CHAPTER I

INTRODUCTION
In an effort to raise milk production, cross-breeding projects have been started throughout the country. Forage production is becoming an essential part of the livestock production to meet the increased needs of these crossbred animals. With intensive cultivation, the mineral content of the forage crops is decreasing day by day, which might cause the marginal trace element deficiency in livestock. The same has been the recent history of many countries, as their animal industry became more intensified, and plant productivity from the land increased. In Australia, for instance, mild or marginal cobalt, copper and selenium deficiencies became apparent over large areas in recent years, as farming practices changed in those areas. In U.S.A., certain types of natural fattening rations for steers have quite recently been shown to be deficient in cobalt and zinc (Raun et al., 1963).

Zinc has been recognized as one of the essential nutrients for livestock and plants. It is found in almost all tissues of the animal and is required for normal growth and development of animals. Zinc appears to be involved in nucleic acid metabolism, protein synthesis
and carbohydrate metabolism, and it plays, in other ways, an essential role in many biochemical reactions in the body. It is a constituent of several metallo-enzymes, and approximately twenty of these have been identified so far. The activity of certain processes mediated through these enzymes are lessened due to dietary zinc deficiency, and the animals show certain clinical syndromes specific to the deficiency.

Even though the severe clinical zinc deficiency has been described in cattle under field conditions in a number of locations throughout the world, it appears unlikely that this is a major problem. However, information currently available does not preclude the possibility of widespread mild or borderline deficiency, which is economically important. The financial consequences of marked deficiencies can be great, however, the losses suffered by all livestock when on mild or borderline intake may, in aggregate, far exceed the total of those caused by overt insufficiency. The effects of mild zinc deficiency would be expected to be decreased feed intake, growth, feed efficiency, milk production, resistance to infection and stress, and lower reproductive efficiency.

Due to severe zinc deficiency, a pathological condition named parakeratosis has been described in number of species. On the other hand, parakeratotic type lesion is produced by feeding a diet devoid of vitamin A or its precursors. Such a common syndrome as well as night blindness common to zinc
deficiency (Arora et al., 1969) and vitamin A deficiency led one to speculate about a relationship between zinc and vitamin A.

The first signs of zinc deficiency in animals are reduced voluntary feed intake and decreased growth rate. When fed at the same rate as normal animals, zinc deficient ones grow more slowly, and thus, decreased growth rate is due to zinc deficiency per se rather than reduced feed intake (Miller et al., 1965b). The reduced feed efficiency of zinc deficient animals results not from lower digestibility, but apparently from less efficient utilization of digested nutrients (Hiers et al., 1962). Thus, it can be postulated that nucleic acids and protein metabolism might be affected due to zinc deficiency at cellular level.

There are still many more unknowns in zinc nutrition than there are established facts. With ruminants, the amount of research data available on zinc is only a small fraction of that with monogastric animals. The role of zinc for rumen microorganism needs to be elucidated.

The problem of trace element deficiency or imbalance is applicable to both livestock industry as well as human health. With the growing evidence and belief that borderline zinc deficiency may be important in human health, it is possible that the zinc content of animal food products, especially milk, may become an item of public interest.
The present investigation was undertaken, keeping in view the points discussed in the preceding paragraphs. The specific objectives of this study were as follows:

1. To elucidate the effect of dietary zinc on β-carotene conversion to vitamin A in rats.

2. To investigate the influence of dietary zinc and/or vitamin A on the ribonucleic acid (RNA), deoxyribonucleic acid (DNA) and protein levels in the liver of rats.

3. To determine the effect of dietary zinc on microbial protein synthesis and volatile fatty acids (VFA) production in the rumen by in vitro and in vivo studies.

4. To evaluate the influence of dietary zinc levels on its secretion in milk of goats using zinc-65.