Int.J.Curr.Microbiol.App.Sci (2018) *7*(6): 3586-3593

International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 7 Number 06 (2018)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2018.706.422

Effect of Sodium Azide Induction on Germination Percentage and Morphological Growth in Two Varieties of Okra

Amol D. Sable*, Asmita D. Sable, Sweety P. Shegokar, Nileema S. Gore and Sanjay Harke

MGM's Institute of Bioscience and Technology N-6 Cidco, Aurangabad, (M.S.) - 431001, India

**Corresponding author*

Keywords

Sodium azide, Germination, Morphological, Okra

Article Info

Accepted:
25 May 2018
Available Online:
10 June 2018

A B S T R A C T

The present investigation entitled, "Effect of Sodium azide induction of two varieties of okra (*Abelmoschus esculentus* L.)" was carried out at the MGM's Institute of Bioscience and Technology, Aurangabad. The aim of study is to see the effect of sodium azide induction of two varieties of okra, Parbhani kranti and Arka Anamika with an objectives to study the effect of SA on germination percentage (%) of different varieties of okra at different concentration of Sodium azide (SA) andto study the morphological variation between different varieties of okra at different concentration of Sodium azide (SA).It was observed that the incresing dose of sodium azide was showed adverse effect on germination percentage (%) as well as morphological characters of two different varieties of okra.The application of sodium azide at T_1 (0.04% of sodium azide) showed similar results in growth parameters such as number of leaves (4.77) , plant height (4.42 cm) , fresh weight (2.43 gm) and dry weight (0.96 gm) in the variety Parbhani Kranti as compared with the contol (5.50 , 9.16 cm ,3.66 gm and 1.03 gm respectively) in the pot culture.Similarly, the application of Sodium azide at T_1 (0.04% sodium azide) showed similar results in growth parameters such as number of leaves (3.76) , fresh weight (1.66 gm) and dry weight (0.46 gm) in the variety Arka Anamika as compared with the control (6.66, 2.11 gm and 0.70 gm respectively) in the pot culture.

Introduction

The genus of okra is *Abelmoschus*, belongs to family Malvaceae, is represented by 12 species (Bentham and Hooker, 1867) in which the most common vegetable crop, okra (*Abelmoschus esculentus (L.) Moench*) is included. Okra is an economically important vegetable crop grown in tropical and sub-tropical regions of the world. It is suitable for cultivation on a large commercial farm. It is grown commercially in many countries such as India, Turkey, Iran, Bangladesh, Brazil, Pakistan, Ghana, Ethopia and Southern united states etc. (Baghery *et al.*, 2016). Okra is the sixth important popular vegetable crop, and widely grown under varying climatic conditions in almost all parts of India throughout the year except in the mountainous region.

It is estimated that world okra production is about 5 to 6 million tonnes per year. India is the largest producer of okra covering an area of 3.8 lakh hectares with an annual production of 36.84 lakh tones (Elangovan and Pavadai, 2015). In India the most okra producing states are west bangal covering an area of 75 lakh hectares with an annual production of 877.00 (MT) and in Maharashtra okra production was 241.50 (MT) within 23 lakh hectares (NHB, 2014).

Induced mutation has been established as an important tool for improvement of certain traits in the existing germplasm. Mutation breeding has been widely used for the improvement of plant characters in various crops. It is a powerful and effective tool in the hands of plant breeders especially for autogamous crops having narrow genetic base (Micke, 1988). In any mutation breeding program, selection of an effective and efficient mutagen is very essential to produce high frequency of desirable mutation. Many chemical mutagens have been employed for obtaining useful mutants in various crop species (Singh and Singh, 2001). The role of mutation breeding increases the genetic variability for the desired traits in various crop plants (Tah, 2006; Adamu and Aliyu, 2007; Khan and Goyal, 2009; Kozgar *et al.*, 2011; Mostafa, 2011). Variability is a pre-requisite for any breeding program to evolve high yielding varieties with other desirable attributes. In such a situation, induced mutations can be used to generate useful variation in quantitatively inherited characters (Baghery and kazemitabar, 2014).

