



Induction of chlorophyll mutants in Coriander (*Coriandrum sativum* linn.) using physical and chemical mutagens

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ABSTRACT

In the present research investigation three types of chlorophyll mutants were recorded in the different doses/ concentration of Gamma rays and Ethyl methane sulphonate (EMS). They were Xantha, Chlorina and Viridis. The morphological mutants were recorded in M2 generation with effect of Gamma ray and EMS. In Gamma rays more percent of chlorophyll mutants were found as compare to EMS treatment.

Keywords: *Gamma rays, EMS, Chlorophyll mutant, Coriander*

INTRODUCTION

Coriandrum sativum Linn. is a genus in the carrot family commonly known as cilantro. Unripe fruit is characterized by a strong unpleasant odor resembling the Greek word Koris, a type of aphids. Coriander is a green 'Dhania' spice used in India. In Maharashtra, it is pronounced Kothembiri. Coriander seeds and leaves are used as a common food flavoring agent and a spice with great economic and nutritional value in agriculture. It is a famous traditional medicine in Ayurveda. Due to its economic and medical importance, a mutagenicity study was performed. The use of inducible mutants for crop improvement has produced a variety of mutants that are directly used as new cultivars Gottschalk and Wolf (1983). This paper reports data on the frequency and patterns of chlorophyll mutations induced by different concentrations/dose of EMS and gamma rays.

MATERIAL AND METHODS

Tamil Nadu Agriculture University, Coimbatore, and Tamil Nadu provided the seed stock for the coriander variety CS-287. Treatment methods included the use of EMS, a chemical mutagen and gamma rays, a physical mutagen.

Gamma rays treatment:

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Savitribai Phule Pune, Pune, Ganeshkhind, Pune exposed the experimental seed material to radiation. Healthy, dry seeds were packed and exposed to 10 kR, 20 kR, 30 kR and 0 kR gamma radiation from a Co⁶⁰ source.

EMS treatment:

Ethyl methane sulfonate (EMS), a chemical mutagen with a molecular weight of 12.16 and a specific gravity of 1.20, was obtained from Spectrochem Pvt. Ltd in Mumbai. EMS was applied to dry, hard seeds at concentrations of 0.050%, 0.075%, 0.10% and 0.125%. To enhance the M1 generation, seeds from each treatment, as well as control seeds (untreated seeds), were seeded in the study field using a randomized complete block design (CRBD) with triplicates.

At the maturity all the survived M1 populations were harvested separately and seeds were sown in for

generation to raise M2 generation. The control and treated progeny were screened for chlorophyll mutants from germination till 15 - 20 days old seedling stage.

RESULT AND DISCUSSION

The M2 generation was bred from seeds harvested and collected from the M1 progeny. Chlorophyll mutants were scored at the seedling stage of 15 to 20 days. Different types of chlorophyll mutations such as xantha, chlorina and viridis have been documented and studied. Mutant xantha is yellow and survives for 30- 40 days and is stunted. The chlorina mutant is greenish-yellow in color. A few of them revert to the normal green type. These mutants survive for up to 30 to 40 days. Viridis mutant is light green. This color then turns to normal green. These seedlings survive up to 40- 45 days.

Table 1: Effect of mutagens on the spectrum of chlorophyll mutants in M₂ generation of *Coriandrum sativum* L.

Mutagens	Concentrations/ Dose	Frequency of Chlorophyll mutants			
		xantha	chlorina	viridis	Total
Control	-	-	-	-	
EMS	0.050%	0	0	1	1
	0.075%	0	1	0	1
	0.10%	1	0	1	2
	0.125%	1	0	1	2
Gamma Rays	10 kR.	0	0	1	1
	20 kR.	0	1	1	2
	30 kR.	1	1	0	2
	40 kR.	0	1	0	1

Table 2: Effect of mutagens on chlorophyll mutants in M₂ generation of *Coriandrum sativum* L.

Mutagens	Concentration/ Dose	Frequency of chlorophyll mutants%
Control	Control	-
EMS	0.050%	0.5
	0.075%	0.7936
	0.100%	1.5625
	0.125%	1.3071
Gamma rays	10 kR.	1.234
	20 kR.	2.0833
	30 kR.	2.631
	40 kR.	3.076

The frequency of chlorophyll mutants was adequate for all the concentrations/doses of the different mutagenic treatments. The mutagenic treatment does not revealed any specific order for the frequency of chlorophyll mutants. The frequency varies from 0.5% to 1.3071% in EMS and 1.234% to 3.076% in Gamma rays. The frequency of the mutants depends on the methods of induction of mutagens and its selection. The first marked appearance of the mutagenic treatment of the seeds is the existence of chlorophyll mutants in the M₂ generation. Mutation frequency was recorded on the basis of phenotypes by screening of seedling lethality (Survival rate), embryonic lethality (seed set), chlorophyll deficiency etc. Chlorophyll mutations are to be considered for the test to determine the effectiveness and efficiency of the mutagens. It also shows the factor mutations.

There was a dose dependent enhancement in the frequency of chlorophyll mutants in case of EMS and Gamma rays treatments. Gamma rays treatment shows the highest frequency of chlorophyll mutation than EMS. The same result was recorded by many researchers like Kothekar (1978), in *Solanum nigrum* L., Deshpande (1980) in *Momordica charantia*, Hakande (1992) in Winged bean., (Matsukura, *et al.*, 2007) *Solanum lycopersicum* L., (Das *et al.*, 2010) in *Withania*, Sri Devi and Mullainathan (2012) in *Capsicum annuum* L. and (Sikder, *et al.*, 2013) in *Solanum lycopersicum* L., Shinde (2013) in Cluster bean and Gaikwad (2013) in Cowpea.

The frequency and types of chlorophyll mutations such as *albina*, *chlorina*, *viridis* and *lutesens* were reported by Sri Devi and Mullainathan (2012) in *Capsicum annuum* L. Chlorophyll mutation frequency was studied in two varieties like EC60176 and EC62017 of *Solanum lycopersicum* L. by (Sikder *et al.*, 2013) they reported that the highest percentage was found in EC60176 followed by EC62017.

Kothekar and Dnyansagar (1985) in *Solanum nigrum* have reported the higher frequency of chlorophyll mutations following treatment with Gamma radiations than chemical mutations.

Conflict of Interest: None of the authors have any conflicts of interest to disclose.

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