

## Effect of EMS (Ethyl Methane Sulfonate) on Seed Germination, Seedling Height and Seedling Injury in *Withania somnifera*, (L.) Dunal

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### ABSTRACT

*Withania somnifera*, Dunal. belongs to family Solanaceae. It is also known as Ashwagandha or Indian Genseng. Withanolides are constituents of roots of Ashwagandha. Withanolide is the major constituent with appreciable quantity of Withanone and traces of Withaferin-A. In Ayurvedic literature, is a "Rasayana" or rejuvenating drug and hence also traditionally known as Avarada which suggests the application of this plant for enhancing longevity. The seeds of *Withania somnifera*, Dunal. var *somnifera* were selected and used for following investigations. The healthy, dry and uniform seeds were treated with EMS at different conc. like 0.05 %, 0.075 %, 0.10 % and 0.125 %. Germination parameters like germination percentage, seedling height and seedling injury were studied. Germination percentage in control was 82 %. Germination percentage revealed gradual decrease from lower conc. to higher doses in given treatments of EMS. It was 78 %, 72 %, 59 % and 57 % at 0.05 %, 0.075 %, 0.10 % and 0.125 % respectively. In case of seedling height indicated dose dependent deduction after treatment of EMS. In EMS treated seeds seedling height was in the range 1.86 cm, 1.79 cm, 1.73 cm and 1.75 cm and seedling injury varied from 2.10 %, 5.78 %, 8.9 % and 7.8 %. In conclusion it can be said that use of chemical mutagens has succeeded in inducing M1 Biological parameters.

### KEYWORDS

Ashwagandha, Mutation, seedling injury

### INTRODUCTION

*Withania somnifera* Dunal (ashwagandha, WS) is widely used in Ayurvedic medicine, the traditional medical system of India. It is an ingredient in many formulations prescribed for a variety of musculoskeletal conditions (e.g., arthritis, rheumatism), and as a general tonic to increase energy, improve overall health and longevity, and prevent disease in athletes, the elderly, and during pregnancy. Many pharmacological studies have been conducted to investigate the properties of Ashwagandha in an attempt to authenticate its use as a multi-purpose medicinal agent. Its importance and for development of interest amongst cultivators it is important to develop better varieties. Therefore mutagenesis has been carried out in recent paper. Any mutagen that induces single base pair mutations or small

deletions/insertions is effective for tilling. EMS (Ethyl methane Sulphonate) is the mutagen we have employed, for the following reasons its effects have been well studied and it is known to generate almost exclusively G/C to A/T point mutations. These mutations may lead to a complete or partial loss of gene function or, less frequently, to some other alteration of normal gene function. Mutations are randomly distributed in the genome. A high degree of mutation saturation can be achieved with a mutagen like EMS that does not cause a lot of collateral DNA damage.

### MATERIALS AND METHODS

The seeds material of *Withania somnifera* (L.) Dunal were collected from Mahatma Phule Agriculture University, Rahuri.

**Mutagen used** - Ethyl methane Sulphonate.

**Mode of treatment with mutagenic agents:**

The concentrations of EMS were decided according to LD<sub>50</sub> treatments.

**Treatments:**

Treatments of chemical mutagens were decided as per doses and concentrations, treatments were replicated thrice. Following M<sub>1</sub> - parameters were studied and results were recorded for

**1. Seeds germination percentage:**

From each treatment 100 seeds material were kept in tray with sterile soil. After one week germination of seeds germination percentage was recorded.

**2. Seedling height and seedling injury:**

The seedling height was recorded at the end of first week and the percentage seedling injury was calculated from the data of seedling height (Mayhill and Konzak, 1967).

**3. Survival of Plants:**

The percentage of plants survival will be recorded at the maturity of plants. Gaul, (1960).

**RESULTS AND DISCUSSION****1. Germination Percentage**

**Table 1: Effect of mutagen on seed germination in *Withania somnifera* (L.) Dunal.**

Mutagen	Concentration	% Germination
EMS (Ethyl methane Sulphonate)	Control	82
	0.05%	78
	0.075%	72
	1.0%	72
	1.25%	57

In control maximum number of seeds germinated after one week of sowing. The percentage of germination was 82. Germination showed gradual decrease from lower to higher concentration of EMS which was 78%, 72%, 72%, and 57% at conc. 0.05%, 0.075%, 1.0% and 1.25%.

**2. Seedling Height and Seedling Injury**

In EMS treatment seedling height was in the range of 1.91379 cm to 1.7339 cm. from control to 0.125%. Seedling Injury varied from 2.1 % to 7.8 % In following investigation various germination parameters were taken in consideration at various concentrations of EMS in M<sub>1</sub> generation which are

**2.1. Seed Germination Percentage:**

In present investigations Seed germination decreased with increase in concentration of EMS indicating toxic effect of chemical on seeds. Similar effects were recorded in *Lycopersicon Esculentum*, Nusrat et al (2002) and in *Solanum lycopersicum* cv. Watanabe et al., (2007).

**2.2. Seedling Height and Seedling Injury:**

In present work Seedling height was concentration dependent. As the concentration of EMS rises from 0.05% to 0.125 % there is gradual decrease in seedling height and increase in seedling injury. This indicated that with increase in concentration of EMS damage in seedling increases similar reports were given in *Lycopersicon Esculentum*, Nusrat et al., (2002) and in Tomato, Kostov et al., (2007).

From above investigations it can be concluded that EMS is capable in inducing damage to plants at molecular level and is capable of inducing mutation the more concentration of EMS more will be damage and chances of getting more variables may increase. Similarly it is proved in chilly plants that EMS can induce mutations (Nyla et al., 2004).

**Table 2: Effect of mutagen on Seedling Height and Seedling Injury in *Withania somnifera* (L.) Dunal.**

Mutagen	Concentration	Average Seedling Height(cm)	Maximum Height (cm)	Seedling Injury
EMS (Ethyl methane Sulphonate)	Control	1.91379	2.8	
	0.05%	1.86026	2.6	2.1
	0.075%	1.79722	2.6	5.78
	1.0%	1.7339	2.4	8.9
	1.25%	1.75263	2.6	7.8

## CONCLUSIONS

In conclusion it can be said that use of chemical mutagens has succeeded in inducing M1 Biological parameters.

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