Chapter-6
SUMMARY AND CONCLUSIONS

In the present investigations, mutagenic effects of Sodium azide (SA), Maleic hydrazide (MH) and Dimethyl sulphate (DMS) were studied in two species of Trigonella viz., Trigonella foenum-graecum L. and Trigonella corniculata L.

The main objective of the study was to enhance the genetic variability for various quantitative traits and isolating such lines showing desired shift in mean values. Various other aspects of the study were 1. Biological damage in M₁ generation 2. Mutagenic effectiveness and efficiency 3. Screening of chlorophyll and viable mutations and 4. Estimation of heritability (broad sense) and genetic advance (percent of mean).

6.1 Sensitivity studies

The effect of different mutagenic treatments was studied in some biological parameters viz., seed germination, plant survival and pollen fertility in M₁ generation. Besides, meiotic behaviour of chromosomes after treatments with different chemical mutagens was also carried out.

a) Seed germination, plant survival and pollen fertility decreased with the increase in mutagenic treatment.

b) Chromosomal abnormalities increased with the increase in mutagenic treatment. Various meiotic aberrations induced by SA, MH and DMS were stickiness, univalents, multivalents, precocious separation of chromosomes, laggards, bridges, non-disjunction and cytomixis etc.
c) The order of effectiveness for three mutagens in case of germination was SA > DMS > MH whereas, in case of survival of plants and pollen fertility, the order of effectiveness was DMS > MH > SA in both the species of *Trigonella*.

d) Among the two species, *Trigonella corniculata* was more sensitive to chemical mutagens as compared to *Trigonella foenum-graecum*.

e) Studies on various quantitative traits in *M1* revealed that lower or intermediate treatments showed stimulatory effect, whereas, higher treatments of all mutagens reduced the mean values.

f) The coefficient of variation (CV) was high among the treated population as compared to control in *M1*.

### 6.2 Qualitative mutations

a) A wide range of chlorophyll and viable morphological mutations were induced in *M2* generation.

b) Chlorophyll mutations initially increased with the increase in dose/conc. whereas, a slight decline in the mutation frequency was noticed at higher treatments.

c) Frequency of xantha mutants was highest followed by chlorina and maculata in both the species.

d) The most promising morphological mutations were tall, dwarf, bushy, and bold seeded mutants.
e) Mutagenic effectiveness was highest at lower or intermediate treatments of all mutagens. SA proved to be most effective followed by DMS and MH.

f) Mutagenic efficiency was highest on the basis of chromosomal abnormalities followed by efficiency based on lethality.

g) SA proved to be most efficient mutagen based on sterility and meiotic aberrations, whereas, DMS was most efficient based on lethality in inducing mutations.

6.3 Induced polygenic variation

a) The lower or intermediate treatments of all mutagens showed positive shift, whereas, higher treatments showed negative shift in the mean values of various polygenic traits in M2 generation.

b) The mean values increased further in M3 generation especially for yield and yield contributing traits.

c) The coefficient of variation (CV) increased considerably in all mutagenic treatments in M2. However, no dose dependent increase in CV was noticed.

d) All the genetic parameters viz., PCV, GCV, $h^2$ (broad sense) and GA (percent of mean) were high among the treated populations as compared to control in M3 generation.

e) The isolated mutant lines in M2 and M3 generation showed considerable increase in number of branches per plant, number of pods per plant and 1000 seed weight
leading to an increase in overall seed yield per plant of these mutant lines.

In general, lower or intermediate treatments of SA, MH and DMS induced greater variability and proved to be more effective and efficient than the higher treatments. The following conclusions were drawn in the present study.

1. The two species of Trigonella viz., Trigonella foenum-graecum L. and Trigonella corniculata L. responded differently to different chemical mutagenic treatments.

2. Increase in mean values coupled with increase in genetic parameters in M₃ suggest possibilities of isolating more promising lines with high yield and high heritability in the future generation.

3. Number of branches per plant, pods per plant and seed weight are highly correlated with yield in Trigonella.

4. Trigonella plant is an efficient material for studying meiotic behaviour of chromosomes after treatments with different mutagens due to its large size and less number of chromosomes.

5. The yield potential of the crop can be increased by efficient selection of promising lines in M₂ and M₃ generations.