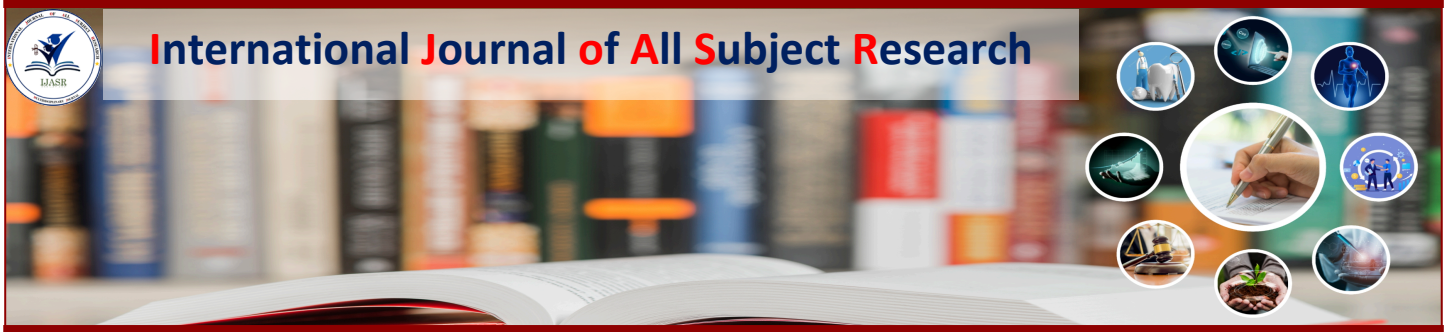
Impact Factor (SJIF): 5.158 **E-ISSN: 2583-7206**

International Journal of All Subject Research



Received: 19/December/2023 **IJASR:** 2024; 3(1):10-13 **Accepted:** 28/January/2024

Effect of Azospirillum Inoculation on Varied Okra Varieties

[*1]Mumtaz Husain and [2]Manoj Kumar

[*1]Department of Botany, Swami Shukdevanand College, M.J.P. Rohilkhand University, Shahjahanpur, Uttar Pradesh, India.

Abstract

The impact of Azospirillum on seed germination and seedling growth of four okra varieties was studied such as Arka Anamika, Versha Uphar, Selection-151, and Parbati Kranti. Seeds treated with Azospirillum bacterial cultures and placed on agar petri dish for Germination at 24, 48, and 72 hours. Seedling growth was assessed by measuring shoot And root length, as well as Newly fresh and dry weights at 5, 10, and 15 days after sowing. A Control group without treatment was also maintained. Significant increases in seed Germination were observed across all varieties with Azospirillum treatment compared to the control. Selection-151 exhibited 100% germination after 72 hours and showed the highest values for shoot and root length, as well as fresh and dry weights. Conversely, Versha Uphar performed poorly in all growth parameters with Azospirillum treatment. Thus, Inoculating seeds with Azospirillum proved advantageous for both germination percentage and seedling establishment due to promoting robust growth.

Keywords: Azospirillum, okra, seed germination, seedling growth

Introduction

Okra (*Abelmoschus esculentus*) is one of the most popular vegetable crops of the world belonging to the family Malvaceae. It is widely grown in all types of climate prevailing in our country. It is extremely important in our daily diet due to the presence of high proteins, vitamins, minerals and fibres (Rhem and Espig. 1976) [4]. Okra can be grown on a wide range of soils, provided the internal soil drainage is good. Soils high in organic matter are preferred with pH 6.00 to 6.5 (Anonymous, 2008) [1]. Therefore, okra is cultivated in each and every part of the country in all seasons.

Azospirillum is a non-symbiotic free living aerobic bacteria possessing high respiratory rate which can fix nitrogen up to 25 kg/ha under optimum conditions increasing yield up to 50%. It is a gram-negative bacterium, polymorphic i. e, it is of different sizes ranging from 2-10 x 1-2.5 µm. Azospirillum improves seed germination and plant growth by producing various growth hormones and vitamins including B-vitamins, naphthalene acetic acid, gibberellic acid as well as certain other chemicals which are inhibitory to certain root pathogens (Jain, 1998) [2]. Its culture has been used in wheat, maize, vegetables, sunflower, mustard and sorghum though their response depends upon the amount of organic matter available in the. Soil.

Keeping in view the above-mentioned importance of Azospirillum, the present study was made to assess its effect on rate of seed germination and seedling growth of four cultivars of okra.