Induce mutation using physical and chemical mutagen is an method to create genetic variation resulting in new varieties with better characteristics Sodium azide (NaN_3) is a chemical mutagen and which considers as one of the most powerful mutagens in plants. Its application on plant is easy and inexpensive and creates mutation to improve their traits. The efficiency of mutant production depends on many conditions such as pH, soaking into water, temperature, concentration of azide and treatment duration. It creates point adverse conditions (AL-Qurainy and khan, 2009). Hence the present investigation on "Effect of Sodium azide induction on two varieties of okra" is proposed with the following objectives, 1. To study the germination percentage (%) of different varieties of okra at different concentration of Sodium azide (SA). 2. To study the morphological variation between different varieties of okra at different concentration of Sodium azide (SA).

Materials and Methods

The present investigation entitled, "Effect of Sodium azide induction of two varieties of okra (*Abelmoschus esculentus* L.)" was carried out at the MGM's Institute of Bioscience and Technology, Aurangabad. The aim of study is to see the effect of sodium azide induction of two varieties of okra. The detailed information on the experimental technique adopted during the study period was presented in this chapter.

A pot experiment was conducted at MGM's Institute of Bioscience and Technology, Aurangabad.

To study the performance of sodium azide in mutation induction on 2 different varieties of okra as the detailed below, the experiment was laid out in RBD with 3 replication other detailed of field experiment are given in table 1.

Treatment details

Treatment details of different concentration of sodium azide (SA) given two different varieties of okra (Parbhani Kranti and Arka Anamika).

The details of the treatment are given in table 2.

Germination

Healthy and dry seeds of the varieties Parbhani Kranti and Arka anamika of okra was selected which are having uniform size. The seeds presoaked in the different concentration of Sodium azide used for chemical mutagenic treatments were (00 %, 0.04 %, 0.08 %, 0.12 %, 0.16 %, 0.20 % and 0.24 %) for 18 hours (Warghat *et al*, 2011). The seeds were thoroughly washed in the running tap water for 4 hours. Based on the Sodium azide mutagenesis, 9 seeds of each treatments (3 seeds per cup tray) were evaluated for germination besides untreated control. The total number of seeds that emerged per cup tray was recorded 15 days after planting and the percentage calculated using the formula.

$$\text{Germination Percentage}(\%) = \frac{\text{Number of Germinated Seeds}}{\text{Total Number of Seeds}} \times 100$$

Plant growth characters

Three pot of each replication from each pot were selected for recording biometric observations. The biometric observations *viz*., number of leaves, plant height, Root length, fresh weight, dry weight. Morphological characters were studied by using 3 selected plants of each replication was counted and recorded.

Results and Discussion

Okra (*Abelmoschus esculentus* L.) is the only vegetable crop of significance in the Malvaceae family and is common in tropical and subtropical regions of the world. Mutation induction has been accepted as a useful tool in plant breeding programs to provide maximum variability. Present topic emphasis is to study effect of differential treatment concentration of single mutagens on two okra cultivar Parbhani Kranti and Arka Anamika. After treatment with single mutagen at various concentration seeds were sown and different observations were recorded at harvesting.

Effect of SA on germination percentage of okra

All the five treatment of sodium azide had best an effect on germination percentage when compared with control treatment. In variety Parbhani Kranti, the highest germination (88.66 %) was showed by the treatment T_0 (0.00% of sodium azide) and the lowest germination (0.00% of sodium azide) was recorded by treatment T_6 (0.24 % of sodium azide) (Table 3, Fig.1).

In variety Arka Anamika, the maximum germination (77.66%) was showed by the treatment T_0 (0.00% of sodium azide) and the lowest germination (0.00%) was observed by treatment T_6 (0.24% of sodium azide) (Table 3, Fig.1).

Effect of sodium azide on morphological growth of okra

Number of leaves of okra

In the present investigation, the maximum number of leaves (5.50) in Parbhani Kranti and (6.66) in Arka Anamika was recorded in control treatment (0.00 % of Sodium azide) of both the varieties followed to (4.77) in Parbhani Kranti and (3.76) in Arka Anamika was observed at treatment T_1 (0.04% of Sodium azide).

