Chapter I

INTRODUCTION

Acarology, the scientific study of mites and ticks has borne and prospered through the advances in microscopy. Even more important to the birth of this new science was the industry and imagination of the Acarologists in the late 1800s. Now, Acarology has become one of the fastest growing disciplines of Zoology. An elaborate study of this branch of science has helped the scientific community to know more about the impact of mites and ticks on man and his environment.

The word ‘mite’ means a very small creature. Mites belong to the largest and most impressive image of animals, the Arthropods. Mites are species rich and biologically fascinating group of invertebrates. The extreme adaptability of these tiny creatures help them to thrive well in every sort of aquatic, terrestrial, arboreal and parasitic habitat. It is really surprising to note that these possess the supermost adaptability to survive in totally adverse ecological situations like benthic zones of oceans, hostile conditions of caves, freezing temperatures of arctics and warm water of thermal springs. ‘Acari is marvellously heterogeneous, exhibiting all sorts of free living, parasitic and commensalistic nature. Hence they are capable of influencing plants and animals, both positively and negatively.

Mites are the major components of biological diversity. They are strong interactors and important indicators of disturbance in both aquatic
and terrestrial ecosystems. In agricultural systems, plant parasitic mites are extremely damaging pests with rapid generation times, high fecundity and tendency to over exploit their hosts.

The original home of mites was the decaying vegetation and soil, where they dwindled in their most dazzling diversity. Mites are engineers of soil structure, indicators of the health of soil systems and major interactors with nematodes and microbes in decomposition. Mites tend to be concentrated in the surface litter layers and the area around roots in mineral soils. They contribute to the regulation of decomposition and nutrient cycling by comminuting organic matter, feeding on microbes and vectoring microbial propagules and preying up on decomposer worms and arthropods.

Oribatid mites are the most abundant of acarine taxa in soils rich in decaying organic matter and which represent one of the groups of soil arthropods involved in decomposer food web. These ground inhabitants are called “beetle mites” because of their heavily armoured body. More than 70% of oribatid mites are soil inhabitants while the remaining part of the community represents either pure arboreal forms or wandering forms which migrate from soil to plants and back to soil, depending on the availability of optimum conditions for life. They render significant contributions to the process of decomposition of organic matter, activation and dispersal of microbial colonies, indication of soil conditions and control of parasites, weeds etc. A good fraction of them serves important roles like transmission of pathogenic agents like cestodes, protozoans etc. Such vector
mites play substantial role in the transmission of diseases like monieziasis in sheep and cattle.

Many species of oribatid mites are effectively useful for the control of population of different groups of pests like parasitic nematodes. Some mites act as potential biocontrol agents of root knot and fungus feeding nematodes also. Orthogalumna terebrantis and Galumna cuneata are found regulating the growth and spread of Eichhornia crassipes.

Oribatid mites have extremely divergent nutritional habits which help them to be classified broadly as macrophytophages, microphytophages and panphytophages. Macrophytophages feed on leafy and woody materials of higher plants and dead root tissues. Accordingly, they are categorised into phyllophages, xylophages and rhizophages respectively. Microphytophages consume lower plant materials like bacteria, fungi, algae, lichen and moss. Thus microphytophages are categorised into mycophages, bacteriophages, phycophages, lichenophages and bryophages. Panphytophages consume both lower and higher plant materials and include further feeding categories like necrophages, zoophages and so on.

Macrophytophages are directly involved in the decomposition process as they bring about physical and chemical changes in the food substrate by triturition and digestion with the help of their enteric microbiota. Members of the primitive oribatid families like Phthiracaridae and Lohamanniidae exhibit significant roles in nutrient cycling by digesting both leafy and woody materials which help in the conversion of highly
complex organic residues to simple and easily assimilable faecal pellets. As they decompose woody tissue, they are important in the cycling of elements like phosphorous, nitrogen, potassium and so on. Oribatid mites, are important in the metabolization of calcium within the ecosystem since they concentrate it in their calcareous exoskeleton.

Microphytophagous oribatid mites feed on the microbial colonies and facilitate the decomposition process in an indirect way. While grazing the microbial colonies, they activate the senescent colonies and help to release the trapped nutrients in the microbial mass. Through their active migratory movements in the horizontal and vertical directions, the microphytophagous oribatid mites enable to disseminate the microbial spores to different soil layers, thereby paving the initiation of decomposition process.

The panphytophagous oribatid mites play dual roles in decomposition process, both directly and indirectly. They are twice as active as macrophytophages in processing dead organic matter. Rhizophagous oribatids provide channels of aeration, drainage and transfer of organic remains by clearing away the drying parts of the root system of the plants in the soil profile.

The extreme sensitivity exhibited by several species of oribatid mites towards the changing physico-chemical conditions of the soil enable them to act as biological indicators of soil conditions. Oribatid mites exhibit
various horizontal and vertical migratory movements in the soil to cope with the altering environmental conditions. Seasonal migration of these mites towards the plant coverage is often correlated with the alterations in the temperature and humidity conditions of the soil. Similarly, a positive correlation is often observed between organic content of the soil and the oribatid population density. Thus, these mites are highly useful in studies of environmental pollution. An excellent example is *Zygoribatula exilis* which acts as a good indicator of air pollution.

The diverse roles of oribatid mites described so far, clearly depict the economic impact of these mites on man and his environment. However, much of the faunal diversity of oribatid mites still remains as an unexplored entity as far as India, particularly, Kerala is concerned. This is mainly because of the lack of knowledge, highly cryptic nature of these mites coupled with the great difficulties in their extraction, processing and identification. The present attempt is to fill up the above lacuna, to a certain extend and it involves the collection, preparation, identification and description of oribatid mites, particularly members of primitive families.