International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2013): 6.14 | Impact Factor (2015): 6.391

Induced Physical and Chemical Mutagensis on Seed Germination of Chickpea *(Cicer arietinum L.)*

Manisha G. Nagargoje, Navnath G. Kashid

Dept. of Botany, Vasant Mahavidyalaya Kaij., Tq. Kaij. Dist: Beed 431123

Abstract: ***In the present investigation of Seeds Chickpea (Cicer arientinum L.) Were treated with different doses of gamma radiation (10KR, 20KR, 30KR,) concentration of sodium azide (0.02%, 0.04% &0.06%) and concentration of Ethyl methane sulphonate (0.05%, 0.10%&0.15%) For studying seed germination. The seed germination percentage was decreased with increased in the conc/doses when campared to control. The decrease in seed germination was more prominent with gamma rays than that at of EMS.***

Keywords: seed germination, chickpea, EMS, SA and Gamma rays

1. Introduction

The chickpea belongs to the family leguminoceae containing 9 annuals and 31 pernnial species are distributed worldwide of which *Cicer arieutinum L.* The diplod Chromosome number has been reported 2n=2x=16 in the cultivar and its wild annual relatines one of the most important break through in the history of genetic was the discovery that mutation can be artificially induced in plant Artificially induced mutation by physical and chemical mutagens have greatly advanced the understanding of genetic of higher organism.

Mutation breeding is one of the conventional breeding method in plant breeding It is relvallt With vazious fields like, morphology cytogenetic, biotechnology and Molecular biology etc. Induced Mutation are highly effective in enhancing natural genetic resources and have been used in developing improhed cultivars of cereals, fruits nad other crop. (Lee.et al 2002) These mutation provide benedicial Variation for practical plant breeding purpose Induced mutation is highly instrumental in plant biology to induced genetic variability in a great number of crops.

Chickpea is the third most important food legume crop & India is the largest producer contributing to 65% of worlds chickpea production. Even though India is the largest producer of chickpea it still imports chickpea from other countries.

2. Materials and Methods

The genetically pure seeds of chickpea variety (PG 0408 & BDNG - 797) Received from Mahatma phule Agriculture university, Rahauri (Ahamadnagar) & Agriculture research Station Badnapur (Jalna). The seeds dried to reduce moisture content up to 10-12% (1000) Each dose / concentration comprised of 1000 seeds. These seeds were irradiated with 10KR, 20KR & 30KR doses at gamma rays from 60 co source at Department of Biophygics, Government institute of science, Aurangabad (M.s.) a dose Rate of.234.KR/h.

The chemical mutagens namelyethyl methanesulphonate (EMS) and sodium azide (SA) and physical mutagen like Gamma rays wereused in the present study. Ethyl methane sulphonate (EMS) and sodium azide (SA) Solutions of mutagen was prepared. The healthy seeds were presoalced in distilled water for 4 hours of room temperature followed by six hours treatment with Vazious Concentration such as 0.05%0.10%and 0.15% EMS and 0.02%, 0.04%& 0.06%SA Mutagen followed by ten times thoroughly washing of seeds Under running tap water out of 1000 Seeds in each treatment 20 Seeds Were kept in pehi- dishes on glotting paper for counting germination percentage.

The effect of gamma ray, SA and EMS treatment was studied with respect to the germination percentage were analysed in laboratory conditions.

Seed germination (%)

Seed germination percentage was recorded at 10 day after sowing in Petri- dishes for pilot experiment.

$$\text{Seed germination (\%)} = \frac{\text{No. of seeds germinated}}{\text{No. at seeds sown}} \text{ X100}$$

formula to calculate mean

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i$$

formula to estimate sample standard deviation

$$\sigma = \sqrt{\frac{1}{n-1}\sum_{i=1}^{n}(x_i - \bar{x})^2}$$

formula to calculate sample SD variance

$$\sigma^2 = \frac{1}{n-1}\sum_{i=1}^{n}(x_i - \bar{x})^2$$

3. Result and Discussion

In the present investigation, the germination percentage revealed reduction in Gammy ray, EMS and SA treatments in case of variety chickpea variety (PG 0408 & BDNG -

797) Received from Mahatma phule Agriculture University, Rahauri (Ahamadnagar) & Agriculture research Station Badnapur (Jalna). This showed distinct varietals variation in regard to the mutagenic sensitivity. Generally, gradual reduction in germination percentage observed from lower to higher dosage of gamma ray treatments. 10KR treated seeds showed the highest germination percentage was observed in lower dosage and lowest germination was observed in higher doses30KR (Bharathi et al, 2013).The dosage of gamma rays increased and it was also reported in Ashwagandha by (Mohsina et al., 2007b).