Similarly, Adamu and Aliyu (2007) reported that, the three varieties of tomato (T106, T244 and T420) exposed to sodium azide at various concentrations (00mM, 1mM, 2mM and 4mM). They found that, the maximum number of leaves (11.00) obtained at the concentration of (00mM) and the lower number of leaves

(3.00) showed at the concentration of sodium azide at (4mM). It resulted the number of leaves decrease with the increasing concentration of sodium azide.

Effect of sodium azide on plant height of okra

In the present study, the highest plant height of okra plant without treatment (0.00% of sodium azide) was about (9.16 cm) in Parbhani Kranti followed to treatment T_1 (0.04% of sodium azide) recorded (4.42 cm) and the treatment T_0 (0.00% of sodium azide) showed the maximum plant height (10.33 cm) in Arka Anamika.

In the support of current study of odeje *et al.*, (2016) reported the seeds of three varieties of guinea corn (samsorg 4, samsorg 40 and samsorg 41) were treated with the combination of gamma rays (20,30,40,100 Krad) and two doses of sodium azide (3mM and 4mM). They observed that, there was generally inverse relationship between mutagens and the varieties. The highest plant height (120.7 cm) was recorded by the first treatment of sodium azide (3mM) without gamma rays and lowest plant height (55.0 cm) was showed by the last treatment of sodium azide and gamma rays (4mM and 30Krad).

Effect of sodium azide on root length of okra

In the present investigation, the highest root length (6.66 cm) in Parbhani Kranti and (7.33 cm) in Arka Anamika was recorded in control treatment (0.00 % sodium azide) of both the varieties and lowest root length (00) was showed in both of the varieties of okra at treatment T_6 (0.24%). The increasing concentration of SA tends to decreasing root length.

Table.1 Experimental details

1. Crop	**Okra *(Abelmoschus esculentus L.)***
2. Varieties	Prabhani Kranti and Arka Anamika
3. Season	Rabi
4. Sowing time	December-March
5. Transplant of seedling	7/01/2017
6. Statistical design	RBD (Randomized Block Design)
7. No. of treatment	7
8. No. of replication	3
9. Location	MGM's IBT, Aurangabad

Table.2 Treatment details

Treatment	Sodium azide (Conc. in %)
T_0	Control
T_1	0.04%
T_2	0.08%
T_3	0.12%
T_4	0.16%
T_5	0.20%
T_6	0.24%

Table.3 Effect of Sodium azide application on germination percentage (%) of different varieties of okra

Treatments	Parbhani Kranti (%)	Arka anamika (%)
T_0 (0.00 %)	88.66	77.66
T_1 (0.04 %)	77.33	66.33
T_2 (0.08 %)	44.00	33.00
T_3 (0.12 %)	33.00	33.00
T_4 (0.16 %)	22.00	33.00
T_5 (0.20 %)	22.00	22.00
T_6 (0.24 %)	No germination	No germination

Table.4 Effect of Sodium azide application on number of leaves of different varieties of okra

Treatments	Parbhani Kranti	Arka anamika
T_0 (0.00 %)	5.50	6.66
T_1 (0.04 %)	4.77	3.76
T_2 (0.08 %)	2.33	3.00
T_3 (0.12 %)	2.33	2.33
T_4 (0.16 %)	2.00	2.16
T_5 (0.20 %)	2.00	2.00
T_6 (0.24 %)	0.00	0.00
SE ±	0.96	0.96
CD	2.94	3.00

Fig.1 Effect of Sodium azide application on germination percentage (%) of different varieties of okra

