GENERAL INTRODUCTION
It is generally assumed that the domestication of plants and animals started in the middle east and the adjoining mediterranean region, some ten thousand years before christ. Man is omnivore and so also these domesticated animals including the chicken. In the wild state the jungle fowl, the ancestor of the domestic fowl, is an omnivore and often acts as a scavenger. Up breeding of the domestic fowl along with other animals logically followed as human agricultural endeavors flourished.

Today it is no problem to raise chickens in enormous numbers in countries where cereal production is high and yields are surplus. Poultry rearing is a noble venture in India. Through the persistent efforts of various state governments and the Central Governments as well as many private agencies, farmers maintaining western breed of fowls, notably the white leg horn, have now sprung in many parts of India.

In many developing and Subtropical Countries to modernize and intensify poultry production as an important source of protective food and better income. In addition to
eggs and meat poultry produce a valuable manure which help to raise the soil fertility. Healthy, high producing poultry are excellent converters of many locally produced feed stuffs and by-products. These ingredients are particularly important for formulating well balanced rations. If cereal grains for human consumption are in short supply, however, they can be utilized efficiently for humans and can be substituted with other available sources if their food value is known.

Recent studies have shown that supplementing the drinking water with 0.2 and 2 grams NaCl/L significantly reduces the defects in egg shell quality and significantly decreases the incidence of egg shell defects. (Balnave et al., 1991)

Attempts to overcome the poor shell quality had limited success; however, Ascorbic Acid has recently been shown to exert a beneficial influence (Balnave, 1991: Balnave et al., 1991). Ascorbic acid appears to act as a preventive rather than as a remedial treatment and proves beneficial if the ascorbic acid is administered in the diet.
or drinking water from the beginning to the mature hens. Increased rate of egg production was reported by Harbaugh and Sanford (1970) when optimum levels of Zinc methionine supplemented in the layer diet. Magruder (1979) found that the addition of this compound reduced the cost of egg production by reducing the feed intake without affecting egg production, egg size, or body weight of the hens. Recent studies (Kienholz et al 1990) demonstrated that laying hens subjected to various forms of environmental stresses were better enabled to recover from each stress with the Zinc methionine in the diet than the controlled hens.

Many elements are co-factors of or rather integrated parts of enzymes and of proteins involved in electron transfer and oxygen transfer. They are often present at centre of action and directly involved in the biological transformation. The physiological processes in man and animals express in an active electrolyte solution containing as the major simple ions, Fe²⁺, Na⁺, K⁺, Mg²⁺, Ca²⁺, and Cl⁻. Many important biopolymers, DNA, RNA and ionic mucopoly saccharides and also aggregates of charged
monomers like biological membranes are highly charged and interact strongly with these ions. Dietary supplementation of certain minerals in Sericulture/eri-culture have been employed for the better silk yield. The use of metallic inorganic substances are used as medicinal agents in the modern therapeutics. Several metals though present in tissues only in minute quantities are considered to be essential for the maintenance of life. The most recent list of such elements comprises Silicon, Vanadium, Chromium, Manganese, Iron, Cobalt, and nickel, Copper, Zinc, Arsenic, Selenium, Molybdenum and Iron. These metals play vital roles and perform specific functions in many biological processes by acting as Catalysts on structural components of larger molecules. In addition to this metals are known to be crucial to enzyme functions and have significance in the synthesis and structural stabilization of proteins and nucleic acids.

In view of these findings we have chosen to study four metals namely Copper which belongs to group one, the Zinc from the second group, Lead from the fourth group;
Manganese from the VII group in the nutritional physiology of the development of the chick.

These metals have significant role in the developing chick. Copper occurs as a native metal and in Sulfide ores. Copper is present in earths crust at about 4/5 ppm and in sea water at 1/25 ppb. Copper is an essential nutrient which is widely distributed in animal and plant tissues. The adult human body contains 100mg copper and 1/3, is in muscle tissues Liver. Brain is also rich source. In human foetus copper is ten times higher than in adult liver. Copper is an essential nutrient and stimulates growth. It is also essential for utilization of iron and function in the enzymes which are essential for energy production, connective tissue formation and pigmentation.