Materials and Methods

The present investigation was carried out at Swami Shukdevanand College, Shahjahanpur, U.P. during summer season of 2024. The experiment was laid out in a factorial randomized design with three replicates along with a control (without inoculation) in Petriplates. The effect of Azospirillum was observed on seed germination and seedling growth of okra. Genuine seeds of four varieties of okra viz., Arka Anamika, Varsha Uphar, Selection-151 and Parbhani Kranti were inoculated with bacterial culture @ 100 g/l on solidified 0.8% agar in Petriplates to test their germination percentage at 24, 48 and 72 h duration after sowing. The seedling growth was 398 Husain, Ahmad, Masood and Saad Measured in terms of shoot and root length, fresh as well as dry weight of shoot and root taken after 5, 10 and 15 days after sowing (DAS)

Results and Discussion

The varieties at all the growth stages. Moreover, germination percentage improved in all the varieties as the soaking period increased from 24 to 72 h. The variety V, showed 100% germination at 72 h. On the contrary, the variety V, gave the poorest performance at all the growth stages. The increase in per cent germination was 35.00, 10.00, 68.00 and 20.83% in V_{v} V_{2} V_{3} and V_{4} respectively, as compared to control at 24 h stage; 14.29, 26.09, 15.71 and 9.09% in v_{1} V, V_{3} and V respectively, at 48 h after soaking stage and 12.68, 4.69, 19.05 and 20.51% in V_{1} V_{x} v_{1} and v_{*}, respectively, at 72 h after soaking stage.

***Corresponding Author:** Mumtaz Husain

It Is evident from Table 1 that there was a significant effect of Azospirillum on per cent seed germination at 24, 48 and 72 h after sowing for the varieties Arka Anamika (V_{1}) Versha Uphar (V,). Selection-151 (V) and Parbhani Kranti (V_{*}). The variety V_{3} showed the best and significant germination as compared to rest of Table 1. Effect of Azospirillum on per cent seed germination of four varieties of okra at three growth stages. When seedling growth was analyzed on the basis of parameters like shoot length, root length, fresh weight of shoot, fresh weight of root, dry weight of shoot and root, the variety v_{1} proved significantly better as compared to rest of the varieties at all the growth stages (Tables 2-7). The increase in seedling shoot length was 39.86, 39.47, 27.83 and 31.50% as compared to control in V, V_{2j} V_{3} and V_{+1} respectively, at 5 DAS; the increase seedling root length was 35.29, 31.65, 33.63 and 41.32%; the increase in fresh weight of shoot was 19.86, 7.97, 18.44 and 17.40%; increase in fresh weight of root was 24.89, 19.61, 23.30 and 21.84% and increase in dry weight of shoot was 18.88, 7.08, 16.66 and 16.66% and dry weight of root was 27.27, 17.59, 16.98 and 20.00% as compared to control in V, V, V, and V respectively, at 5 DAS stage. The similar trend was found at 10 and 15 DAS stages. At 10 DAS, the increase in length of shoot was 20.63, 26.55, 16.90 and 18.87%; increase in length of root was 48.49, 27.51, 35.76 and 27.05%; increase in fresh weight of shoot was 21.04, 7.89, 27.20 and 21.83%; increase in fresh weight of root was 18.89, 9.39, 41.53 and 20.79%; increase in dry weight of shoot was 8.50, 7.25, 17.34 and 12.74% and increase in dry weight of root was 17.22, 15.96, 21.47 and 15.38% as compared to control in V_{v} V., V, and V_{*}, respectively, at 10 DAS stage. Similarly, increase in length of shoot was 6.30, 15.45, 7.85 and 13.74%; increase in length of root was 18.36, 32.45, 14.15 and 17.49%, increase in fresh weight of shoot was 35.82, 14.84, 28.06 and 20.36%; increase in fresh weight of root was 55.87, 42.99, 86.52 and 52.62%; increase in dry weight of shoot was 34.29, 13.95, 18.05 and 17.25% and increase in dry weight of root was 46.00, 53.11, 68.60 and 41.02% as compared to control in v_{v} r_{1},v_{2},v_{3} and respectively, at 15 DAS stage. V_{4}

The results indicated that the variety v_{x} (Selection-151) surpassed rest of the varieties (V_{1},V_{2}) and V_{4}) in terms of per cent seed germination with the inoculation of Azospirillum. In a similar study, Paul *et al*. (2002) [3] found that seed inoculation with Azospirillum improved germination percentage as well as seedling weight significantly in onion. Evidences of favourable effects of Azospirillum inoculation in providing plant nutrients to Response of okra to Azospirillum inoculation each value is mean of three replications.

