

# Chapter 1



## INTRODUCTION

In the late 19th Century till the beginning of the 20th Century the Darwin's theory of organic evolution greatly influenced the general thinking of the biological world and modified the outlook point of view of evolution. Darwin in his theory of evolution emphasized two major aspects - one the natural selection and another the mutation or the change. When De Vries postulated the mutation theory working on Oenothera lamarkiana greater emphasis was given to this concept and Darwin's concept of organic evolution and De Vries mutation theory become 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. 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.

Sustained work in this direction lead to make the concept of mutation breeding much clear and deeper probe to understand the mechanism of mutation was started.

In 40s work by biochemical geneticists demonstrated clearly that genes are nothing but DNA. 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 equivoally demonstrate 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 machinery, which ultimately be responsible for manifestation of character. For in order to bring about the modification in phenotype the change in the gene has to be induced.

Ionizing radiation is known to induce change in the structure of gene by creating unsaturated radicals in the system. Such type of effect could also be brought by certain highly unsaturated chemicals was first demonstrated by Aurbach.

. 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 achievements 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. Although a few works are known on the mutagenic effect of chemical mutagens as well as high energy radicals on important oil yielding plant Carthamus tinctorius no attempt has been made to investigate in detail, the effect of these mutagens on various physiological parameters. In the present investigation therefore a modest attempt has been made to know the effect of increasing concentration of EMS and increasing dose of  $\gamma$  - radiation on the rate of growth, enzymes of germination, morphological peculiarities, photosynthetic leaf area, chlorophyll, the organic constituents of leaf, chlorophyll stability index, photosynthesis in Carthamus tinctorius L. var. N 62-8.