The major path-way of copper excretion in many animals and birds is the biliary system. Ionic copper is absorbed from the stomach, duodenum, and jejenum (Van camper, 1971, Decker et al., 1972). The absorption of Copper is influenced by a number of factors including the chemical forms of Copper. The oxides, hydroxides, Iodides, glutamates, Citrates, and
Pyrrophosphates of copper are readily absorbed. The sulfides and often water-insoluble salts are poorly absorbed. Leucine and other amino acids enhance the absorption of dietary copper in rats and humans (Krishna machari, 1974). The major pathway of copper excretion in man, animals, and birds is the biliary system. About 80% of the absorbed copper is excreted in the bile, while about 15% is passed directly into the bile. Intravenously injected copper does not increase the urinary output. In addition to the liver, the primary organ which regulates the copper metabolism is the intestinal mucosa. This acts as a regulatory barrier to the absorption of the excess copper and for the release of copper into the succus entericus.

Copper plays an important role in many enzymes. Examples are ascorbic acid oxidase, phenoloxidase (tyrosinase), which plays an important metabolic role in plants including fungi and in mammalian pigment cells, and it also provides the protein a tanning agent that hardens insect integument.

Copper is essential for the action of dopamine hydroxylase (a key enzyme in the oxidase and of
the Catecholamine hormones), monoamine oxidase and ascorbic acid oxidase. Copper is known to be concentrated several fold in the sympathetic nerve endings, and in the synaptic vesicles of brain and other nerve tissues. The copper deficiency leads to anemia, demyelination of the spinal cord and loss of pigmentation. (Misra et al 1983)

Medical importance of Copper lies in the fact that this metal or its complexes used as anti inflammatory agents in the treatment of arthritis (Kapoor et al 1984). It is suggested that these Copper complexes play an important role in mediating normal physiological anti-inflammatory responses, which bring about tissue repair and remission (Sorenson 1977).

The next metal employed is Zinc. Zinc occurs in nature as a sulfide. The Zinc is used extensively in alloy making industry to make bronze, German Silver etc. Many Zinc salts are used therapeutically. Zinc is an essential trace metal, having highest intracellular concentration. Zinc deficiencies including skin infections, infantilism, Skeletal defects, Stunted growth and failure of skeletal
development. Zinc forms part of metalloenzymes, peptidases, esterases, carbonic anhydrase, alkaline phosphates, and dehydro geneses. Zinc salts have been used as topical agents for their astringent and antimicrobial properties. Zinc deficiency has been associated with various abnormalities. Zinc deficiency in infants and preadolescents leads to growth retardation, impaired learning and failure of sexual maturation.

A new therapeutic agent Silver-Zinc-allantoinate, has been designed to aid in the healing of infected cutaneous wound. It has been found clinically effective in severe human burns and has the advantage of being nonstaining and easy to use (Margrat et al. 1977). The basis of the design of this complex is that Zinc is associated with wound healing (Hanzel et al. 1970, Haeger et al. 1974), and allantoin stimulates the growth of healthy tissue and debris necrotic tissues (Robinson 1935). Silver-Zinc allantoinate can be synthesized from silver nitrate, Zinc sulphate, allantoin and Ammonium hydroxide (Margrat 1975). The observation that ionic Zinc is in some way essential for
the normal synovium and that local Zinc levels are depleted in rheumatoid synovitis has been the basis of study of oral Zinc sulphate supplementation in rheumatoid arthritis (Simkin 1976). The results have shown that oral Zinc sulphate might be beneficial to patients with rheumatoid arthritis. The significant improvement in joints swelling, morning stiffness, walking time and the assessment of the overall condition of patients suggest that articular function responded well to Zinc during the double-blind trial (Simkin 1976). Zinc deficiency has been one of the factors in atrophy of thymus gland in children. This results in increased susceptibility to infections. Zinc supplementation (as Zinc acetate) in malnourished children has been shown to cause enlargement of thymus gland (Golden et al 1977). Gonadal disfunction is feature of end stage renal disease. It causes impotence and decreases libido along with other side effects in uraemic males. The sexual function gets worsened by long term haemodialysis. Zinc sulphate treatment (150 mg of elemental Zinc daily) improved potency in haemodialysed males (Antoniou et al 1977). The frequency
of crisis experienced by patients with sickle cell anemia is reported to be reduced by prophylactic use of oral Zinc Sulphate (Brewer, et al 1977). Lead is belonging to group IV. Lead is a known essential element, which is abundant in the body of many mammals. In some unusual conditions, lead exerts stimulatory effect causing enhanced protein synthesis and increased erythropoiesis, respiration, DNA synthesis, cell replication and reproduction.

