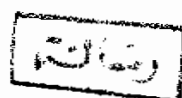


**NUTRITIONAL AND PHYSIOLOGICAL
STUDIES ON CALCIUM METABOLISM**

IN QUAIL

BY



HALA MOHMED GAMAL EL-DEIN

Athesis submitted in Partial fulfilment

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APPROVAL SHEET
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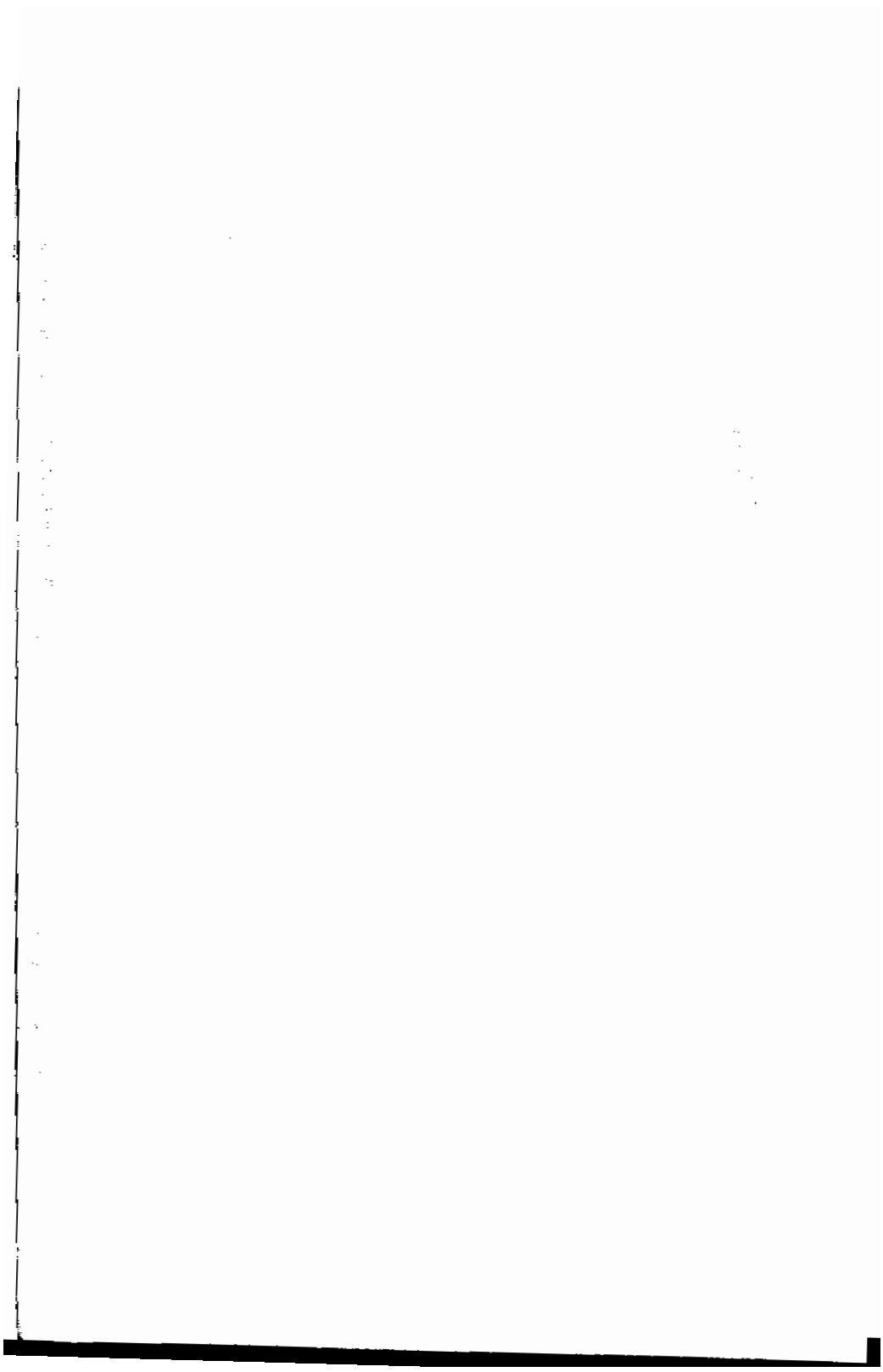
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the 1990s, the number of people in the UK who are aged 65 and over has increased from 10.5 million to 12.5 million (1990–1999).