Several researchers have reviewed the effects of alkylating agents and their mechanism of action in biological systems. They include Ross (1962), Loveless (1966), Fishbein et al. (1970), Lawley (1973 and 1974). The decrease in germination percentage has been ascribed mainly to the lethality generated in the seeds due to physiological injuries, chromosomal aberrations and the effect of hydrolytic products of the mutagen.

Aman (1968) explained that the endogenous growth regulators play an important role in seed germination and there exists a striking balance between the promoters and the inhibitors. Attributed the reduction in germination to the disturbance of this balance. Brock (1965) and Larik (1975) have pinpointed that the mutagen induced gross chromosomal breakages may be affecting the germination percentage. According to Gaul (1964) the pertinent effect is produced mainly through physiological damage.

The seed germination in control was PG0408 (95%) 2.BDNG-797(95%45%) It was decreased with an increase in the dose at gamma ray, EMS and SA. The germination was recorded maximum PG 0408 (85%) in dose 10 KR, (85%) in dose 0.05% EMS Concentration, (90)in dose 0.2% SA. In BDNG 797 (80%) in dose 10 KR, (95%) in dose 0.05 EMS Conc., (90%) in dose 0.02 SA Concentration and the minimum in PG 0408 Variety Gamma ray 30 KR (65%), EMS 0.15 % (65%) and SA 0.06 (60%) & BDNG 797 Variety Gamma ray 30 KR (65%), EMS 0.15% (90%) & SA 0.06 (80%).The reduction in the germination percentage induced by EMS Treatment was less as Compared to that in the Gamma rays. In gamma rays treatment induced the maximu inhibition in Seed germination with the corresponding increase in its doses. After the mutagenic could be distinctly seen in chickpea mutagenic treatments revealed a gradual decreasing trend in germination from lower to higher doses (sunli.et.al-2011) The result suppcrted by the work done by (Dhulgande at al (2015) Datir et al. (2007) in horsegram, Potdukhe and Narkhede (2002) in pigeon pea reduction stimulation in seed germination might have been due to the effect at mutagens on metistematic tissue of the seed. The dectease in seed germination at ligher doses / conc. Of the mitagens may attribayted to disturbances at cellular level (caused either at physiological (0r) physical leavel) same result reported kumar and mishra (2004)and reportd in okra. Reduced germinaton percentage with increasing doses of gamma ray diation has also been reported in Rye (Akgun and Tosum, 2004) and Chickpea (Khan et al., 2005 and Toker et al., 2005).

Table 1: Effect of mutagen on seed germination in chickpea. *(Cicer arientinum L.)* **Variety BDNG-797**

Sr no.	Treatment	Conc/Dose	Total no of Germinated in petri plates	Germination percentage	S.D	Variation	SE
1	Control	-	20	95.45%	-	-	-
2	Gamma rays	10KR	20	80	1.52	2.33	1.08
		20KR	20	70			
		30KR	20	65			
3	EMS.	0.05	20	95	0.57	0.33	0.40
		0.10	20	90			
		0.15	20	90			
4	S.A.	0.02%	20	90	1.00	1.00	0.70
		0.04%	20	85			
		0.06%	20	80			

Table 2: Effect of mutagen on seed germination in chickpea. *(Cicer arientinum L.)* **Variety PG0408**

Sr no.	Treatment	Conc/Dose	Total no of Germinated in petri plates	Germination percentage	S.D	Variation	SE
1	Control	-	20	95.%			
2	Gamma rays	10KR	20	85%	2.00	4.00	1.41
		20KR	20	75%			
		30KR	20	65%			
3	EMS.	0.05	20	85%	1.52	2.33	1.080
		0.10	20	80%			
		0.15	20	65%			
4	S.A.	0.02%	20	90%	2.51	6.33	1.77
		0.04%	20	75%			
		0.06%	20	60%			

4. Conclusion

The percentage of seed germination was inhibited with an increasing dose/conc of mutagen. The germination percentage was highly reduced with the increasing dose/conc. at mutagens.

