

## Research Article

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Impacts of Azolla extract on the growth of Bhendi (*Abelmoschus esculentus*)

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**ABSTRACT**

In this study, Azolla extract of different concentrations (10%, 20%, 30%, 40%, 50%, 60%) was treated in Bhendi seeds, and results were obtained. Among these (T4 – 40%) showed better results with a higher rate of germination (90%), Root length (6cm), Shoot length (18.5cm), and seedling vigour (18.37). A control solution without biofertilizer extract was prepared. The Bhendi variety (Arka anamika) was used for this experiment. Azolla spp strain was grown in pit size of 6.5\*1.3m and extract was collected, and used for further analysis. The experiment was conducted at the College of Agricultural Technology, Theni. A completely randomized design (CRD) with 7 Treatments and 3 Replications was followed.

**Keywords:** Azolla, Bhendi seeds, Germination, Root length, Shoot length, Seedling vigour, CRD

**INTRODUCTION**

Nitrogen plays a key role in plant growth. Nitrogen requirement is mostly a central feature of plant production [3]. Azolla an aquatic fern, is regarded as a “Live Nitrogen Manufacturing Factory” because it has Nitrogen fixing Cyanobacteria. It belongs to the family Salviniaceae and consisted of two sub - genera and six living species [4]. Azolla and blue-green algae Anabaena azollae maintain a symbiotic relationship as algae provides nitrogen to the fern and the fern provides habitat for the algae. Azolla has been extensively used both as biofertilizer and green manure for rice cultivation in the South East Asia countries more than 50% nitrogen can be supplemented when Azolla dual cropped with rice. Azolla fastens plant growth through Nitrogen supply.

Bhendi (*Abelmoschus esculentus*) is a flowering plant belonging to Malvaceae family. It has edible green seed pods. It is cultivated throughout the world's tropical and warm temperate regions - for its fibrous fruits or pods containing round, white seeds. It is a rich source of dietary fiber, vitamin C, and vitamin K with moderate contents of Thiamin, folate, and magnesium. Due to their richness in polyphenols, it is a very efficient source of antioxidants [2].

**MATERIALS AND METHODS**

The “Impacts of Azolla extract on the growth of Bhendi” experiment was carried out in the Department of Agricultural Microbiology, at the College of Agricultural Technology, Theni.

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**Experimental design**

A completely randomized design (CRD) with 7 Treatments and 3 Replications was adopted. Random sampling can be done in two ways and can be drawn through two parameters i.e., Lottery method, Random number tables. CRD has drawn through the - Lottery method in our experiment.

**Pro Tray sowing**

Pro Tray is raised for nursery sowing each cell of the pro-tray is filled with soil and cocopith in 1:1 ratio. The soaked Bhendi seeds are sown in concentration wise in Pro Tray. Experiments of 3 replication and 7 treatments were carried out.

**Top of the paper method (In petri plate)**

Seven treatments and three replications are carried out in both the methods. So, totally portray and 21 Petri plates were made ready and sowing is done. The germination percentage was calculated. A sprinkling of water is done daily.