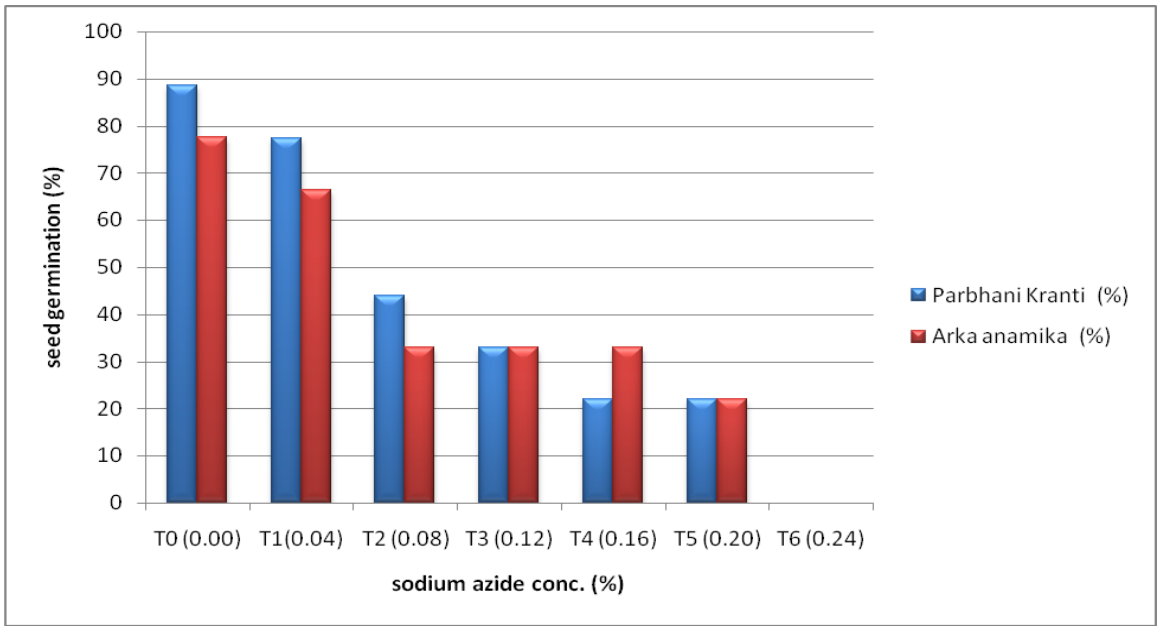
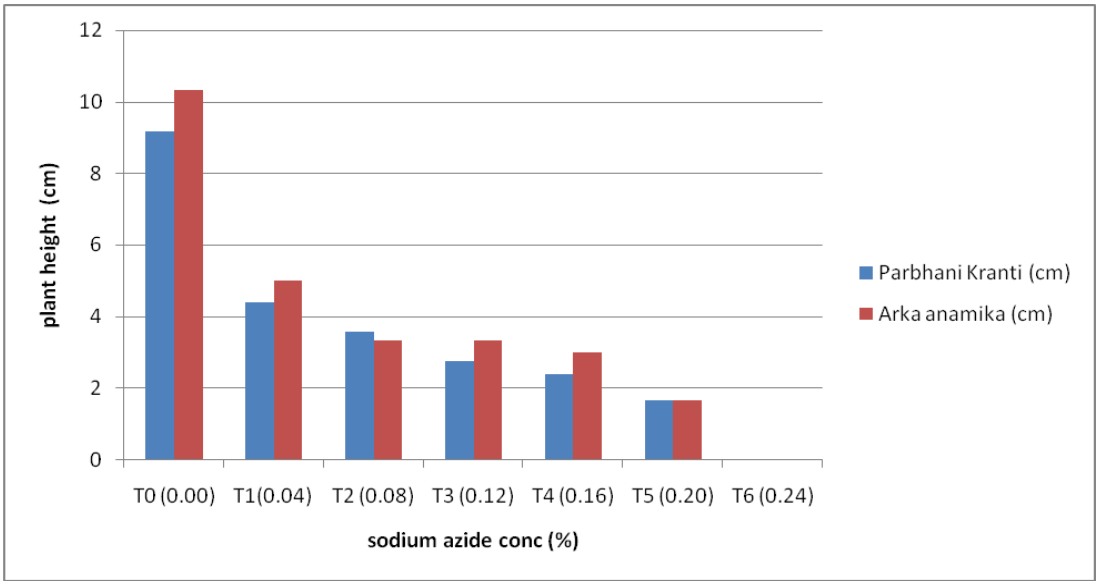


Fig.2 Effect of Sodium azide application on plant height of different varieties of okra



The result are agreement with the finding of srivastava *et al.*, (2011) suggested that root length of the treated seeds was recorded at 7,10 and 14th DAS at different concentration of sodium azide (0.00%, 0.02%, 0.04% and 0.06%). They observed that, highest root length was recorded (7.53 cm) at 0.00% and the lowest root length showed (5.93 cm) at 0.06% of sodium azide.