There is a growing awareness of the need to develop strategies to meet the needs of the ageing population. The Department of Health (1999) has published a strategy for the ageing population, which sets out the government's commitment to improve the health and social care of older people. The strategy is based on the following principles: (1) to improve the health and social care of older people; (2) to ensure that older people are able to live independently; (3) to ensure that older people are able to participate in society; and (4) to ensure that older people are able to live in their own homes.

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INTRODUCTION

The National Research Council (1984) has set the calcium requirement of laying quails at 2.5%. Therefore, this level of calcium needs a further investigation to study its effect upon both production and reproduction performance. Research interest in studying calcium regulation in bird is quite important.

The deposition of calcium for egg shell formation is highly complex process, since it involves several physiological activities which lead to calcium homeostasis.

Parathyroid hormone (PTH) released from parathyroid glands, provides indispensable process essential to the blood calcium homeostasis. Parathyroid hormone is one of the most important hormones in the rapid response for the regulation of calcium metabolism.

The regulation is complex, but the end result is the maintenance of plasma values at approximately 2.5 mm or 10 mg/100 ml.

Although the metabolism of calcium by chicks has been studied by many investigators, few studies have been reported on egg laying quails. Considering that several processes in reproduction such as egg production and shell formation require enhanced calcium availability, the manifold regulators of calcium metabolism can certainly be expected to occur. Therefore, the objectives of the present investigation were:

- 1- To study the effect of adding different calcium levels to the diet of laying female Japanese quail on productive performance, such as body weight, feed consumption, feed efficiency and hatchability.
- 2- To determine the effect of adding different levels of calcium to layer diets on the blood levels of calcium and parathyroid hormone.
- 3- To assess the levels of both calcium and phosphorus in tibia bone of female Japanese quail, fed on different calcium.

REVIEW OF LITERATURE

1. Nutritional Studies :

a- Body weight and body weight gain : Studies on the effect of calcium in the diet of domestic fowl on body weight and gain are rather conflicting. Mehring (1965) in a series of experiments found that body weight gain of New Hampshire Chicken just starting to lay was markedly decreased when calcium level was higher than 5% Reddy, *et al.* (1968) found that for Hy-Line 934 fed either 2.65 or 3.05% calcium, birds gained significantly more weight than laying hens fed either lower (2.25%) or higher (3.45, 3.65 4.25 and 5.05%) calcium levels. On the other hand, Berg *et al.* (1984) found that body weight gain of White Leghorn layers was not affected by restricting calcium levels. On the other hand, Berg, *et al.* (1964) found that body weight gain of White Leghorn layers was not affected by restricting calcium level. Several reports, (Gerry and Bird, 1967; Cannor and Arnold, 1972, Holcomb, *et al.* 1977, Roland *et al.* 1985, Chandramoni, *et al.* 1987 and Jeesson, *et al.* 1993) have indicated that feeding dietary calcium levels of 2.25, 3.0, 3.75% to commercial chicken laying hens during their reproductive period significant effect on weight on body weight gain. However, there are, few reported studies on turkey hens showed that increasing the dietary calcium levels from 1.16% to 4.75 resulted in a substantial increase in body weight gain (Jensen *et al.* 1964, Atkinson *et al.* 1967 and Mengo *et al.* 1977). In mature Japanese quail (*Coturnix coturnix Japonica*) Vohra *et al.* (1979) and recently, Khalil (1992) found that body weight was not significantly affected by different dietary calcium levels 1.3, 2.0, 2.5, 3.0 and 3.5% with or without vitamin D₂.

b. Feed consumption : In laying chicken hens, Anderson (1966) and Miller and Sunde (1975) showed that dietary calcium levels starting from 1.5 up to 4.5% increased feed consumption. But Gilbert *et al.* (1981) found that feed consumption was decreased when dietary calcium was increased from 0.048 to 3.66%. Scott *et al.* (1971) with Babcock layer hens showed that when hens fed on 2.5% calcium they tended to over consume feed. While, those receiving 5% calcium consumed appreciably less feed than hens receiving calcium levels of

3.0, 3.5, 4.0 and 4.5%. Summers *et al.* (1967) used varying dietary calc levels from 2.5 to 4.0%, they observed that feed consumption was reduced with the high calcium level. Lennards and Roland (1981) found that Hy-Sex hens tend to over consume feed when a calcium deficient diet 0.4% Was fed .