Table 1: Effect of *AZOSPIRILLUM* ON percent seed germination of four varieties of Okra at three growth stages

Name of Varieties	24 hours		48 hours		72 hours	
	Control	Treatment	Control	Treatment	Control	Treatment
Arka anamika	20.00	27.00	56.00	64.00	71.00	80.00
Versha uphar	20.00	22.00	46.00	58.00	64.00	67.00
Selection 151	25.00	42.00	70.00	81.00	84.00	100.00
Parbhani kranti	24.00	29.00	66.00	72.00	78.00	94.00
Mean	22.25	30.00	59.50	68.75	75.00	84.50

C.D at 5%
C. D. due to Variety = 5.17, 2.76, 5.52
C. D. due to Treatment = 3.55, 1.90, 3.79
N.B. = Each value is a mean of three replicates.

Table 2: Effect of *AZOSPIRILLUM* ON shoot length (cm) of four varieties of Okra at three growth stages

Name of Varieties	5 DAS		10 DAS		15 DAS	
	Control	Treatment	Control	Treatment	Control	Treatment
Arka Anamika	4.43	6.20	9.53	11.50	17.43	18.53
Versha uphar	3.63	5.06	7.53	9.53	15.10	17.43
Selection 151	6.46	8.26	11.63	13.60	18.66	20.13
Parbhani kranti	5.50	7.23	10.60	12.60	17.23	19.60
Mean	5.00	6.69	9.82	11.80	17.10	18.92

C. D. at 5%
C. D. due to Variety = 0.300, 0.337, 0.633
C. D. due to Treatment = 0.300, 0.231, 0.435
N.B. = Each value is a mean of three replicates.

Table 3: Effect of *AZOSPIRILLUM* ON Root Length (cm) of four varieties of Okra at three growth stages

Name of Varieties	5 DAS		10 DAS		15 DAS	
	Control	Treatment	Control	Treatment	Control	Treatment
Arka anamika	2.26	3.06	4.46	6.63	10.53	12.46
Versha uphar	2.00	2.63	3.50	4.53	6.36	8.43
Selection 151	3.46	4.63	6.33	8.60	14.36	16.40
Parbhani kranti	2.50	3.53	5.66	7.20	11.43	13.43
Mean	2.58	3.46	4.99	6.74	10.67	12.68

C.D. at 5%

C. D. due to Variety = 0.250, 0.497, 0.373
C. D. due to Treatment = 0.172, 0.341, 0.256
N.B. = Each value is a mean of three replicates

Table 4: EFFECT of *AZOSPIRILLUM* ON fresh weight of shoot (g) of four varieties of Okra at three growth stages

Name of Varieties	5 DAS		10 DAS		15 DAS	
	Control	Treatment	Control	Treatment	Control	Treatment
Arka anamika	1.10	1.32	1.76	2.14	2.35	3.20
Versha uphar	1.04	1.12	2.00	2.16	2.75	3.15
Selection 151	1.20	1.43	2.12	2.69	2.94	3.76
Parbhani kranti	1.17	1.37	2.00	2.44	2.80	3.37
Mean	1.13	1.33	1.97	2.36	2.71	3.37

C.D. at 5%
C. D. due to Variety = 0.1688, 0.1769, 0.1457
C. D. due to Treatment = 0.1160, 0.1215, 0.1001
N.B. = Each value is a mean of three replicates.

Table 5: Effect of *AZOSPIRILLUM* ON fresh weight of Root (g) of four varieties of Okra at three growth stages

Name of Varieties	5 DAS		10 DAS		15 DAS	
	Control	Treatment	Control	Treatment	Control	Treatment
Arka anamika	0.478	0.597	0.720	0.856	0.870	1.35
Versha uphar	0.418	0.500	0.682	0.746	0.849	1.21
Selection 151	0.502	0.619	0.650	0.920	0.890	1.66
Parbhani kranti	0.499	0.608	0.635	0.767	0.972	1.46
Mean	0.474	0.581	0.672	0.822	0.895	1.42

C.D. at 5%
C. D. due to Variety = 0.0117, 0.053, 0.105
C. D. due to Treatment = 0.008, 0.0364, 0.0722
N.B. = Each value is a mean of three replicates.

