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 SEED GERMINATION IN TWO DIFFERENT VARIETIES OF CICER ARIETINUM L.

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ABSTRACT:

Effect of mutagenesis on seed germination 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 collected fromAgricultureResearchUniversity,Badnapur,Dist:Jalna.Effectofthesemutagensonseed germination was studied. Highest germination percentage was recorded along with some morphological changes. The most effective mutagen observed wasEMS.

Keywords: *Cicer arietinum* L., mutagenesis, EMS, SA.

INTRODUCTION:

Chickpea (Cicer arietinum L.) is the third important food legume of the world grown in 40 countriesoveranareaofabout11.2millionhectares,withproductionof9.2milliontonnesandaverage yield of 818 kg/ha. (TM Shah and JI Mirza et al., 2008). The crop is self-pollinated diploid (2n=2x=16) with a comparatively small genome (Arumuganathan & Earle, 1991). Currently the productivity of

chickpeaisverylowandhasstagnantinrecentyears.Despiteitshighmorphologicalvariability,genetic variation is limited probably due to its monophyletic descendence from Cicer reticulatum (Ladizinsky & Adler, 1976; Lev-Yadun et al., 2000; Abbo et al., 2003).

Chickpea is relatively cheap source of protein (23%), carbohydrates (40%), oil (61%) and minerals(Mg,K,P,Fe,ZnandMn).Itismoredroughttolerantthanothercoolseasonlegumes,andits relative importance is projected to increase in future due to global population growth and climate change. Chickpea is a socially and economically important food legumes in South Asia, West Asia, NorthAfricaandMediterraneanregions.Itrankssecondinareaandthirdinproductionafterbeansand pea (www. Wikipidia.com).

Although extensive studies have been undertaken on mutagenesis in cereal crops (Kumar & Mani, 1997; Konzak et al., 1965; Nilan et al., 1965), its utilization was limited for improving pulse crops (Haq et al., 2001, 2002; Kharkwal, 1998; Kharkwal et al., 1988; Nadarajan et al. 1982). The ethylated agents, ethyl methane sulphonate (EMS) have been found more effective and efficient than physical mutagens in crops like lentil (Gaikwad & Kothekar, 2004), cowpea (John, 1999).

METHODOLOGY:

Experimental plant material

Theexperimentalplantmaterialusedinpresentinvestigationcomprisedtwovarieties Chick pea (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 initiatesmetabolismintheseedsfortreatment.Pre-soakedseedswerelaterimmersedinthemutagenic 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 0.10%, 0.15% and 0.20% 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 filterpaper.

RESULT:

Seed germination percentage

Itisevidentfromthedataofmeanseedgerminationpercentagethatalltheconcentrations/doses of mutagens had an inhibitory effect on germination in both the varieties. As the concentration of SA increasesseedgerminationratedecreasesKabuli;whereasinallconcentrationofEMSgerminationrate was shown maximum growth. In Desi Chana the concentration shows variable results; whereas all concentrations/doses of EMS had shown maximumgrowth.

Thegerminationincontrolwasfoundtobe90%in(Kabuli)**BDNGK-798**whereas100%in

BDNG-797 (Desi Chana) variety. The germination percentage in 0.01%, 0.02% and 0.03%

concentration of SA in Kabuli Chana **BDNGK-798** was 100%; whereas the germination percentage in 0.05%, 0.10% and 0.15% of EMS in Kabuli Chana was recorded 100%. The germination percentage in 0.01%, 0.02% and 0.03% concentration of SA in Desi Chana **BDNG-797** was 100%; whereas the germination percentage in 0.05%, 0.10% and 0.15% of EMS in Desi Chana was recorded100%.

Morphological variation in Seed Germination On Plates at Room Temperature:

In both the variety of Kabuli Chana **BDNGK-798** and Desi Chana **BDNG-797** morphological variations were also recorded. In control variety of Kabuli Chana **BDNGK-798** secondary filamentous growthwasveryless.PrimaryRootsarelesshairyinappearance.All10seedsshowsvariationsintheir lengthsofroots.InEMSat0.05%concentrationofKabuliChana**BDNGK-798**secondaryfilamentous growth was very high. Primary Roots are hairy in appearance. All 10 seeds not shows much variations in their lengths of roots as compared to controls. In EMS at 0.10% concentration of Kabuli Chana **BDNGK-798**secondaryfilamentousgrowthwasless.PrimaryRootsarenotmuchhairyinappearance. All 10 seeds shows variations in their lengths of roots as compared to controls. In EMS at 0.15% concentration of Kabuli Chana **BDNGK-798** secondary filamentous growth was less. Primary Roots arenothairyinappearance.All10seedsshowsdiversevariationsintheirlengthsofrootsascompared to controls. In all the concentrations of SA i.e., 0.01%, 0.02% and 0.03% the morphological variation was very diverse as compared to EMS. secondary filamentous growth was absent. Primary Roots are not hairy in appearance. All 10 seeds are of same lengths of roots as compared tocontrols.

