-end" eggs, biased sex in Japanese quails. The observed hatchability, is within the range of 70 – 80%, reported as normal in poultry species (Abbaya *et al*., 2018; Kul and Seker, 2004). It was revealed that there were both male and female chicks that hatched in all the egg shapes, except Spherical eggs that had 7 male chicks without a female.

Table 2: Effect of Japanese quail egg shapes on hatchability and chick sex ratio

Parameters	Egg shape				
	Round	Oval	Spherical	Elliptical	Total
Number of eggs set	44	139	9	60	252
Number of eggs hatched	36	102	7	46	191 (75.8) ᵠ
Number of hatched male chicks	13	40	7	22	82 (42.9) ᵠ
Number of hatched female chicks	23	62	0	24	109 (57.1) ᵠ
Percentage hatchability (%)	81.8	73.4	77.8	76.6	
Male to female ratio of hatched chicks	13:23	20:31	7:0	11:12	

ᵠ**:** Value in bracket is the corresponding percentage

This observation may be coincidental as both male and female chicks were recorded in some poultry breeds' eggs with Spherical shape and stated that this particular shape reduced heat loss hence optimal hatchability was achieved (King'ori, 2012; Daikwo *et al*., 2011). Though there were apparently more female chicks that hatched in all the egg shapes, there was no particular trend thus, agreed with earlier reports of positive interrelationship between egg shape and sex in poultry breeds (Sati *et al*., 2019; Idahor *et al*., 2015; Davis, 2014).

More importantly, the positive relationship that existed among the Japanese quail egg shape indices, is similar to the observations reported in Isa Layer Breeders, Belgian Breeders, Tswana Chickens and Iraqi Strains of Local Hens (Kgwatalala *et al*., 2016; Moula *et al*., 2009; Olawuni *et al*., 2008). This possibly indicated higher, positive and significant coefficients on some egg quality traits, particularly egg width and length index, as reported in laying hens (Hagan et al., 2013), helmeted guinea fowl (Fajemilehin *et al*., 2009) and partridge (Alkan *et al*., 2015), where similar observations were recorded. But contradicted Dogara *et al*. (2021) who observed poor relationship among egg characteristics in noiler chickens.

CONCLUSION

Japanese quail egg indices showed positive relationship in weight, width, length and chick weight. Both male and female chicks hatched in all the different egg shapes examined. Japanese quail eggs indices did not influence chick sex ratio. Consequently, eggs indices may not be feasible in predetermination of Japanese quail chicks' sex.

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