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Egg Dimension and Egg Weight loss During Incubation of red- Wattled Lapwing (Vanellus Indicus) at Junagadh city, Gujarat

KEYWORDS: Egg dimension and egg weight loss of Red- wattled lapwing

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ABSTRACT *The Red-wattled lapwing is a monogamous bird, breeds from March to August, and eggs are laid in March to June in Junagadh. The average size of 100 eggs was 4.21 X 3.03cm. Variation in length and breadth was reflected on egg weight which varied from 19.33 to 22.27 g with an average of 20.53 g. The shape index varied from 57.37cm to 76.54cm. A total weight reduction of 1.94g within three weeks; The weekly difference in egg weight was 1.18g between first and second week and 0.76g between second and third week.*

INTRODUCTION:-

The Red-wattled lapwing (*Vanellus indicus*) is classified as Least Concern on the IUCN Red List (2010).and is a member of the Charadriidae family. The local name is "titodi" in Gujarati. It shows a preference for sites in close proximity to freshwater and it is also found on Agricultural land. It is a monogamous bird, breeds from March to August; eggs are laid in March to June in Junagadh. About 3 to 4 black-blotched buff eggs shaped a bit like a peg-top. The nest is usually just a simple shallow scrape in the ground, which can be encircled with small stones or hard clay and usually matches the ground pattern. In residential areas, they sometimes take to nesting on roof-tops. Egg weight loss is an important parameter for incubation. It has been used to estimate vital gas exchange (Paganelli *et al.*, 1978; Rahn *et al.*, 1979), and has been correlated with embryo metabolism and development rates (Rahn & Ar, 1980; Burton & Tullet, 1983).

STUDY AREA:-

The study was confined to Junagadh (21° 31'N and 70° 49' E) city a District head-quarter and a picturesque town, which was the former capital of the Princely State of Junagadh. The city is a gate way to famous Gir Forest which is the natural habitat for the last existing population of Asiatic Lion in the wild. Junagadh has a tropical monsoon climate with three distinct seasons i.e., monsoon, winter and summer.

MATERIAL AND METHOD:-

A study on breeding biology of Red-wattled lapwing was conducted in detail at five different study sites. Data were collected and analyzed as per standard methodology available from ornithological studies. Eggs studies were conducted in the Red Wattled Lapwing, once in a week in all the five study areas. During such visits to the nest, eggs were marked with permanent marker when seen for the first time. And they often became faded, which were marked again. On subsequent visits, the fade marks were reinforced to retain the original numbering. A month was divided into four weeks and the exact date of clutch initiation was assigned to a concerned week. Laying date and the diametric (of the eggs were taken using vernier caliper) were recorded. Weight was measured using digital balance (with 500.00g capacity and 2.0g sensitivity) at weekly interval. For each egg, shape index was calculated by Romanoff and Romanoff 1963.

RESULTS AND DISCUSSION:-

In present study initiated breeding activity in March which lasted up to August, extending over a period of six months. Mostly it nests in the habitations of man and their immediate neighborhood where water is available. Typical nesting habitat includes open country, grazing land, fallow fields, dry beds of village tanks, and islets in river (Ali & Ripley 1998).

Egg diametric:-

Egg diametric was showed no annual variations. Dimension of 100 eggs was recorded which is shown in (Table 1). The mean value of egg diametric did not show any significant variations between years. The measurement of length and weight showed that width was the most constant among all the parameters. This was due to the fact that eggs originated in an oviduct whose cross sectional area has a limited extensibility (Romanoff and Romanoff 1963). The length of the egg ranged from 3.84 to 4.95cm and the breadth ranged from 2.8 to 3.19 cm. The average size of 100 eggs was 4.21 X 3.03cm. Variation in length and breadth was reflected on egg weight which varied from 19.33 to 22.27 g with an average of 20.53 g. The shape index varied from 57.37cm to 76.54cm. Saxena, V.L. *et al* 2013 also observation and indicate that the egg size varied from 1.2 inches to 1.6 inches on an average. Incubation period of Red-wattled lapwing was 28 to 30 days respectively. During incubation in many birds eggs (1) some degree of shell thinning occurs, which in some species causes an increase in the water vapour conductance of the eggs shell, and (2) egg temperature, and therefore the water vapour pressure inside the egg, increases. Either one of these factors will result in an increase in the rate of water loss. Thus, an increase in the rate of water loss during incubation is probably a common phenomenon in birds' eggs (David *et al.*1990).

