Chapter VII

SUMMERY AND CONCLUSION

A. SUMMARY :

For the present work seeds of Carthamus tinctorius L. var. N 62-8 (inbred) was obtained from Nimbkar Agriculture Research Institute, Phaltan for the purpose of investigating the response to the increasing concentration of chemical mutagen EMS and increasing dose of γ-radiation. The comparative study of effect of these mutagens on germination, growth and development, and physiological parameters such as leaf area, chlorophyll, chlorophyll stability index, enzymes of germination, rate of photosynthesis etc. was carried out.

Known quantity of seeds were sent for irradiation with a specified dose of 1, 2.5, 5, 7.5 and 10 Kr radiation at Bhabha Atomic Research Centre, Trombay. And seeds immediately after receiving they were subjected for investigation. Similarly the seed was treated with 0.2, 0.25, 0.3, 0.35 and 0.4 M concentrations of EMS by standard method described by Hollaender (1971). Both the irradiated as well as EMS treated seeds were studied for the rate of germination in germination paper. The rates of germination were recorded periodically every 24 h and carried out up to 96 h. Depending upon the percentage of germination lethal dose was worked out in EMS treated plants. The parts of so treated seed were independently sown in the pots for the purpose of investigation of the morphological peculiarities leaf area etc. From 0.2 M EMS treated seeds the enzymes of seeds the enzymes of seed germination peroxidase, lipase and amylase

were also assayed and their activities studied. From the morphological peculiarities the change in the cotyledonary morphology, seedling morphology, leaf morphology, stomatal density etc. were recorded every weak starting from second week and extented upto 7th week. The height, total number of leaves per plant, average leaf area, total leaf area per plant, stomatal frequency per unit area were also recorded. To know the effect on physiological parameters chlorophylls were estimated, chlorophyll stability index was determined. The leaf discs were also exposed to short term as well as long term steady state rates of photosynthetic $^{14}CO_2$ fixation, proteins and carbohydrates were estimated from the leaves and results have been incorporated.

B. CONCLUSIONS :

The study has lead to draw following conclusions -

(1) Amongst the EMS concentrations chosen 0.4 M reduces the germination rate to about 50 % of the control in this variety indicating thereby the LD_{50} is around 0.4 M EMS.

(2) Much effect has been noticed in MES than at highest dose of 10 Kr γ-radiation as there was no severe reduction in the germination percentage of the seeds.

(3) The sublethal concentration of 0.2 M EMS was chosen to have many beneficial effects and the enzymes of treated seeds

by 0.2 M EMS peroxidase, lipase and amylase have been assayed and shown to have increased activity.

(4) Maximum morphological anamalies such as cotyledonary curvature, mottled leaves, marginal midrib, biftrcated leaf tip, dissected cotyledon, week stem etc. have been noticed in 0.4 M EMS treated plants. Similar effects were also noticed in 10 Kr dose of r-radiation, however, with low frequency capitulum size was increased in 10 Kr dose of r-radiation and was decreased in 0.4 M EMS treatment.

(5) Average leaf area per plant has increased with increasing concentration of EMS but the total number of leaves per plant has decreased. Thus the overall photosynthetic area per plant is maximum in 0.2 M EMS treated plants but reduced significantly in 0.4 M EMS treated ones.

(6) With increasing dose of radiation the average leaf area has also increased but the total number of leaves per plant decreased with a stimulatory effect at 1 Kr, however, at 1 Kr the total photosynthetic leaf area has increased by $1\frac{1}{2}$ time.

(7) The frequency of stomata per unit area has decreased with increasing concentration of EMS but it has increased with increasing dose of r-radiation.

(8) The total chlorophyll content has increased with increasing concentration of EMS and increasing dose of radiation; but increase in EMS treatment is marginal.

(9) Chlorophyll stability index increased marginally after 0.35 M EMS treatment, whereas it decreases with increasing dose of radiation.

(10) With increasing dose of EMS treatment, reduction in the level of N and protein is noticed, where as with increasing dose of radiation N level and protein content have increased.

(11) Reduced carbohydrate synthesis with increased concentration of EMS is noticed where as carbohydrate synthesis has been stimulated with increasing dose of radiation.

(12) Following 5 seconds fixation in control, 0.4 M EMS treated plants and 10 Kr irradiated plants, it could be seem that the rate of fixation is doubled in 0.4 M EMS treated ones, it is 4 times in 10 Kr irradiated plants .

(13) As studies from the steady state photosynthesis it can be said that increasing concnetration of EMS as well as increasing dose of radiation stimulate the rate of photosynthesis, however, increase in the rate in EMS treated plants is eratic but in irradiated plants it is gradual and steady.

(14) It is speculated that since the radiation dose chosen is sublethal and has overall stimulatory effect, it may have more beneficial effects than could be achieved with EMS treatments.