References

[1] **Akgun, I., Tosum, M., 2004.** Agricultural and cytological characteristics of M1 perennial rye (Secale montanum Guss.) as effected by the application of different doses of gamma rays. Pak. J. Biol. Sci.7(5), 827-833.
[2] **Aman R. D. (1968)**: A Model of seed dormancy. *Bot Rev*., 34: 1-31.
[3] **Bharathi T., Gnanamurthy, S., D. Dhanavel, S. Murugan and M. Ariraman(2013):** Induced Physical mutagenesis on seed germination, lethal dosage and morphological mutants of Ashwagandha (Withania somnifera (L.) Dunal) International Journal of Advanced Research (2013), Volume 1, Issue 5, 136-141
[4] **Brock R.D. (1965a)**: Induced mutation affecting quantitative characters. In: "The use of Induced
[5] **Datir, S.S., Dhumal, KN., Pandey, R.N., 2007**.Gamma radiation and EMS induced variati on in seed germination and plant survival in horsegram (Macrotyloma uniflorum (Lam.) Verdc). J. Arid Legumes4(1), 15-17.
[6] **ishbein L., Flamm W. G. and Falk H. L. (1970)**: Chemical mutagenesis. Academic Press New York.
[7] **Gaul H. (1964)**: Mutations in plant breeding for forage and grain. *Rad. Bot*. 4(3): 151-232.
[8] **Khan M.R., Qureshi, A.S., Syed, A.H., Ibrahim, M., 2005**. Genetic variability induced by gamma irradiatioand its modulion with gibberellic acid in M2 Generation of chickpea (Cicer arietinum L.). Pak. J. Bot.37(2), 285-292.
[9] **Kumar, A., Mishra, M.N., 2004**. Effect of gamma-rays, EMS and NMU on germination, seedling vigour, pollen viability and plant survival in M1and M2 generation of Okra (Abelmoschus esculentus (L.) Moench). Adv. Plant Sci.17(1), 295-297.
[10] **Lee, Y.I., Lee, I.S., Lim, Y.P., 2002.** Variation in seed potato regenerates from gamma-rays irradiated embryogeniccallus. J. Plant Biotech. 4, 163-170.
[11] **Larik, A. S. (1975)**: Induced polygenic mutations in wheat (*Triticum aestivum* L.). *Genetica Polonica* 16:153-160.
[12] **Lawley, P. D. (1973)**: Reaction of NMU with 32 p-labeled DNA, evidence for formation of phosphotriesters. *Chem. Biol. Interaction,* 7:127-130.
[13] **Lawley, P. D. (1974)**: Some chemical aspects of dose response relationship in alkylating mutagenesis. *Mut. Res*., 23: 283-295.
[14] **Loveless A. (1966)**: Genetic and allied effects of alkylating agents. Butterworths, London: 270.
[15] **Potdukhe, N.R., Narkhede, M.N., 2002**. Induced mutation in pigeonpea (Cajanus cajan(L.) Millsp.). J. Nucl. Agric. Biol. 31(1), 41-46.
[16] **Mohsina Iqbal, M., Datta, A. K., 2005**, The effect of gamma rays and EMS on meiotic chromosome behavior of Withania somnifera(L) Dun. Journal of phytological Research. 18: 183-185.
[17] **Ross W. C. J. (1962)**: Biological alkylating agents;. Butterworths, London
[18] **Sunil, M., Sangle Swapnil, E., Mahamune Sopon, N., Kharat Kothekar, VS., 2011**. Effect of mutagenisis on germination and pollen sterility in pigeonpea. Biosci. Discov. l02(1), 127-130.
[19] **Toker C., Uzen, B., Canci, H., Ceylan, F.O., 2005**. Effects of gamma irradiation on the shoot length of Cicer seeds. Rad. Phys. Chem.73, 365-367.