BIOLOGIA PLANTARUM (PRAHA)
24 (4) : 307—310, 1982

BRIEF COMMUNICATION

# Induced Mutation in Tomatillo (*Physalis ixocarpa* BROT.)

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**Abstract.** To induce mutation in tomatillo (*Physalis ixocarpa* BROT.) commonly grown for its fruit value, seeds were treated with three alkylating agents (dimethyl sulphate, diethyl sulphate and methyl ethane sulphonate) and gamma rays. Seven viable and five chlorophyll mutant types were screened both from $M_1$ and $M_2$ generations. The isolated mutant lines are described and evaluated with reference to their beneficial value.

Tomatillo (*Physalis ixocarpa* BROT.), a Central American Solanaceous plant was introduced in Rajasthan (India) in 1962. Its fruit could be used as a vegetable and raw like tomato. No comprehensive study on mutagenesis in tomatillo has been made so far. So an attempt was made to induce mutation in tomatillo using three alkylating agents and gamma rays, with the aim of isolating beneficial mutants. In the present paper the isolated mutant lines of tomatillo have been described and genetically analysed.

Original seed samples obtained from the Economic Botanist, Durgapura, Jaipur, India were used to raise the plants. Seeds from a single plant formed the stock seeds for the present study. Dry seeds were irradiated from a $^{60}Co$ source at I.A.R.I., New Delhi, giving a total dose of 20, 30 and 40 kR (20 kR = 5.16 $kg^{-1}$). Three alkylating agents namely dimethyl sulphate (DMS), diethyl sulphate (DES) and methyl ethane sulphonate (MES) obtained from B.D.H. and SIGMA (U.K.) were used. Seeds presoaked in distilled water for 12 h were treated with different concentrations (0.25, 0.50, 0.75 and 1.0% by volume, pH 7.4) of chemical mutagens for 12 h at 22 °C. The test tubes were intermittently shaken and the solution was changed every 4 h. A control was run using distilled water instead of chemical mutagens. Chemically treated seeds were washed in running tap water for 10 min and finally rinsed with distilled water and then sown in pots. Later on one month old seedlings were transplanted into garden beds. Each treated population ($M_1$) was screened during vegetative, flowering and fruiting periods. 150—200 seeds were sown from each $M_1$ plant.

*Received August 4, 1981; accepted November 25, 1981*
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TABLE 1
Frequency of viable and chlorophyll mutation in $M_2$ generation in *Physalis ixocarpa* BROT.

| Mutagens dose %/kR | Number of $M_1$ plants yielding particular mutants in $M_2$ | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Hispid stem | Trifurcate stem | Large ovate leaf | Aristate recurved calyx | Grooved fruit | Discoid fruit | Chlorophyll mutant types | No. of $M_1$ plants | Mutants as % $M_1$ plants |
| DMS 0.25 | — | — | 1 | 1 | — | — | 1 (cha) | 15 | 20.0 |
| 0.50 | — | — | 1 | — | 2 | — | 1 (chb) | 15 | 26.6 |
| 0.75 | 2 | — | — | 1 | — | — | — | 10 | 30.0 |
| DES 0.25 | — | — | — | — | — | — | 2 (lu) | 15 | 13.3 |
| 0.50 | — | — | 1 | — | — | — | 1 (cha) | 12 | 16.6 |
| 0.75 | — | — | — | — | — | — | 1 (chb) | 15 | 6.6 |
| 1.0 | — | — | — | — | 1 | 1 | 1 (ma) | 12 | 25.0 |
| MES 0.25 | 1 | — | — | — | — | — | — | 12 | 8.3 |
| 0.50 | — | — | — | — | — | — | 2 (lu) | 12 | 16.6 |
| Gamma rays | | | | | | | | | |
| 20 | 1 | — | — | — | — | — | 1 (al) | 15 | 13.3 |
| 30 | — | 2 | — | — | — | — | — | 12 | 16.6 |
| 40 | — | — | — | — | — | — | 1 (lu) | 12 | 8.3 |

Tomatillo responded fairly well to various treatments and yielded interesting viable and chlorophyll mutants (Table 1). The "open bud" mutant was recorded in the very first generation ($M_1$) and six viable mutants were secured in $M_2$ segregation population. The diagnostic features and genetic behaviour of all isolated mutants in the present study are given below:

**Hispid Stem (Fig. 1B)**

In control, the stem was glabrous but in mutant it was covered with tufts of hairs. The character was recognised at seedling stage. The mutant character occurred consistently, in $M_3$ generation.

**Trifurcate Stem (Fig. 1C)**

Stem was trifurcate at first forking with swollen nodes, which gave a characteristic appearance to the mutant. The character continued to breed true in subsequent population.

**Large Ovate Leaf (Fig. 1D)**

Mutant showed erect habit throughout the growing period, leaf large, thick ovate and undergoing chlorosis at tip. The mutant bred true in $M_3$.