Lead is a non-essential element abundant in the body of the mammals. Schwarz (1974) reported some evidence for possible essential function. Under certain unusual conditions lead acts as stimulatory agent causing enhanced protein synthesis (Luckey, 1975 b). Absorption of lead is depended on the age (Forbes and Reina, 1972).

The last metal which is employed is manganese. Manganese is an essential metal for animals. Birds require more manganese than mammals, a fact attributed to their higher body temperature and higher oxygen consumption. Manganese is essential for many degradative enzymes such as
pyruvate, Carboxylase, arginase, phosphotases, phosphorylases—the biosynthetic enzymes of lipid and mucopolysaccharides of Cartilages. In animals deficiencies cause decrease in growth, impaired reproduction, poor bone formation, impaired glycogen tolerance, slower blood clotting in young animals both with manganese deficiencies cause ataxia. (Cuthbertson, 1973).

In view of all these above findings the present study is undertaken to utilize hitherto unutilized above mentioned minerals for cheaper feed making and better increments of the growth, development and better egg laying in domestic fowl. Various facets of the thesis are summerized below:

The part I of the thesis deals with the fowl nutrition. Fowl production is very much depended upon the quality of the food provided to the fowls. In devising suitable foods for the chick growth in India, the Consideration is to consider the locally available raw materials in compounding fowl feed. The fact that the fowl is an omnivore and is a scavenger to be kept in mind. In
addition the food necessarily contains protein, carbohydrates, fats, minerals and vitamins. To avoid the high cost products the poultry feed has to be balanced and should meet the physiological demands of the growing chick. Under this nutritional physiology the effect of these minerals on the growth development, biochemical and physiological behaviour of the chicks were conducted in the post-hatched chicks.

This third part of the thesis constitute three chapters. Chapter one comprises the aspects of growth and development and how these four minerals helped in the growth percentage in the development of the post hatched chick.

Chapter two comprises the fuel reserves in the liver during the development.

Chapter three deals with the fuel reserves in the muscles.

Part II of the thesis deals with the metabolism of the liver and how all these four metals effect the liver capacity in synthesising various compounds during the development. Part II consists of five chapters Chapter I
constitutes the effect of minerals on the lipid profile of
the liver during the development. Chapter II deals with
the effect of the metals on the lipase activity in the liver
of the growing chick. Chapter III deals with the enzymatic
changes in the liver during development. Chapter IV
delays with the fatty acid oxidation and Chapter V deals
with the effect of these minerals on the aminolevulinic acid
dehydratase.

Part III of the thesis deals with the studies on
the developing muscles. This constitutes five chapters.
Chapter I deals with the Lipolytic activity and how the
minerals exercise their effect in the muscles. Chapter II
deals with the effect of metals on the lipid profile in the
muscles. Chapter III deals with effect these minerals on
the myoglobin synthesis in the muscles. Chapter IV deals
with the effect of minerals on the muscle cytochrome C and
Chapter V deals with the effect of the minerals on the
enzymes in the muscle tissue during the development.