

EFFECTS OF ETHYLENE DIAMINE ON CERTAIN BIOLOGICAL PARAMETERS IN *Cicer arietinum* CV G-130

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ABSTRACT

In the present investigation one variety of *Cicer arietinum* cv G-130 was treated with five different concentration (0.1%, 0.25%, 0.5%, 0.75%, 1.00%) of ethylene diamine mutagen ethylene diamine has induced morphological variations in *Cicer arietinum* (G-130). In these five different concentration at seed level. Reduction in seed germination, height of plant, pollen fertility, while increase in the percentage of morphological logical variation and height injury were recorded with the increasing concentration of EDA. Coefficient of variation was recorded to be higher mutagen treated population.

KEYWORDS : *Cicer arietinum*, Ethylene Diamine, Mutagen

Mutation is known to create genetic variations and complements as an alternative to hybridization and recombination in plant breeding.

Gram Peas also called as Bengal gram or Channa gram is native of southern Europe. People of Asia, Africa and Central America use its as food supplement.

Cicer arietinum is an important commercial crop plants used as pulses. Seed are considered to be rich in protein. Considering its important the mutagenic treatment was carried out by ethylene diamine at seed level. Gram is a small much branched plants attaining a height of about two feet. In India gram is mainly cultivated in UP, MP, Punjab, Bihar, etc. it is eaten as raw, boiled or cooked as pulse or vegetable. Roasted, satted, sweetened seed and flour are also used as food. Its varieties G-130 are selected for investigation. (Sparrow and Sparrow, 1965)

MATERIALS AND METHODS

Uniform, healthy seeds of *Cicer arietinum* CV G-130 were presoaked in distilled water for 2 hours and were then subjected to five different concentration (from 0.1% to 1.0%) of ethylene diamine solution prepared in phosphate buffer of pH-7. One set of seed was kept untreated to act as control. After completion of treatment period for 24 hours, seeds were thoroughly washed in running tap water to reduce the residual effects of mutagen sticking to the seed coat.

Three replications of 100 seed were sown for every treatment in the field in complete randomized block

design (CRBD) to raise M₁ generation Data on seed germination. Leaf abnormalities, plants growth and pollen fertility was recorded and analysed statistically to find out mean, standard deviation (S.D.) and coefficient of variability (C.V.)

RESULTS AND DISCUSSION

Seed germination and average height of plants reduced i.e. from 82% (Control) to 1% and from 38.70 cm to 24.0 cm respectively with the simultaneous increase in height injury from 0.00 to 37.98 % in control to 1% EDA. However few plants were found to be vigorous in lower concentration of mutagen (0.5% EDA) than control as the height number of branches increased many folds.

No morphological variation were found in control population whereas they increased from 16-100% in (0.1-1%) EDA (Table-1). In controls plants, the leaves were generally obovate, while in 0.1% EDA, the leaves were round and thick, in 0.2% EDA the notched and smaller and in 0.5% EDA, they were broader and more compactly arranged as compared to control. Moreover, curved leaves with wavy margin were observed in 0.75 and 1.0% EDA. In the highest concentration, the leaves were comparatively broader than length.

Pollen fertility in control was found to be 95%. It showed reduction in the treated populations but there was no linear dependence on concentration of mutagen.

The reduction in germination percentage may be due to weakening and disturbance in growth process

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Table 1 : Germination Percentage, Growth, Pollen Fertility and Morphological Variation Studies in EDA (Ethylene Diamine) Treated *Cicer arietinum* C.V G-130

| Sl. N. | Characters/ Concentrations | Control | 0.1% | 0.25% | 0.5% | 0.75% | 1.00% |
|--------|--|---------|-------|-------|-------|-------|-------|
| 1 | Max. seed germ on 15 th day (%) | 82 | 75 | 71 | 40 | 1 | 1 |
| 2 | Percentage inhibition (cm.) | - | 8.54 | 13.42 | 51.22 | 98.78 | 98.78 |
| 3. | height of plant (Cm) Mean | 38.70 | 32.00 | 32.00 | 31.70 | 30.00 | 24.00 |
| | SD | 0.36 | 0.42 | 0.42 | 0.88 | 0.00 | 0.00 |
| | CV | 0.93 | 1.32 | 1.32 | 2.78 | 0.00 | 0.00 |
| 4. | Height injury (%) | 0.00 | 17.31 | 17.31 | 18.08 | 27.48 | 37.98 |
| 5. | Pollen fertility (%) | 95 | 93 | 89 | 82.80 | 82.90 | 82.90 |
| 6. | Relative reduction in pollen fertility | - | 2.11 | 6.32 | 12.84 | 12.74 | 12.74 |
| 7. | % of morphological variations | 00 | 16 | 23 | 43 | 100 | 100 |

S. D. = Standard Deviation, C. V. = Coefficient of Variability

resulting in early elimination of seedlings and inhibition of growth regulators and metabolic disturbance during germination.(E.G. Sideris et. Al. 1971)

The average height of plants decreased and height injury increased concentration of EDA, similar to the findings in other mutagens. (P.J. Temple 1990)in *Lycopersicon esculentum*, (Gay et.al. 1991)in *Helianthus annuus* L. and Murray and Wilson, 1991 in *Medicago truncatula*. Sparrow and Sparrow, 1965 concluded that the growth inhibition arises from interference of mutagen with cell elongation.

The variation in seedling and mature plants, such as habits, shape and size of cotyledonary and vegetative leaves, branching pattern, growth etc. were observed and their frequency generally increased with the increasing concentration of EDA. Many worker have also reported the morphological variation in different plants, such as Zeerak, 1990. in Brinjal, Murray and Wilson in *Medicago truncatula*, Corradi et al., 1993, 1 in *Salvia Sclarea*. Hagen and Gunckel found in general that where leaf abnormalities occurred there was a concomitant increases in the free amino acid contents in these leaves.

Pollen fertility decreased and sterility increased with the increasing concentrations increased of EDA. Sinha and Godward, 1969 described the translocation to be responsible for decreased fertility. Rana and Swaminathan, 1964 and Rammana, 1974 reported that any deviation in karyokinesis or cytokinesis could produce non-viable microspores.

CONCLUSION

In the light of above discussion, it may be concluded that all these changes in morphological characters of leaf and the plants, branching patterns and increased pollen sterility causing the fall in yield. However some variations may be useful. Since mutation induced high rate of changes provide us greater chance of selection of desired characters and rejection of undesirable one.

REFERENCES

- Corradi, M.G., A. Bianchi and A. Albasini, (1993), Environ. & Exp. Botany, **33**:405.
- Gay, C.F. Corbineau and D. Come(1991). Environ. & Exp. Bot., **31**:193.
- Hagen, G.L. and J.E. Gunckel (1958). Pl. Physiol., **33**:439.
- Murray, F. and S. Wilson (1991). Environ. & Exp. Bot., **31**:319.
- Rammana, R.S. (1974). Euphytica, **23**:20.
- Rana, S.R. and M.S. Swaminathan(1964). Recent advance in Palynology, pp. 276.
- Sideris, E.G., M.M. Nawar and R.A. Nilan (1971). Radiat. Bot., **11**:209.
- Sinha, S.S.N, and M.B.E. Godward(1969). J. Cytol. **3**:80.
- Sparrow, R.C. and A.H. Sparrow (1965). Science, J. 147 :1449.
- Temple, P.J.(1990). Environ. & Exp. Bot., **30**:283.
- Zeerak, N.A. (1990). Phytomorphology, **40** (3&4):81.