Effect of sodium azide on fresh weight of okra

In the present study, the highest fresh weight of okra plant in control treatment T_0 (0.00% of sodium azide) was about (3.66 gm) in Parbhani Kranti and (2.11 gm) in Arka Anamika followed to (2.43 gm) in Parbhani Kranti and (1.66 gm) in Arka Anamika was observed at treatment T_1 (0.04% of Sodium azide).

Similar results reported by Gnanamurthy *et al.*, (2012) studied that, maize variety JKMH-1001 was treated with different conc. of chemical mutagen namely, EMS at (40mM, 50mM and 60mM), DES (30mM, 40mM and 50mM) and SA (30mM, 40mM and 50mM). They obtained that, the highest fresh weight (523.77) was reported in first treatment of SA (30mM) and the lowest fresh wt (388.45) was recorded in last treatment of SA (50 mM).

Effect of Sodium azide on dry weight of okra

In the present investigation, the highest dry weight of okra plant in control treatment T_0 (0.00% of sodium azide) was about (1.03 gm) in Parbhani Kranti and (0.70 gm) in Arka Anamika followed to (0.96 gm) in Parbhani Kranti and (0.46 gm) in Arka Anamika was observed at treatment T_1 (0.04% of sodium azide).

Similar results reported by Gnanamurthy *et al.*, (2012) studied that, maize variety JKMH-1001 was treated with different conc. of chemical mutagen namely, EMS at (40mM, 50mM and 60mM), DES (30Mm, 40mM and 50mM) and SA (30Mm, 40mM and 50mM). They obtained that, the first treatment of SA (30mM) showed highest dry weight (130.08) and the last treatment of sodium azide (50 mM) recorded lowest dry weight (99.83).

In conclusion, the application of sodium azide at T_1 (0.04% of sodium azide) showed similar results in growth parameters such as number of leaves (4.77), plant height (4.42 cm), fresh weight (2.43 gm) and dry weight (0.96 gm) in the variety Parbhani Kranti as compared with the contol (5.50, 9.16 cm, 3.66 gm and 1.03 gm respectively) in the pot culture.

Similarly, the application of Sodium azide at T_1 (0.04% sodium azide) showed similar results in growth parameters such as number of leaves (3.76), fresh weight (1.66 gm) and dry weight (0.46 gm) in the variety Arka Anamika as compared with the control (6.66, 2.11 gm and 0.70 gm respectively) in the pot culture.

Thus, it is concluded that sodium azide at (0.04% of sodium azide) low concentration appear to be the better effective treatment for inducing variality in okra varieties such as Parbhani Kranti and Arka Anamika as compare with other concentrations of sodium azide (0.08 % to 0.24 %).

References

Adamu AK, Aliyu H. Morphological effects of Sodium azide on tomato *(Lycopersicon esculentum Mill.)* Sci. World J, 2007; 2(4): 9-12.

Al- Qurainy F. Effect of Sodium azide on growth and yield traits of *Eruca sativa* (L.) World Appl Sci. J, 2009; 7:220-226.

Anwar F, Rashid U, Ashraf M, Nadeem M. Okra *(Hibiscus esculentus)* seed oil for biodiesel production. Appl Energy, 2009; 87(3), 779–785.

Ali A, Yubey K, Deka KR, Tomar SMS. Effect of sodium azide on seed germination and related Agro-material traits in M_1 Lentil (*Lens culinaris* medik) Generation world.J.of Agri. Sci, 2014; 10(3):95-102.

Anonymous, Director of horticulture/agriculture of respective state, NHB.2014. http:// www.National Horticulture Board, India.

Bentham G, Hooker JD. Genera Plantarum, Vol. I, L. Reeve & Co., London, 1867.

Baghery MA, Kazemitabar SK. Effect of EMS induction on some morphological traits of okra (*Abelmoschus esculentus L.*). Int. J. of Bioscience, 2014; 5(9): 340-345.