In Desi Chana **BDNG-797** morphological variations were also recorded. In control variety of Desi Chana **BDNG-797** secondary filamentous growth was very less. Primary Roots are less hairy in appearance. All 10 seeds shows variations in their lengths of roots. In EMS at 0.05% concentration of Desi Chana **BDNG-797** secondary filamentous growth was not observed. Primary Roots are hairy in appearance. All 10 seeds not shows much variations in their lengths of roots as compared to controls. In EMS at 0.10% concentration Desi Chana **BDNG-797** secondary filamentous growth was not observed. Primary Roots are not much hairy in appearance. All 10 seeds shows variations in their lengths of roots as compared to controls. In EMS at 0.15% concentration of Desi Chana **BDNG-797** secondaryfilamentousgrowthnotobserved.PrimaryRootsarehairyinappearance.All10seedssho ws diverse variations in their lengths of roots as compared to controls. In all the concentrations of SA i.e., 0.01% and 0.02% the morphological variation was very diverse as compared to EMS. secondary filamentous growth was absent except in 0.03% concentration. Primary Roots are not hairy in appearance. All 10 seeds are of same lengths of roots as compared tocontrols.

CONCLUSION: ThispresentinvestigationshowsthatthemosteffectivemutagenicagentwasSAa nd EMS for seed germination at room temperature at plate method for both the varieties viz. (Kabuli) **BDNGK-798 and BDNG-797** (DesiChana).

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SEED GERMINATION

Cicer or7etinum L. (DESI CHANA- VARIETY- BDNG-797)