Several studies showed that dietary calcium levels from 2.0% to 5.2% hens either White Leghorn or Brown layer had no effect on feed consumption. (Gerry and Bird, 1967, Connor and Arnold 1972; Roland *et al.* 1974; Holcombe *et al.* 1977; Atteh and Leesson, 1983; and recently Abdalla *et al.*, 1993; Leeson *et al.* 1993; and Gordon and Roland, S., 1994).

In Broad Breasted Bronz turkey and Broad Breasted White turkey hens, Atkinson, *et al.* (1976) observed that feed consumption (g/bird/day) was not significantly affected by increasing calcium levels to 1.24, 1.67, 1.9, 2.43, 2.66, 3.19, 3.43 and 3.95%.

In Japaneses quail (*Coturnix coturnix japonica*) Vohara *et al.* (1979) reported that dietary deprivation of supplementary calcium or vitamin D₃ had a significant effect on decreasing feed intake,. Recently, Khalil (1992) found that feed consumption in Japanese quail was increased with decreasing dietary calcium levels (2.0, 2.5, 3.0 and 3.5%).

c. Feed efficiency : Atkinson, *et al.* (1967) reported that feed efficiency based on grams of feed per egg, was closely related to the rate of egg production . The best feed efficiency and the highest egg production were obtained when laying hens were fed on diet containing 2.66 and 3.43% calcium levels. Al-Awadi *et al.* (1967) found that laying hens given the highest amount of calcium and phosphorus (4.25% and 0.9%) had the best feed efficiency, while hens given the lowest calcium amounts of 0.25% and 0.5% phosphorus had the poorest feed efficiency .

However, Ewing (1951) and Reddy, *et al.* (1968) indicated that excessive amounts of calcium up to 5.0% was associated with the poor effect on feed conversion for Hy-Line 934 chickens .

In turkey hens, Jensen *et al.* (1964) reported insignificant response on feed efficiency when birds were fed on diets containing 1.75% to 6.25% calcium levels.

In another on turkey hens by Menge *et al.* (1977) they showed that the 2.25% calcium gave significantly the best feed efficiency (feed/Kg egg).

In sexual mature quail, Shrivastav and Panda (1986) indicated that feed efficiency was decreased slightly with increasing calcium levels from 3.0 to 3.75%.

d. Calcium intake : Atkinson *et al.* (1967) concluded that calcium intake per egg production was found to be directly related to the calcium level of the ration when Broad Breasted Bronze turkey fed diet containing 1.67, 2.66 and 3.43 calcium levels.

Wells and Belyavin (1987) showed that the correct supply of calcium depends on the inclusion of proper calcium concentration in the diet, and on the availability of calcium needed during shell formation .

II. Performance parameters :

a. Egg production : There are numerous studies on the effect of calcium level on egg production in chickens. The addition of calcium level from 1.75 to 0.50% In Commercial White Leghorn hens diet had no effect on egg weight and egg production (Lowrance *et al.* 1962; Hurwitz and Barnstain, 1966; Hurwitz *et al.* 1969; Paul and Sentsinger, 1969; Summers, *et al.* 1976; Atteh and Leeson, 1963, Perez and Dela, 1967 and Roland, Sr. *et al.* 1993).

Using New Hampshire, Mehring, (1965) indicated that increasing calcium level from 1.0% to 6.0% did not depress egg production and egg weight, Roland *et al.* (1974) and Holcombe *et al.* (1977) noticed that egg weight and egg production of Bacoock B. 300 hens were not significantly affected by increasing calcium from 2.0% to 5.0%. Also, Lennards and Roland (1961) observed that egg weight and egg production of Hy-Sex hens were not affected by various levels of dietary calcium from 0.4% up to 9.4%.

For brown commercial strain Lesson *et al.* (1993) found that diet which contained 2.8, 3.4, 3.8 or 4.2% calcium had no effect on egg production.