INTRODUCTION

The insects are the most abundant that can live on land, water as well as adapted for the aerial mode of life. A great struggle exist between the insects and man as they damage all kinds of growing crops and other plants by chewing leaves, buds, flowers, fruits, stems and even roots of the vegetation useful for human beings. These also destroy the stored products, clothing, books, furniture timber etc. to a great extent. There are several insects like house flies, tsetse fly, mosquitoes, bed bugs, rat flea etc. which are responsible for human diseases such as cholera, typhoid, diarrhoea, tuberculosis, kalaazar, trypanosomiasis, malaria, dengue, filariasis, yellow fever plague etc.

On the other hand some of the insects are very useful for their products such as silk, honey, beeswax, shellac, paints dyes etc. which have given opportunities to raise industries and given employment opportunities to many of us. These are also very important for the growth and maintenance of plant life as the sexual reproduction is needed essentially for majority of plants and crops where the insects play a major role.

The coleopteran beetles probably constitute the most flourishing taxonomic order of the animal kingdom. There are over, 3, 50,000 described species of beetles (Richard and Davis 1977). The families and genera of coleopteran exhibit a great variation in their chromosomal number and evolution (White 1978). Similarly the bugs belong to the order- Hemiptera also include about 55,000 species.
1.1 X-ray-and their doses -

In this context it will not be out of way to give a brief account regarding the radiations and their doses used for such studies. Atomic radiation's usually referred to as an ionizing radiations. The electromagnetic waves, known according to their origin as either X-ray or gamma rays. Their chemical and biological effects are closely similar and often identical. From the biological point of view X-and gamma rays need to be considered nearly as a means of releasing high energy electrons within the object which is being irradiated whatever its chemical constitution is. In fact X-and gamma rays belong to the same class of radiation. These are of very much shorter wave length and this makes them much more energetic as compared to other waves. It may be mentioned here that the term gamma ray is used when the radiations are given off by radioactive substances, while they are called X-rays when produced by special high voltage equipment.

There are two kinds of doses. One is exposure dose and the other is absorbed dose. The exposure dose is that amount of radiation to which the cells are exposed i.e. the amount of radiation depending on the properties of the source of radiation and the distance from the source of radiation. However, the energy from the absorbed dose has a biological effect on cells. The absorbed dose depends on two factors. One factor is the amount of radiation and the other factor is the physical properties of the cell system irradiated. The unit of exposure is the roentgen and is the official unit of radiation quantity. By definition the roentgen is restricted to gamma rays and X-rays, and in the present investigation also 'r' has been used as an unit of X-ray exposure.
The present work deals with the effect of different X-ray doses i.e. 1500\(r\), 3000\(r\) and 4000\(r\) on the male germinal cells of four insects namely *Aulacophora foveicollis, Aulacophora intermedia, Coryaodes peregrinus* (all coleopterans) and *Dysdercus cyngulatus* (a Hemipteran).

1.2 **Research Objective**

The present study aims to observe and discuss the chromosomal variations such as the chromosomal breakage and fragmentation, condensation and clumping, unequal distribution at anaphase and telophase and their stickiness etc. occurring during the increasing order of radiation doses of X-ray (i.e. at 1500\(r\), 3000\(r\) and 4000\(r\)) in the male germinal cells of the four insect species. These changes have also been reported by some of the previous authors who gave their findings in different insects at different X-ray exposures. However, there are some differences of opinion in their reports.

An effort has also been made to give findings on certain remarkable features which have not drawn the attention of previous authors such as nuclear swelling and persistence of the nuclear membrane, nucleolus, nucleolar vacuole, perinucleolar ring, persistence of the cell membrane, variation in the cell sizes, cytoplasmic changes and the formation of cytoplasmic blocks etc. These features are being reported probably for the first time in the present study along with the effects of different X-ray irradiations on them.