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Effect of gamma rays on chlorophyll content and ascorbic acid content of chilli in M_1 generation

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Abstract
This study was performed by exposing the seeds of chilli (*Capsicum annuum* L.) cv. Phule Jyoti to gamma rays. The observations were made on chlorophyll content and Ascorbic acid content of chilli. The study revealed that ascorbic acid content decreased with an increase in dose/concentration of gamma rays as compared to control. Whereas in Chlorophyll content, maximum chlorophyll 'a' was observed in control, chlorophyll 'b' in lower dose of radiation and total chlorophyll in higher dose of gamma rays. Higher dose of radiation showed minimum chlorophyll 'a' and 'b' in M_1 generation.

Keywords: Gamma rays, chlorophyll, ascorbic acid, chilli

Introduction
Chilli is a spice cum vegetable crop of commercial importance, characterized by tempting colour and biting pungency. No dish will fulfill without this spice in India. India is blessed with a plethora of chilli varieties which are as fresh green fruits, fresh red fruits, and dried red fruits or processed in to chilli paste, chilli powder, oleoresin etc. It is grown in several parts of India has a larger area; its productivity is very low as compared to other countries. Hence, there is an urgent need to produce and identify new varieties combining with high level of disease resistance, besides increased yield and capsaicin content in chilli.
Mutation is a sudden heritable change, brought out in a single nucleotide base pair either by addition, deletion or substitution caused by the various factors which leads to a change in the coded information finally expressed in terms of changed phenotypes through alteration in the chain of events like transcription and translation. Gamma rays are ionizing physical mutagens, capable of inducing mutation in plants and animals. Gamma rays are electromagnetic radiations, similar to X-rays in their physical characteristics and have an action on the organism. They are of very short wavelength by virtue of which they are more penetrating.

Material and Methods
The present investigation was carried out at All India Co-ordinated Research Project on Vegetable crops, Department of Horticulture, Mahatma Phule Krishi Vidyapeeth, Rahuri during 2014-2015. The selected seeds of Chilli cv. Phule jyoti (15 g for each treatment) were treated with different doses of gamma rays *viz*. 10, 20, 30 & 40 kR at Bhabha Atomic Research Centre, Trombay, Mumbai.

Chlorophyll content (mg/g)
The chlorophyll content in leaf was estimated by adopting the procedure and extraction of chlorophyll was done with DMSO (Dimethyl Sulphoxide) method. The leaf samples weighing 0.100g were added in test tubes containing 10ml DMSO solution and kept in BOD incubator for 2 hours at 60 °C for extraction of chlorophyll. The supernatant was used for estimation of pigments. The optical density of the aliquot was measured on spectrophotometer at the wavelength of 663 nm for chlorophyll a, 645nm for chlorophyll b and 652 nm for total chlorophyll with red filter.

The chlorophyll prom leaves calculated as per Arnon (1949) equations and was expressed in mg/g.

$$\text{Total chlorophyll} = \frac{\text{OD at 652 nm} \times 100}{34.5} \times \frac{V}{100 \times W}$$

Where
OD = Optical density
V = Final volume i.e. 10ml of DMSO.
W = Weight of fresh leaves (g)

$$\text{Chlorophyll a} = 12.7\,(\text{OD at } 663) - 2.69\,(\text{OD at } 663) - 2.69\,(\text{OD at } 645) \times \frac{V}{1000 \times W}$$

$$\text{Chlorophyll b} = 22.9\,(\text{OD at } 645) - 4.68\,(\text{OD at } 663) \times \frac{V}{1000 \times W}$$

Ascorbic acid content (Ranganna, 1979) [8].
5 ml of standard ascorbic acid solution was taken in a beaker and 5 ml of HPO3 was added to it. This solution was titrated with the dye solution to a pink colour which persisted for 15 seconds. Dye factor (mg of ascorbic acid per ml of the dye) was determined by using the formula:

$$\text{Dye factor} = \frac{0.5}{\text{Titre}}$$

Here
0.5 means 0.5 mg of ascorbic acid in 5 ml of 100 ppm standard ascorbic acid solution

Titre = Volume of dye used to neutralize 5ml of 100 ppm standard ascorbic acid solutions along with 5 ml of metaphosphoric acid.