Baghery MA, Kazemitabar SK, Renari RE.Effect of EMS on germination and survival of okra (*Abelmoschus esculentus L.*). Bih.Bio, 2016; 10(1):33-36

Elangovan R, Pavadai P. Studies on induced chemical mutagenesis in bhendi (*Abelmoschus esculentus* (L.) Moench). Int. J. of Modern Bio & Med, 2015; 6(1): 30-37.

Gnanamurthy S, Dhanavel D, Girija M, Pavadai P, Bharathi T. Effect of chemical mutagenesis on fquantitative traits of maize (*zea mays* L.) Int.J.of Res.in Bot, 2012;2(4):34-36

Jagajanantham N, Dhanavel D, Gnanamurthy S, Pavadai P. Induced on chemical mutagens in Bhendi, *Abelmoschus esculentus l. moench*., Int. J. Curr. Sci, 2013; 5:133-137.

Khan S, Goyal S. Improvement of mung bean varieties through induced mutations. Afr. J. Plant Sci, 2009; 3: 174-180.

Kozgar MI, Goyal S, Khan S. EMS induced mutational variability in *Vigna radiata* and *Vigna mungo*. Res. J. Bot, 2011; 6: 31-37.

Kashid NG, Kulthe MP. Effect of physical and chemical mutagens on pod length in okra *(Abelmoschus esculentus* l. moench). Science research report, 2014; 4(2): 151-154.

Micke A. Genetic improvement of grain legumes using induced mutations: An

overview. In: Improvement of Grain Legume Production Using Induced Mutations. IAEA, Vienna, 1988; 1-51.

Mays DA, Buchanan W, Bradford BN, Giodano PM. Fuel production of several agricultural crops. In: Janick J, Simon JE, ed. Advances in New Crops. Portland, US: Timber Press, 1990; 260-263

Mostafa GG. Effect of Sodium azide on the growth and variability induction in *Helianthus annuus L*. Int. J. Plant Breed. Genet, 2011; 5: 76-85.

Maryam AH, Kasimu AA. Effect of combined doses of gamma ray and Sodium azide (mutagenic agents) on the morphological traits of some varieties of okra (*Abelmoschus esculentus)* . Afr. J. of Agri Res, 2016; 11(32): 2968-2973.

Odeje SC, Adamu AK, Muhammad H. Combined effects of gamma rays and Sodium azide on yield components of selected varieties of guinea corn (*sorghum Bicolor* L). IOSR. J. of Agri. Veterinary sci, 2016; 9(5):15-20.

Singh J, Singh S. Induced mutations in basmati rice (*Oryza sativa* L.). Diamond Jub. Symp., New Delhi, 2001; 212.

Srivastava P, Marker S, Pandey P, Tiwari DK. Utagenic effects of Sodium azide on the growth and yield characteristics in Wheat (*Triticum aestivum L.*) . Asian J. of plant sci.2011;10(3):190-201.

Tah PR. Induced macromutation in mungbean *(Vigna radiata (L.)Wilczek)*. Int. J. Bot, 2006; 2: 219-228.

Verma A, Singh MK, Kumar B. Phytochemical evaluation and characterization of hypoglycemic activity fo various extracts of *Abelmoschus esculentus* Linn. Fruit inte. Jor. Pharma. And Pharmaceu. Sci, 2011; 3(4): 60-65.

Warghat AR, Rampure NH, Wagh P. Effect of Sodium azide and gamma rays treatments on percentage germination, survival, morphological, variation and chlorophyll mutation in musk okra (*Abelmoschus esculentus L.*). Int. J. Pharmacy and Pharma Sci, 2011; 0975-1491.

How to cite this article:

Amol D. Sable, Asmita D. Sable, Sweety P. Shegokar, Nileema S. Gore, Sanjay Harke. 2018. Effect of Sodium Azide Induction on Germination Percentage and Morphological Growth in Two Varieties of Okra. *Int.J.Curr.Microbiol.App.Sci.* 7(06): 3586-3593.
doi: https://doi.org/10.20546/ijcmas.2018.706.422