**Open Bud (Fig. 2A, C)**

Screened in $M_1$ population. Buds were open from early stages, style projecting in bud, corolla slow growing, corolla tube very short, ovary protruding above floral parts, anthers wide apart and in fruit the persistent calyx formed a cap-like structure at the base. The mutant behaviour in self and cross pollination revealed that the original mutant was heterozygous for open bud factor which showed marked pleiotropic effects on other floral and fruit characters (MAHNA and SINGH 1975).

**Aristate-Recurved Calyx (Fig. 2B)**

Plants were weak, persistent calyx recurved and aristate shaped.

**Grooved Fruit (Fig. 2C)**

Fruits prominently grooved, hollow, apex retuse, surface sticky and persistent, calyx thick, adpressed and without a conspicuous beak.

**Discoid Fruit (Fig. 2D)**

Fruit slow growing enclosed in rather excessively inflated calyx at maturity disc-shaped with a prominent depression in apical region, seeds light.

**Chlorophyll Mutant Types**

Albina (al) — Cotyledons and leaves formed were without chlorophyll, mutation lethal.

Maculata (ma) — Leaves showed irregular white blotches on lamina, mutation viable.

Chlorina A (cha) — Leaves with persistent pale green colour, costal region pale and intercostal green, mutation viable.

Chlorina B (chb) — Leaf colour as in Chlorina A, but costal region green and inter costal pale.

Lutescent (lu) — Green pigment gets destroyed forming partial or complete pale leaves, mutation viable with reduced fertility.

Some of the mutants isolated in the present study can be used for fundamental biological research as they have good marker genes which find expression during early stages like "hispid stem" and "open bud" mutants.

As reported earlier by MAHNA and SINGH (1975) the "open bud" mutant was inferior to other genotypes but drastic alteration in floral characters make it a very useful type for breeding projects. The open bud, projecting style and raised ovary provide the mechanism to ensure cross pollination in mutant and to carry out emasculation with ease and least injury.

In "grooved fruit" mutant ascorbic acid was estimated to be on the higher side, which is an added utility to its fruit value (MAHNA and SINGH 1974).

## REFERENCES

MAHNA, S. K., SINGH, D.: Free ascorbic acid from solanaceous plants and their mutants. — Indian J. Pharmacy **36** : 138—140, 1974.

MAHNA, S. K., SINGH, D.: Induced floral mutation in *Physalis ixocarpa* BROT. — Curr. Sci. **49** : 21—22, 1975.

*Figures at the end of the issue.*

## BOOK REVIEW

ROMAN, H. L., CAMPBELL, A., SANDLER, L. M. (ed.): ANNUAL REVIEW OF GENETICS. Vol. 15. — Annual Reviews Inc., Palo Alto, California, USA 1981. 450 pp., US $ 21.

Annual Reviews Inc. is a non-profit corporation established to promote the advancement of sciences. The first Annual Review was published in 1932 and covered biochemistry. Now there are 24 Annual Reviews covering a broad series of scientific and public interest. The first Annual Review of Genetics appeared in 1963. It is the regular practice that Annu. Rev. Genet. are introduced by a paper on the scientific achievements of an outstanding geneticist. This 15th Volume is opened by a paper on T. M. Sonneborn (1904—1981), written by D. L. Nanney. Sonneborn focused most of his attention to the genetics of the ciliated protozoa *Paramecium*. He was the president of the Genetics Society of America and besides other awards he won the Mendel Medal of the Czechoslovak Academy of Sciences (1965). Further topics covered in Vol. 15th of Annu. Rev. Genet. are: Sister exchange formation (S. A. Latt); Phenomenology and genetic control of mitotic recombination in yeast (B. A. Kunz, R. H. Haynes); Integration and excision of bacteriophage lambda: the mechanism of conservative site specific recombination (H. A. Nash); Genetics of HLA disease association (L.P. Ryder, A. Svejgaard and J. Dausset); Gene transfer in amphibian eggs and oocytes (J. B. Gurdon and D. A. Melton); *Drosophila* genome organisation: conserved and dynamic aspects (A. C. Spradling and G. M. Rubin); Directed mutagenesis (D. Shortle, D. DiMaio and D. Nathans); Simian virus 40 as a eukaryotic cloning vehicle (J. T. Elder, R. A. Spritz and S. M. Weissman); Transposable elements in prokaryotes (N. Kleckner) and Reflections on phage genetics (T. F. Anderson). This volume includes a cumulative index of chapter titles, Volumes 11—15.

Readership: all those interested in genetics and molecular biology.

