CHAPTER-I

INTRODUCTION

India is one of the largest economies in the world with annual growth rate of 6.2%. Agriculture and allied sectors contribute nearly 14.1% to the Gross Domestic Product (GDP) at constant 2004-05 prices, while providing livelihood to 58.2% of the country’s population. Livestock population of India is among the highest in the world (512.1 million) and this sector contributes approximately 4% to 27% to national and agricultural GDP, respectively. Poultry is one of the fastest growing segments of the agricultural sector in India with around 8% growth rate per annum (Anonymous, 2016a). India is a fourth largest broiler producer after China, Brazil and USA in the world and contributes nearly 45% of the total meat production of the country (Kotaiah, 2016). About 3.4 million tons (74 billion nos.) of eggs are produced from 260 million layers and 3.8 million tons of poultry meat is produced from 3000 million broilers per annum in India. About 2.0-2.5 million tons of poultry litter, a valuable organic fertilizer is produced as a by-product every year (Chatterjee and Rajkumar, 2015).

Poultry farming is the process of raising domesticated birds such as chickens, ducks, turkeys and geese for the purpose of producing meat and eggs for food. Poultry are farmed in great numbers with chickens being the most numerous. Indian poultry-meat industry has been growing at a very rapid rate in recent decades, by transforming gradually from unorganized, small-scale backyard farming into large-scale, organized farming. Poultry production is one of the new emerging growing sectors and has become one of the biggest agricultural industries in India and so its improvement is one of the main objectives of the poultry industry (Karthikeyan and Nedunchezhiyan, 2013). Nearly one third of country’s population living below poverty line is suffering from malnutrition wherein, poultry can serve as an important tool to provide household nutritional security and supplementary income especially to the vulnerable sections of society. Poultry meat is a cheapest source of protein and is used by all for consumption without any taboos and has potential to provide food and livelihood securities to major chunk of Indian population (Lupien and Menza, 1999).
Poultry production sector in developing countries are facing some problems, ensuring feed availability at affordable price remains the key concern for the poultry industry with more than 70 per cent of production cost being in the form of feed. Nevertheless, the quality of the feed also plays a major role in poultry production (Asghar et al., 2000). Micronutrients being vital components, unless the poultry diet is well formulated and balanced, it is likely that deficiencies will occur. Minerals play a role in important functions viz., bone formation, formation of blood cells, blood clotting, enzyme activation and metabolism. The functions performed by minerals can only be fulfilled if sufficient amounts of the ingested minerals are absorbed and retained to keep pace with growth, development and reproduction and to replace minerals that are lost as products, such as meat or eggs. Natural feedstuffs such as corn, wheat, soybean meal, rice bran etc. contain essential minerals. However, these trace elements are often in a form which renders them unavailable to the bird or may not be in adequate concentrations. Hence, most of the minerals must be added to the diet for optimal growth and production.

Minerals are often divided into two categories, based on the amount that is required to be incorporated in the diet. Requirements for major or macro minerals usually are expressed as a percentage of the diet, whereas, requirements for minor, or trace minerals are expressed as milligrams per kilogram of diet or as parts per million. Twenty two mineral elements are believed to be essential for animal life, out of which, chromium (Cr) is also considered as a trace mineral (Underwood, 1981). Following the ban on the use of antibiotics as growth promoters in animal nutrition by the European Union (EU) in 2006, the nutritionists and researchers attempted other alternatives to enhance the performance of broiler chicken. One such alternative is the use of Cr as feed additive in the broiler production. Chromium as an essential mineral was first demonstrated by Schwarz and Mertz (1959) in rats and by Jeejebhoy et al. (1977) in humans. Chromium, which exists in nature mostly is in the trivalent form (Cr³⁺), thought to be essential for activating certain enzymes and for stabilizing proteins and nucleic acids. Its primary role in metabolism, however, is to potentiate the action of insulin, one of the most important anabolic hormones, through its presence in an organo-metallic molecule called glucose tolerance factor (GTF). Dietary chromium supplementation has been shown to positively affect the growth rate, feed efficiency and carcass
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characteristics in broilers. Bioavailability of organic source of chromium is ten times higher than inorganic sources. Chromium propionate is an organic source of chromium absorbed more efficiently as compared to other organic chromium sources.

For the past four decades, many nutritionists have considered chromium as an essential trace element for humans and animals, as feed additives because of its involvement in carbohydrate, lipid, protein and nucleic acid metabolic functions (Anderson and Kozlovsky, 1985). Chromium compounds were also found to function as blood glucose tolerance factor (GTF) in rat experiments (Walker, 1993) which promotes glucose metabolism, enhances glycogenesis from glucose and accelerates glucose transport and muscle build up (Steele and Rosebrough, 1981). Chromium is also act as a co-factor of insulin, promoting insulin activity (McCarty et al., 1988), enhancing amino acid uptake, promoting lipogenesis from glucose and lipid storage in the liver and adipose tissues (Steele and Rosebrough, 1979). Chromium can also reduce levels of lipid, total cholesterol, low density lipoproteins (LDL) and increases high density lipoproteins (HDL) in blood (Press et al., 1990). Chromium is considered as anti-stress factor (Kegley and Spears, 1995) and it improves immune response (Uyanik et al., 2002). Chromium forms are varied in their bioavailability inside animal body (Mowat, 1997). In broilers, dietary supplementation of trivalent organic chromium could result in improved growth rate, feed efficiency, meat yield and carcass characteristics with reduced carcass fat (Gursoy, 2000).

Detailed analysis of past research shows that, various sources of chromium produce beneficial effects on feed intake, growth performance, feed conversion ratio, body composition, resulting in improvement in health of the chicken against the adverse condition and leads to higher production in specific period. Additionally, they have been shown to enhance economic returns in poultry (Halder and Ghosh, 2008). However, studies in poultry that’s evaluating the organic form of chromium (e.g. chromium propionate) for their beneficial effect on growth and performance of broiler chickens are very limited in India. In this view, the present study was undertaken in chicken (Cobb-400) to evaluate the effects of supplementing chromium as chromium propionate with the following objectives:
Objectives:

1. To study the effect of supplementation of organic chromium on feed intake, growth performance and feed conversion ratio of broiler chickens.

2. To study the effect of supplementation of organic chromium on hemato-biochemical parameters of broiler chickens.

3. To study the effect of supplementation of organic chromium on carcass characteristics of broiler chickens.

4. To work out economics of feeding of organic chromium in the feed/diet of broiler chickens.