



E-ISSN: 2278-4136

P-ISSN: 2349-8234

www.phytojournal.com

JPP 2021; 10(1): 331-332

Received: 20-11-2020

Accepted: 22-12-2020

Sonali Ramaji SoyamDepartment of Horticulture,
Post Graduate Institute, MPKV,
Rahuri Ahmednagar,
Maharashtra, India

Effect of EMS (Ethyl methane sulphonate) on chlorophyll content and ascorbic acid of chilli in M₁ generation

Sonali Ramaji Soyam

Abstract

This study was performed by exposing the seeds of chilli (*Capsicum annum* L.) cv. Phule Jyoti to EMS. 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 EMS as compared to control. Whereas in Chlorophyll content, maximum chlorophyll 'a' was observed in higher dose of EMS treatment, chlorophyll 'b' in lower dose of EMS and total chlorophyll in higher dose of EMS. Higher dose of EMS showed maximum chlorophyll 'a' and total chlorophyll in M₁ generation.

Keywords: Ethyl methane sulphonate, chlorophyll content, ascorbic acid

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. In plant research, a chemical mutagen, ethyl methane-sulfonate (EMS) produces single base substitutions with different mutation spectra. These chemical mutagens induce a broad variation of morphological and yield structure parameters in comparison to normal plants.

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 EMS treatment (0.2%, 0.3% & 0.4%) at the Tissue Culture Laboratory, MPKV, Rahuri.

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

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

Corresponding Author:**Sonali Ramaji Soyam**Department of Horticulture,
Post Graduate Institute, MPKV,
Rahuri Ahmednagar,
Maharashtra, India

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) [6]

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:

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

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 EMS was found to be significant, the maximum dose of EMS treatment (0.4%) recorded maximum chlorophyll "a" (4.30 mg/g) and it was at par with the lower doses of EMS treatment and control treatment. The dose of 0.3% EMS treatment was recorded maximum chlorophyll "b" (0.82 mg/g) and maximum total chlorophyll (1.08 & 1.03 mg/g) found in the higher doses of EMS treatment (0.4% & 0.3%).

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. Jabeen and Mirza (2002) [5] studied in *Capsicum annum*, maximum chlorophyll content was observed in the treatment of 0.1% EMS for 3hrs. Similar result was found by Saba and Mirza (2002) [4], the highest chlorophyll content was observed in 0.5% EMS for 3 hrs in tomato.

Regarding ascorbic acid content, Ascorbic acid content in M₁ generation was decreased in the mutagenic treatments with increase in the dose of mutagens as compared to the control treatment. The maximum ascorbic acid content (118.13 mg/100g) recorded in the control treatment followed by the lower dose of EMS treatment 0.2% (116.03 mg/100g).

Whereas the higher dose of EMS treatment (0.4%) recorded minimum ascorbic acid content (113.43 mg/100g).

Conclusion

The present investigation indicated that, lower doses of EMS 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. 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.
2. 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.
3. 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;70:69-79.3E3`
4. Nusrat Saba, Bushra Mirza. Ethyl methane sulphonate induced genetic variability in *Lycopersicon esculentum*. Int. J Agri. Biol 2002;4(1):89-92.
5. Nyla Jabeen, Bushra Mirza. Ethyl methane sulfonate enhances genetic variability in *Capsicum annum*. Asian J Plant Sci 2002;1(4):425-428.
6. Ranganna S. Head Book of Analysis and Quality Control for Fruit and Vegetable Products. Tata McGraw-Hill 1979.
7. Sikder P, Biswas P, Hazra S, Akhtar A, Chattopadhyay AM, Badigannavar, D'Souza SF. Induction of mutation in tomato (*Solanum lycopersicum* L.) by gamma irradiation and EMS. Indian. J Genet 2013;73(4):392-399.