Table 6: Effect of *AZOSPIRILLUM* ON dry weight of shoot (g) of four varieties of Okra at three growth stages

Name of Varieties	5 DAS		10 DAS		15 DAS	
	Control	Treatment	Control	Treatment	Control	Treatment
Arka anamika	1.10	1.31	1.75	1.90	2.34	3.14
Versha uphar	1.03	1.10	1.98	2.13	2.73	3.11
selection 151	1.19	1.39	2.11	2.47	2.93	3.45
Parbhani kranti	1.16	1.36	1.99	2.24	2.77	3.24
Mean	1.12	1.29	1.96	2.18	2.69	3.24

C.D. at 5%
C. D. due to Variety = 0.04, 0.064, 0.1105
C. D. due to Treatment = 0.0275, 0.0441, 0.0759
N.B. = Each value is a mean of three replicates.

Table 7: Effect of *AZOSPIRILLUM* ON Dry weight of Root (g) of four varieties of Okra at three growth stages

Name of Varieties	5 DAS		10 DAS		15 DAS	
	Control	Treatment	Control	Treatment	Control	Treatment
Arka Anamika	0.220	0.280	0.360	0.422	0.426	0.622
Versha uphar	0.216	0.254	0.332	0.385	0.418	0.640
selection 151	0.265	0.310	0.382	0.464	0.430	0.725
Parbhani kranti	0.230	0.276	0.377	0.435	0.468	0.660
Mean	0.233	0.280	0.363	0.427	0.436	0.662

C.D. at 5%
C. D. due to Variety = 0.006, 0.009, 0.030
C. D. due to Treatment = 0.004, 0.006, 0.020
N.B. = Each value is a mean of three replicates.

Cereals and vegetables have been provided by many workers. In general, seed treatment with Azospirillum chroococcum had a positive influence on germination in seed of rice and cotton (Wani *et al.*, 1976: Shende *et al.*, 1977) [10, 7]. Shakuntahala (1994) [6] reported the increased germination of seeds in different oil crops on inoculation with A. chroococcum. In another study, effectiveness of seed bacterization with A. chroococcum in enhancing better seed

germination in species of wheat has been reported by Tippanavar *et al*. (2004) [9]. Similar trends of effects of biofertilizers and growth regulators on germination in okra were reported by Subramanian and Kumar (2001) [8] and Sajindranath *et al*. (2002) [5] in Coriander sativum.

Conclusion

In conclusion, the Selection-151 exhibited 100% germination after 72 hours and showed the highest values for shoot and root length, as well as fresh and dry weights. Azospirillum Has been found to positively impact the percentage of seed germination and subsequent Seedling growth in okra varieties. These findings indicate the potential of Azospirillum as a Biofertilizer for okra cultivation, with the ability to improve nutrient uptake, promote plant Growth, and enhance overall crop productivity. Overall, the research suggests that the use Of Azospirillum as a biofertilizer has a significant positive effect on seed germination and Seedling growth of okra. Furthermore, the combination of Azospirillum with other beneficial Bacteria or fungi has the potential to enhance its effectiveness in controlling pathogens and promoting plant health

References

1. Anonymous (2008). Growing Okra. Department of Primary Industries and Fisheries, Queensland, http:/www2.dpi.qld.gov.au/horticulture/5197.
2. Jain R. Millennium Biofertilizers Guide, Nagri Printer, New Delhi, 1998, 52.
3. Paul S, Verma OP, Rathi MS and Tyagi SP. Effect of Azospirillum inoculation on seed germination and yield of onion (Allium cepa). Ann. Agric. Res. New Series. 2002; 23:297-99.
4. Rhem S, Espig G. Dil Kullurp flanzen Tropen and subtropen, Stuttgart. Eugen ulmer Gmb. 1976; 11:496.
5. Sajindranath AK, Narwadkar PR, Prabu T, Rathod NG. South Indian Hort. 2002; 50:538-42.
6. Shakuntahala NM, Effect of microbial inoculation and growth regulators on the germination and seed quality of oil seeds. M. Sc. Thesis, Univ. of Agric. Sci., 1994.
7. Dharwad. Shende ST, Apte RG, Singh T. Influence of Azospirillum on germination of rice and cotton seeds. Curr. Sci. 1977; 46:675-76.
8. Subramanian S, Kumar MV. Effect of nitrogen and Azospirillum on growth and yield of CO, coriander (Coriandrum sativum L.). South Indian Hort. 49 (Special), 2001, 191-93.
9. Tippanavar CM, Kulkarni JH, Reddy TKR.. Seed germination as influenced by Azospirillum chroococcum in durum and aestivum wheat. *Mysore J agric. Sci*. 2004; 38:459-62.
10. Wani SP, Bopaiahs BM, Rai PV. Response of rice (Oryza sativa L.) to Azospirillum chroococcum. Curr. Sci. 1976; 51:44 45.