Think India Journal
ISSN: 0971-1260 Vol-22, Special Issue-31
National Conference ETDAB-2019
Held on 23th & 24th December 2019
Organized by: Deptt. of Botany, Deogiri College, Aurangabad, M.S

EFFECT OF MUTAGENESIS ON SEEDLING GERMINATION ON FIELD IN TWO DIFFERENT VARIETIES OF CICER ARIETINUM L.

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ABSTRACT:

Effect of mutagenesis on seedling germination on field in two different varieties of *Cicer arietinum* L. was studied. Varied concentrations of chemical mutagens viz. Ethyl Methane Sulfonate (EMS) 0.05%, 0.10%, 0.15% and Sodium Azide (SA) 0.01%, 0.02% and 0.03% were used. Two different varieties of *Cicer arietinum* L. i.e., **BDNG-797 and BDNGK-798** were obtained from Agriculture Research University, Badnapur, Dist: Jalna. Effect of these mutagens on seedling germination on field was studied on 6th day. Highest germination percentage was recorded. The most effective mutagen observed was EMS.

Keywords: *Cicer arietinum* L., **BDNG-797 and BDNGK-798,** EMS, SA.

Introduction:

Crop improvement programmes through induced mutations were initiated about seven decades ago, immediately after the discovery of mutagenic effects of X-rays on *Drosophila* by (Muller 1927), and barley and maize by (Stadler; 1928). Over 2252 mutant varieties of crop plants including cereals, oilseeds, pulses, vegetables, fruits, fibres and ornamentals have been developed by the end of the 20th century. More than 60% of these mutant varieties were developed and released after 1985 (M. C. Kharkwal; R. N. Pandey and S. E. Pawar; 2004).

Mutagens cause random changes in the nuclear DNA or cytoplasmic organelles, resulting in gene, chromosomal or genomic mutations (e.g. deletions, translocations, duplications, aneuploidy, breakage of linkage association, etc.) and create variability. The limitation of mutation breeding is the unspecificity of the mutated trait. Mutation represents a unique analytical tool to study gene function and to understand the molecular basis of

inheritance of plant characteristics. A large mutant germplasm collection of different model plants (Arabidopsis, Brassica, etc.) and crop plants (wheat, pea, barley, etc.) is available for genetic and plant transformation studies (L Wang -1991).

Chickpea (Cicer arietinum L.) is an annual, autogamous legume and the only cultivated species within the genus Cicer. Pakistan is the second major producer of chickpea (9.5%) after India (65%) followed by Turkey (6.7%) in the world (Anon., 2005). The most commonly followed breeding approach for the improvement of crop is usually recombination breeding. The existing chickpea germplasm indicates limited variability for improvement of economic traits. Mutation breeding is a powerful and effective tool in the hands of plant breeders especially for autogamous crops having narrow genetic base (Micke, 1988). Mutagenic agents have been used to induce useful phenotypic variations in plants for more than seven decades ago. During the past 70 years, more than 2,252 mutant varieties including cereals, oilseeds, pulses, vegetables, fruits, fibres and ornamentals have been officially released in 50 countries all over the world (Maluszynski et al., 2000). Although induced mutations have been undertaken in the past on some grain legumes, however limited attempts have been made on chickpea (Kharkwal, 2003; Haq et al., 2001; Haq et al., 2002; Cagirgan & Toker, 2004; Gaur

& Gaur, 2002; Khan & Wani, 2005). The literature is scarce for the comprehensive and systematic studies of frequency and spectrum of chlorophyll mutations induced by a wide array of treatments of physical and chemical mutagens on distinctly diverse genotypes of chickpea (TM Shah, JI Mirza, MA Haq, and B. M Atta 2006).

METHODOLOGY:

Experimental plant material

The experimental plant material used in present investigation comprised two varieties Chickpea (Desi Chana) **BDNG-797 and** (Kabuli) **BDNGK-798** Germplasm of these two

varieties was obtained from the were obtained from Agriculture Research University, Badnapur, Dist: Jalna.

Mutagenic Treatment:

Healthy and uniform seeds Chickpea varieties (Desi Chana) **BDNG-797 and** (Kabuli) **BDNGK-798** were surface sterilized with 0.1% mercuric chloride solution for about one minute and washed thoroughly with distilled water. They were pre-soaked in distilled water for 6 hours. The pre-soaking enhances the rate of uptake of the mutagen through increase in cell permeability and also initiates metabolism in the seeds for treatment. Pre-soaked seeds were

later immersed in the mutagenic solution for 4 hours in EMS and SA and treatment was given with intermittent shaking. The volume of the chemical mutagenic solution used was 100 ml to facilitate uniform conditions. All the chemical mutagenic treatments were given at room temperature. Seeds soaked in distilled water for 12 hours served as control. The different concentrations used for chemical mutagenic treatment were 0.05%, 0.10% and 0.15% for EMS and 0.01%, 0.02% and 0.03% for SA, respectively. Immediately after the completion of treatment, the seeds were washed thoroughly under running tap water to remove excess of mutagens. Later on treated seeds were post soaked in distilled water for 2 hours. The post soaked seeds were dried in folds of filter paper.

RESULT:

Seedling germination percentage (Table 1)

It is evident from the data of mean seed germination percentage that all the concentrations/doses of mutagens had an inhibitory effect on germination in both the varieties. As the concentration of SA increases seed germination rate decreases Kabuli; whereas in all concentration of EMS germination rate was shown maximum growth. In Desi Chana the concentration shows variable results; whereas all concentrations/doses of EMS had shown maximum growth.

The germination in control was found to be 95% in (Kabuli) **BDNGK-798** whereas 95% in **BDNG-797** (Desi Chana) variety. The germination percentage in 0.01% concentration of SA in Kabuli Chana was 85%; in 0.02% of SA Shows 70% and in 0.03% of SA shows 70%; whereas the germination percentage in 0.05% of EMS in Kabuli Chana was recorded 95%, in 0.10% shows 100% and in 0.015% shows 95%. The germination percentage in 0.01% concentration of SA in Desi Chana was 85%; in 0.02% of SA Shows 45% and in 0.03% of SA shows 80%; whereas the germination percentage in 0.05% of EMS in Desi Chana was recorded 95%, in 0.10% shows 100% and in 0.015% shows 95%.

In case of SA treatments, values of germination ranged from 85% to 70% in Kabuli Chana and 85% to 45% in Desi Chana; while in case of EMS treatment values of germination ranged from 100% to 95% in Kabuli Chana and 100% to 95% in Desi Chana.

This shows that the most effective mutagenic agent was EMS for both the varieties viz. (Kabuli) **BDNGK-798 and BDNG-797** (Desi Chana).

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PLATE - 1

Seedling germination

Cicer arietinum L. (KABULI CHANA- VARIETY- BDNGK-798)

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PLATE - 2

Seedling germination

***Cicer arietinum* L. (DESI CHANA- VARIETY- BDNG-797)**

TABLE 1:

Effect of mutagens on seed germination percentage in M1 generation of Chickpea.

TREATMENT	CONCENTRATION %	SEEDLING GERMINATION IN BDNGK - 798	SEEDLING GERMINATION IN BDNG -797
CONTROL		95%	95%
EMS	0.05	95%	95%
	0.1	**100%**	**100%**
	0.15	95%	95%
SA	0.01	80%	85%
	0.02	**70%**	**45%**
	0.03	70%	80%

CONCLUSION:

For seedling germination on field in both the varieties BDNGK – 798, BDNG - 797, the most effective mutagenic agent was found to be EMS. As it shows higher percentage of germination as compaired to all the three concentrations of SA.

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