T. GICHNER (*Praha*)

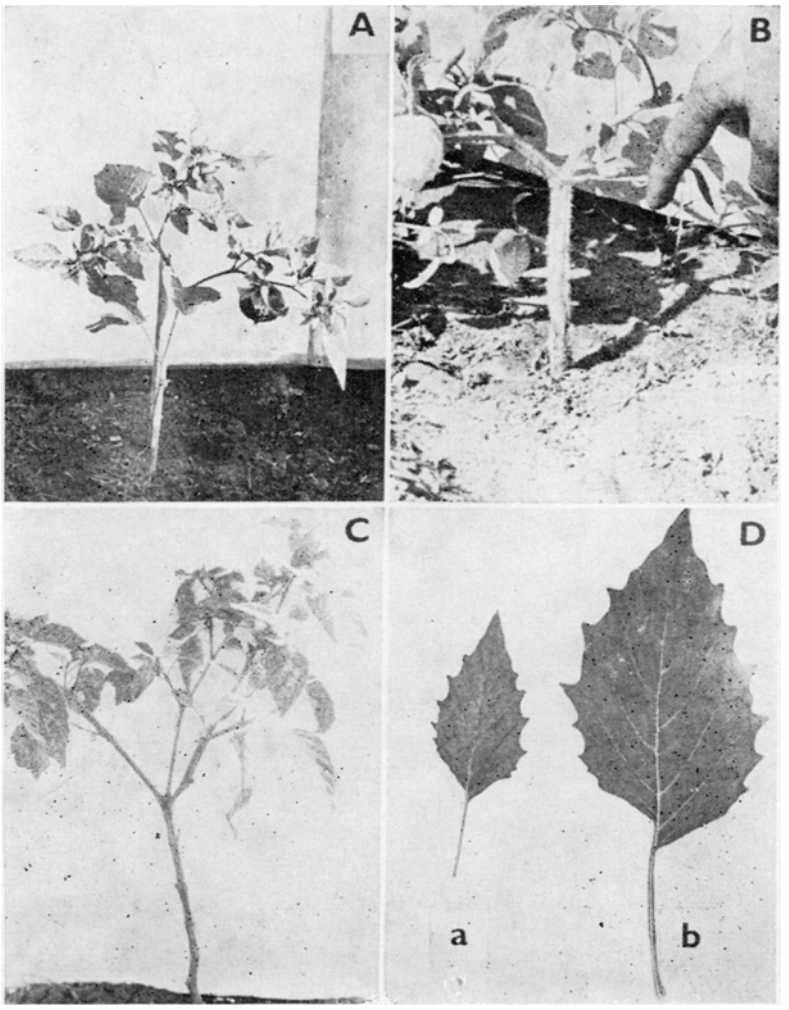


Fig. 1. Vegetative mutants: A — control; B — hispid stem; C — trifurcate stem; D — control leaf (a), ovate leaf (b).

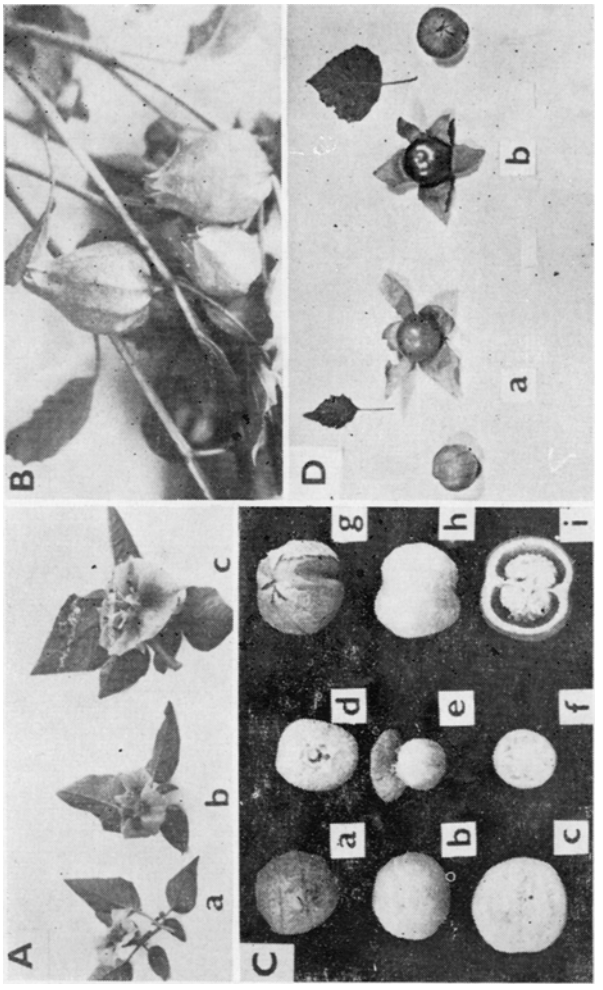


Fig. 2. Flower and fruit mutants: A — open bud mutant (comparison of floral characters): control (a), mutant (b, c); B — aristate-recurved calyx; C — comparison of mutants' fruit characters: control (a—c), open bud (d—f) and grooved fruit (g—i); D — discoid fruit (comparison of leaf and fruit character): control (a), mutant (b).