Germination percentage = (Seeds germinated/total seeds) \*100

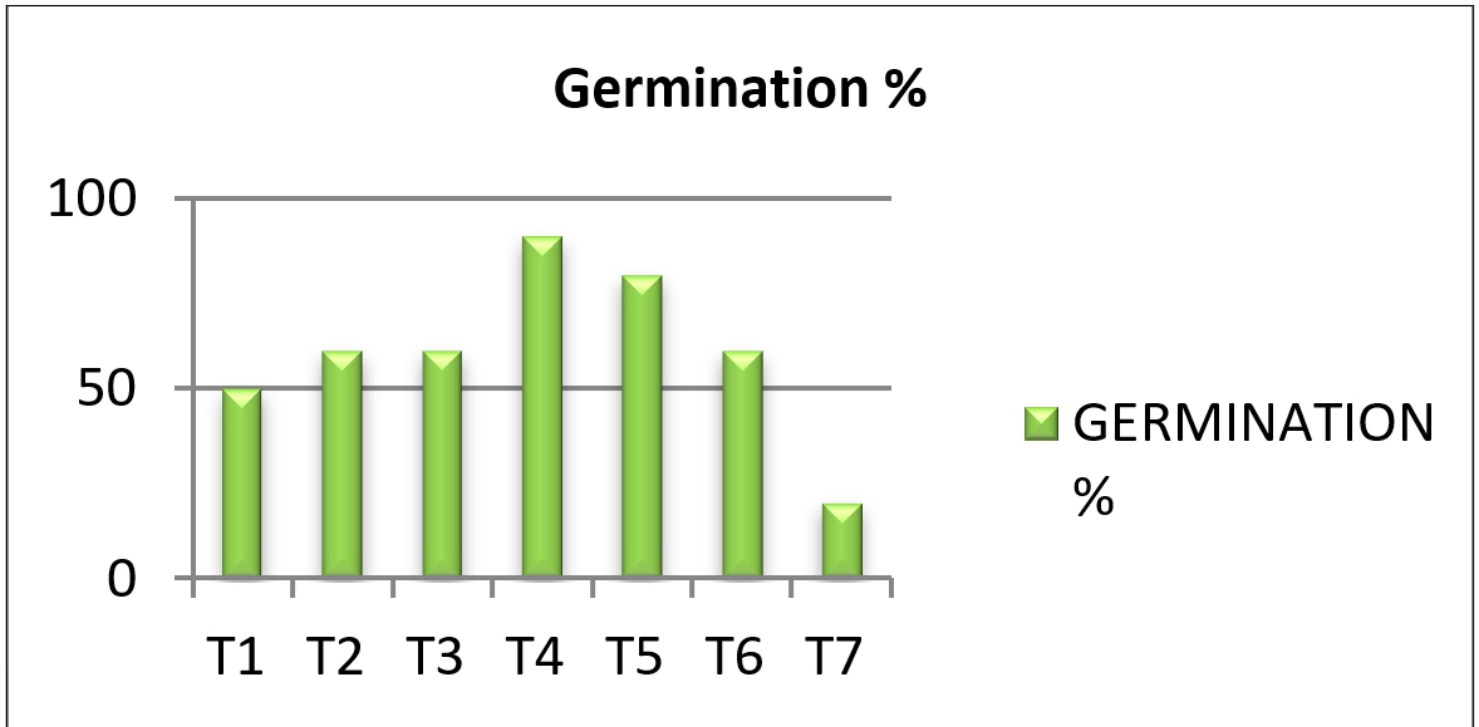
**Measuring shoot length & root length in Pro Tray method**

