PART - I

INTRODUCTION

The interrelatedness of all life was given further expression through the theory of evolution put forth by Darwin and Wallace in 1859. It is in the operation of evolution that we encounter the principle of genetic continuity enriched by variation, for only when heritable diversity exists is evolution possible. A fundamental feature of life, therefore, is that it reproduces to conserve the species and changes to produce diversity. Because the cell is the fundamental unit of struacture, these two vital features must have a cellular basis.

Darwin in his theory of evolution emphasized two major aspects - one the netural selection and another the change or the mutation. When De Vries postulated the mutation theory working on Cenothera lamarkiana greater emphasis was given to this concept and Darwin's concept of organic evolution and De Vries mutation theory became the classical aspect of biology. When Mendel's work was rediscovered in the year 1900, the concept of genetics and heridity slowly changed the trend of thinking of plant scientists.

The idea of genetic basis of crop improvement and selection in the natural variants was adopted by the plant breeders where mutation occupied a central place for the increased genetic variability could only facilitate better selection. By 1902, Garrod, through his study of human disease, took the first step towards an understanding of the biochemistry of inherited variation and interrelations of chromosomes and chemical reactions. Muller (1928) first demonstrated that radiation can dedouble the natural rate of mutation. When there was no wider genetic variability in the crop plants, it was thought of increasing the rate of mutation to widen the genetic variability by the help of radiations.

Induced mutations are an important and often a unique approach to plant breeding has been shown in number of crop plants. They are capable of conferring specific improvements to varieties without otherwise significantly affecting their performance and the time required for such specific improvement is shorter than if only hybridization were used. They represent the only possible method of creating a character which is not found in the natural population and are often the easiest and quickest method if the desired character is part of an undersirable genotype. They offer a method of breaking tight linkages, producing translocations for gene transfer and are an invaluable tool for genetical and cytological studies.

In 1940 s work by biochemical geneticists demonstrated clearly that genes are nothing but DNA. As we know, DNA is a key molecule of hereditary and uniqueness. As befits its role, it is the only permanently conserved molecular species in the chromosome, the protein and RNA of the chromosome are transitary. Based on this fact it was extrapolated to understand the gene mutation which is nothing but the change in the DNA molecule. It was during the same period Beadle and Tatum (1942) could equivocally demonstrated that genes control manifestation of characters by modulating the protein or more precisely enzyme. In other words, when the organism inherits particular idioplasm, it inherits the entire enzymatic machinary, which ultimately be responsible for manifestation of characters. For inorder to bring about the modifications in phenotype the change in the gene has to be induced.

Ionizing rediation is known to induce changes in the structure of gene by creating unsaturated radicles in the system. In 1927, Muller demonstrated that the mutation rate of *Drosophila melanogaster* could be markedly increased by treating the flies with X-rays. This was confirmed by Stadler (1928) in Barley. Such type of effect could also be brought by certain highly unsaturated chemicals was first demonstrated by Oehlkers (1943).

Since then large number of mutagenic chemicals were discovered and synthesized, and their mechanism of action has been well illustrated. In the recent years therefore the exploitation of both high energy radiations as well as the chemical mutagens are used to increase the genetic variability in crop plants. Remarkable achivements in this direction has been attained in the plant breeding programme.

As early as in 1905 Gager studied the physiological effect of high energy radiation in plants. Since then voluminous work on the effect of high energy radiations and chemical mutagens on various crop plants have been studied. In the present investigation a modest attempt has been made to know the effect of increasing concentraction of DES and increasing dose of γ-radiation on the germination, survivability, rate of growth, morphological pecularities, photosynthetic leaf area, chlorophyll, nitrogen content etc. in <u>Crotalaria juncea</u> Linn.