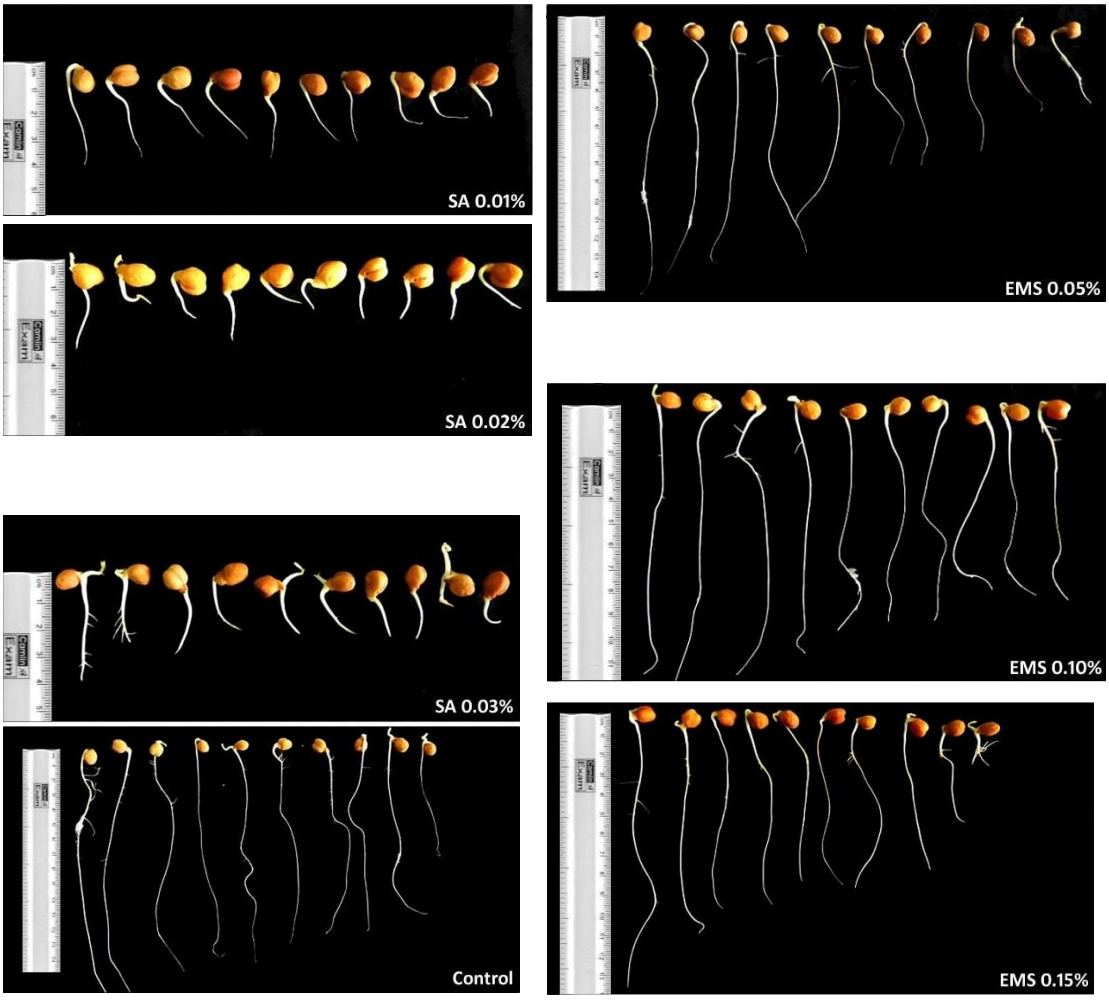

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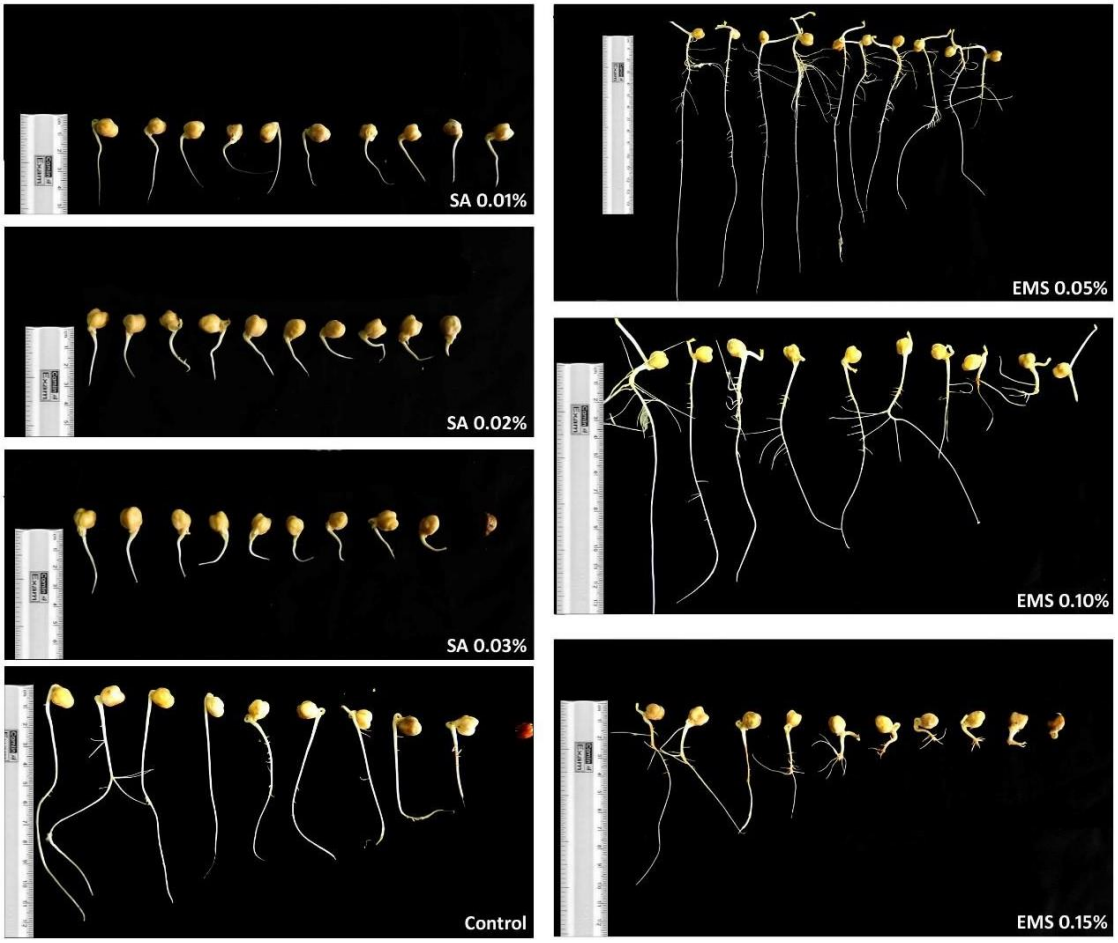
PLATE - 2

SEED GERMINATION

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



The morphological changes and variation shows that more the roots are strong more will be the chances of mechanical support to plant. The observation shows that the root filaments and their lengths

inallthethreeconcentrationsofSAi.e.,0.01%,0.02%and0.03%areweakascomparedtocontroland EMS. The absence of secondary filaments which are important for secondary root growth might be weaker in giving mechanical support to the plants in laterstage.

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