After 10 days of sowing root and shoot length was measured

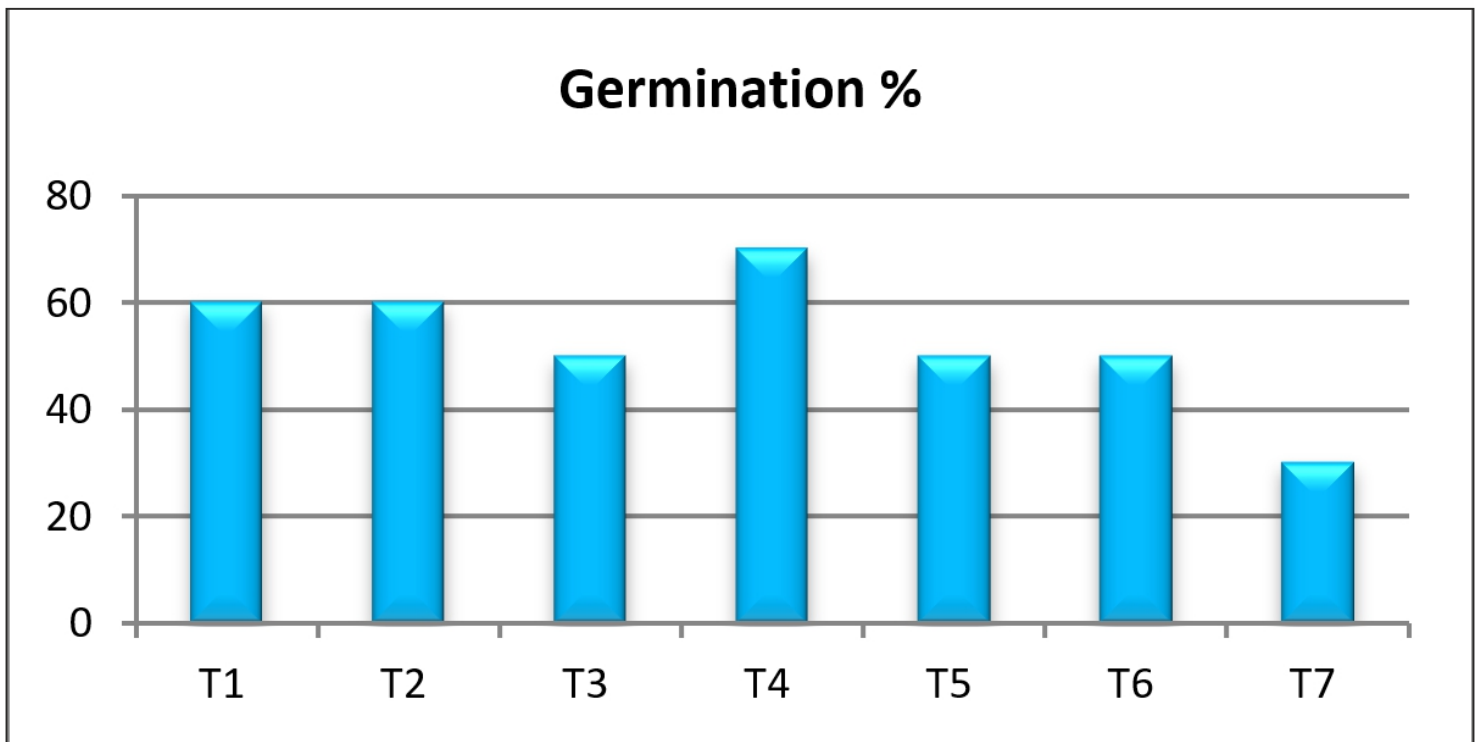
**RESULTS AND DISCUSSION****Germination test**

The germination - test was done by the Top of the paper method. In this (T4) shows a higher rate of germination and (T2) shows the slowest germination rate. The effect of Azolla extract on the germination of bhendi seeds in the portray method depicts that (T4) shows a higher rate of germination and (T2) shows the slowest germination rate.

**Fig.1 Germination percentage by Top of the paper method**



**Fig.2 Germination percentage by Pro Tray method**



**Table 1. Root length, shoot length and seedling vigour of Bhendi seed- 10 DAS**

| S. No | Treatment | Root length (cm) | Shoot length (cm) | Seedling vigour |
|-------|-----------|------------------|-------------------|-----------------|
| 1     | T1        | 4.7              | 17.5              | 16.72           |
| 2     | T2        | 4.3              | 16.6              | 17.2            |

|   |    |     |      |       |
|---|----|-----|------|-------|
| 3 | T3 | 4.5 | 17   | 17.76 |
| 4 | T4 | 6   | 18.5 | 18.37 |
| 5 | T5 | 3.5 | 13.5 | 15.0  |
| 6 | T6 | 4   | 16   | 12.75 |
| 7 | T7 | 2.5 | 11.5 | 9.1   |