Egg weight loss:-

Bird eggs are virtually self-contained life-support systems. All they require for the embryo to develop properly are warmth and oxygen. Oxygen diffuses into the egg through microscopic holes formed by the imperfect packing of the calcium carbonate crystals that compose the eggshell.

Figure 1 show the egg weight loss measured. Egg weight of Red-wattled lapwing was taken on weekly basis and the observations revealed that a total weight reduction

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of 1.94g within three weeks; and same as observations in Myna by Dhandhukia 2012 revealed that a total weight reduction of 1.92g in Common Myna within three weeks and 1.54g in Bank Myna and 1.02g in Brahminy Myna. Weis J. *et al* (2011) indicate that high difference in the results recorded for hatchability between medium and large eggs; ducklings from heavier eggs longer to hatch in Muscovy duck. Weight loss during incubation was directly influenced by weight loss during the storage. Eggs stored for longer periods presented lower levels of weight loss during incubation as compared to fresh incubated eggs or those that were submitted to a few days of storage (Romao *et al* 2008).

Carbon dioxide and water vapour diffuse outward through the same pores. Birds can lay their eggs in even drier environments than reptiles, because when the fatty yolk is broken down to provide energy for the developing embryo, water is produced as a by-product (Paul *et al* 1988).

Our observations indicate that egg weight was loss during incubation periods. This loss was due to metabolic process during embryonic development that led to the exchange of materials in gaseous forming especially CO_2 and water vapor between the egg and environment through porous egg shell (Dhandhukia *et al* 2014).

Eggs of species from wet habitats loose weight at a higher rate than those from drier habitats at a given relative humidity. It is suggested that the conductance of the egg shell to water vapour is adapted to the conditions of humidity in the environment such that weight loss varies little in relation to the relative humidity at the nesting sites (Lamholt 1976).

The weekly difference in egg weight of Red-wattled lapwing was found to be 1.18g between first and second week and 0.76g between second and third week the data indicate that egg weight loss high between first and second week than second and third week. Weight was the fastest growing parameter, which reached approximate to that of adult size in 15 days in Myna (Dhandhukia 2014).

Water loss is a normal process during incubation; usually 12 to 14% of water is lost in broilers and turkeys eggs (Rahn *et al.*, 1981). However, too low or too high water loss influences embryo development (Rahn & Ar, 1974). Incubation temperatures above the optimum cause excessive egg water loss (higher than 14%), leading to embryo mortality by dehydration. On the other hand, temperatures below the optimum decrease hatchability due to reduced water loss (< 12%), which causes an over-hydration of the embryo and an impairment of gas exchange (Romanoff, 1930).

Humidity is one of four primary variables which must be controlled during egg incubation - the others being temperature, ventilation and movement. Egg shells are porous - they allow water to pass through, and so all eggs, whether being incubated or not, dry out slowly. All eggs have an air space at the round end and as water is lost through the shell it is replaced by air drawn through the shell into the air space which gradually increases in size – the greater the water loss through the shell, the larger the airspace.

Table: 1. Diametric on Red- wattled lapwing eggs (n=100 Egg).

Particulars	Length (cm)	Breadth (cm)	ESI (cm)	Fresh Weight (gm)
Average	4.21	3.03	71.94	20.53
Stdev	0.19	0.08	2.65	0.92
S. Em	0.019	0.008	0.265	0.092
Range	3.84 to 4.95	2.8 to 3.19	57.37 to 76.54	19.33 to 22.27

ESI Egg Shape index = Breadth / Length X 100

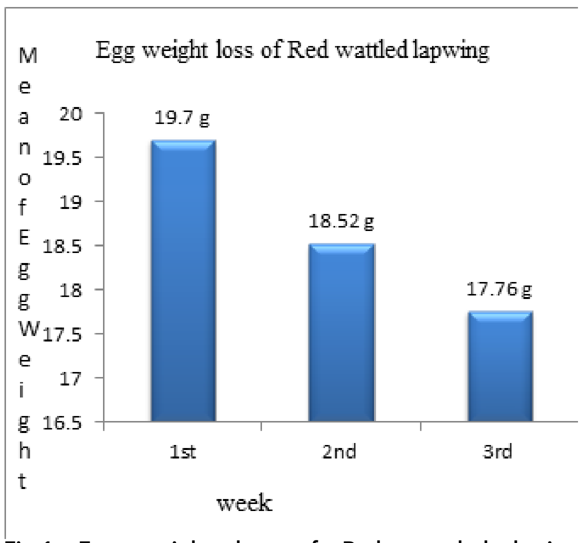

Fig.1 Egg weight loss of Red- wattled lawing (n=35Egg).

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