The ascorbic acid content was calculated by using the following formula

$$\text{Ascorbic acid (mg/100g)} = \frac{\text{Titre} \times \text{Dye Facter} \times \text{volume made up}}{\text{Aliquot of extract} \times \text{Weight of sample taken for estimation}} \times 100$$

Here
Titre = Volume of dye used to titrate the aliquot of extract of a given sample.

Results and Discussion
The data regarding chlorophyll content of leaves as influenced by the gamma rays was found to be significant, the control treatment recorded maximum chlorophyll "a" (3.98 mg/g) and it was at par with the treatment 10 kR, 20 kR and 30 kR of gamma rays, while the higher dose of gamma rays treatment 40 kR of gamma rays recorded minimum chlorophyll "a" (2.90 mg/g). The lower dose of radiation treatment 10 kR was recorded maximum chlorophyll "b" (0.96 mg/g) followed by the treatment 20 kR of gamma rays, while the higher dose of radiation treatment 40 kR recorded minimum chlorophyll "b" (0.67 mg/g). The treatment of 30 kR gamma rays recorded maximum total chlorophyll (1.14 mg/g). The lower dose of radiation treatment 10 kR gamma rays recorded minimum total chlorophyll (0.78 mg/g).
Plants with lower doses of mutagens shows protective response to the heat stress, which involves structural alternations in the photosynthetic apparatus as compared to higher doses. Prolonged irradiations damage to reaction centers is usually followed by chlorophyll loss.
Regarding ascorbic acid content, increasing doses of gamma radiation decreases in ascorbic acid as compared to control. The maximum ascorbic acid content (118.13 mg/100g) recorded in the control treatment followed by the lower dose of irradiated treatment 10 kR (116.30 mg/100g). Whereas the higher dose of irradiated treatment 40 kR gamma ray recorded minimum ascorbic acid content (111.93 mg/100g).

Conclusion
The present investigation indicated that, lower doses of gamma radiation have shows variability in the cv. Phule Jyoti for chlorophyll contents and ascorbic acid content. It needs to confirm the performance of mutants and their breeding behavior in subsequent generations.

References

1. Aruna S Desai, Srinath Rao. Effect of gamma radiation on germination and physiological aspects of Pigeon pea (*Cajanus Cajan* (L.) Millsp) seedlings. Int. J Res. App. Nat. Soc. Sci 2014;2(6):47-52.
2. Deepthi T, Dr. Remesh KN. Impact of EMS induction on morphological, anatomical and physiological traits of Bhindi *Abelmoschus Esculentus* (L.) Moench. Int. J Rec. Res. Life Sci 2016;3(2):4-11.
3. Hegazi AZ, Hamideldin N. The effect of gamma irradiation on enhancement of growth and seed yield of okra. J Hort. and Forestry 2010;2(3):038-051.
4. Mullainathan L, Sri Devi A. Effect of EMS and dES on oleoresin, capsanthin and ascorbic acid contents in chilli. Int. J Cur. Tr. Res 2012;1(3):110-114.
5. Naheed Akhtar. Effect of physical and chemical mutagens on morphological behavior of Tomato (*Solanum Lycopersicum*) cv. Rio Grande under heat stress conditions. Plant Breeding and Seed Science 2014;70:69-79.
6. Nusrat Saba, Bushra Mirza. Ethyl methane sulphonate induced genetic variability in *Lycopersicon esculentum*. Int. J Agri. Biol 2002;4(1):89-92.

7. Nyla Jabeen, Bushra Mirza. Ethyl methane sulfonate enhances genetic variability in *Capsicum annuum.* Asian J Plant Sci 2002;1(4):425-428.
8. Ranganna S. Head Book of Analysis and Quality Control for Fruit and Vegetable Products. Tata McGraw-Hill 1979.
9. Sikder P, Biswas P, Hazra S, Akhtar A, Chattopadhyay AM, Badigannavar *et al*. Induction of mutation in tomato (*Solanum lycopersicum* L.) by gamma irradiation and EMS. Indian. J Genet 2013;73(4):392-399.