Table- 1 shows the root length was found significantly higher at 6 cm in T4 followed by 4.7 cm in T1 and reduced to - 2.5cm in T7. The shoot length was found to be higher at T4 of 18.5 cm followed by 17.5cm (T1), 17cm (T3), 16.6 cm (T2), 16 cm (T6), 13.5 cm (T5), and minimum at T7 of (11.5 cm). Seedling vigor is a measure of the extent of damage that accumulates in seeds until the seeds are unable to germinate and eventually die. Seeds with higher vigor is important. Seedling vigour of Treatment 4 showed the highest of 18.37 followed by 17.76 (T3), 17.2 (T2), 16.72 (T1), 15.0 (T5), 12.75 (T6), and 9.1 (T7)



**Fig.3 Observation on 3rd day**



**Fig.4 Sowing of Bhenidi seeds in Pro tray**

The results of the study showed that the highest rate of seed germination (90%) was recorded with the treatment incorporated with 40% (T4) of Azolla extract and the slowest germination rate was found out to be in T2. A significant increase in Root length (6cm), shoot length (18.5cm), and seedling vigour (18.37 cm) was recorded in T4 of 40% Azolla extract.

The application of fresh fronds of Azolla increased the grain yield of wheat [5]. All vegetative growths parameters were greatly affected by Azolla biofertilizers extract and foliar application in producing healthy tomatoes [1]. The incorporation of 200 kg/ha of Azolla biomass also increased the yield of tomatoes by 21.2% [6]. The effect of Azolla in the yield of Mung Bean increased a number of pods and yield per plant after the incorporation of 12 tonnes of Azolla/ha was studied [7]. Corn yield in Taro was increased with the incorporation of 20 tonnes of Azolla/ha into mud and soil application of 0.5 kgm<sup>-2</sup> [8].

### Conclusion

The application of Azolla extract positively increases the germination percentage, root length, shoot length, and seedling vigour. The amendment of Azolla as a supplement certainly reduces the application of nitrogenous fertilizers and increases the soil fertility. Azolla acts as a biological herbicide depressing germination of weeds. Due to its rapidly decomposing nature, Azolla can be used as manure for dryland crops, and vegetable and ornamental plants. The result of the present study showed that the incorporation of Azolla extract (T4-40%) showed better results with a higher rate of germination (90%), Root length (6cm), Shoot length (18.5cm), and seedling vigour (18.37).

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### Competing interests

Authors have declared that no competing interests exist

### References

1. Ashraf Hanafy, Gehan Elaemary & Arora. (2018). Role of Azolla pinnata. Biofertilizer Extract in producing healthy tomatoes. *Acta Bot indica*:20. pp: 345-357.
2. Barcellos, M.D & R.L. Lionello. (2011). Consumer Market for functional foods in South Brazil. *Int .J. Food Syst.Dyn*:2,pp:126-144.
3. Bondad, B.R & D.M. Oosterhuis. (2001). Canopy Photosynthesis, Specific leaf weight and yield components of cotton under varying nitrogen supply. *Plant Nutr*:24. pp:469-477.
4. Lumpkin, T.A., & D.L. Plucknett. (1980). Azolla: Botany, Physiology and use as a green manure. *Econ.Bot*.34,pp:111-153.
5. Marwaha, T.S., Singh, B. V and Goyal. (1992). S. K. Effect of incorporation of Azolla on wheat (*T. aestivum* var. HD - 2329). *Acta Bot Indica*., 20: 218- 220.

6. Milica, F & Favilli, F. (1992). Azolla symbiotic system's: Application as a bio-fertilizer for green garden crops. *Symbiosis*, 14. pp:495-500.
7. Ram, H., Raja, P., Krishna and Naidu, M.V. S. (1994). Effect of Azolla on soil properties and yield of mung bean (*Vigna radiata* L.). *J Ind Society of Soil Science.*, 42 (3): 385 – 387
8. Tekle – Haimanot, A. and Doku, E. V. (1994). Comparison of Azolla Mexicana and N and P fertilization on paddy Taro (*Colocasia esculenta*) yield. *Trop Agr.*, 72 (1) : 70- 72