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Impact of organic seed priming amendments and botanicals on seed quality parameters of bhendi

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Abstract
Seed priming is an effective, Eco Friendly method to promote seed germination and seeding vigour of bhendi to overcome the reduced and delayed germination in fresh or stored bhendi seeds caused by seed hardness. The laboratory experiment was conducted to study the effect of seed priming of plant extract and organic supplements on the characteristics of okra seeds. Various botanical leaves extracts viz., used like moringa, coleus, neem, Ocimum, Pungam, Alevera, turmeric rhizome extract, onion bulb extract and 3G (garlic, ginger and green chilli) extract and organic amendments like panchagavya and vermiwash were used to study the effect on seed quality characters of *Arka anamica* variety of Bhendi. As a result, priming with vermiwash at 1% for 12 hours improved seedling vigor and germination of bhendi seeds. Its exhibited high mean value for seedling characters like seed germination percentage (92%), root length (13.02 cm), shoot length (19.08 cm), seedling dry weight (0.4mg) and seed vigour index values (2924).

Keywords: Bhendi, priming, germination, seeding vigour

Introduction
Bhendi (*Abelmoschus esculentus* (L.)Moench) is one of the most commonly used species in the Malvaceae family and is an important crop in tropical countries. It is a self-pollinated, seed-propagated annual herbaceous plant. In addition to being very nutritious, it has industrial and commercial value. India is the largest producer of bhendi globally, with a contribution of more than 72% and cultivated in an area of 0.52 million hectares with a production of 6.41 million MT in 2021-2022. In Tamil Nadu bhendi was cultivated in an area of 23,330 hectares with a production of 2, 08,250 MT in 2021-2022 (MoAF, 2022). Bhendi plants are generally propagated through seeds. Majority of farmers collect seeds from a heterogeneous landrace or from their own native cultivar. Leaving the pods until seed is needed and is the cheapest method for conserving bhendi seeds. The germination of seeds is an important stage in the life cycle of crop plants. Bhendi seeds are viable, however they sprout slowly and sporadically. A significant issue in the cultivation of okra is reduced, delayed, and unpredictable emergence, which is brought on by seed hardness that hinders germination (Lamichhane *et al.*, 2021) [5]. The hard seed coat prevents the embryo from growing uniformly or absorbing water, which hinders seed germination.
(Mereddy, 2015) [6]. Quality seed is the key for successful agriculture which demands that each and every seed should be ready to germinate and produce a vigorous seedling ensuring higher yield (Ananthi *et al.*, 2015) [1]. The problem of low germination due to the hard seed coat in okra could be overcome by seed priming. Seed priming is the process of controlled hydration of seeds which is potentially able to promote rapid and more uniform seed germination and plant growth (Sharma *et al.*, 2014) [8].

Materials and Methods
This experiment was conducted at the Seed Science and Technology laboratory, Department of Vegetable Sciences, Horticultural College and Research Institute, Periyakulam to evaluate "Impact of organic seed priming amendments and botanicals on seed quality parameters of bhendi. The seeds of the bhendi cultivar Arka anamica were treated with organics and botanicals in order to evaluate the factors related to seed quality.

Preparation of aqueous extracts

Fresh leaf samples of moringa, coleus, Neem, Aleovera, Ocimum and Pungam each 100gram were collected and washed with distilled water. Then the plant parts were ground with a mortar and pestle, the materials were soaked in 100 milliliters of distilled water for 48 hours in order to fully extract the active substance from the extracted samples. The water and ground material were then filtered using muslin cloth and subsequently using Whatman's grade filter paper no. 1. Then, for later usage, the crude extracts were stored in glass vials and refrigerated at 4 +/- 2 ºC. To obtain 1% solution, one milliliter of leaf extract was added individually to 100 milliliters of water. To prepare aloe vera leaf extract, grate the aloe extract and add 1g to 100ml of distilled water to get a 1% solution. Onion bulbs and turmeric rhizome weighed 100 grams each, then were pulverized and made into 1% solution.

Table 1: Treatment details

T_1	-	Moringa leaf extract
T_2	-	Coleus leaf extract
T_3	-	Neem leaf extract
T_4	-	Panchagavya
T_5	-	Vermiwash
T_6	-	3G (garlic, ginger, green chilli) extract
T_7	-	Aloevera extract
T_8		Ocimum leaf extract
T_9		Pungam leaf extract
T_{10}	-	Turmeric rhizome extract
T_{11}	-	Onion bulb extract
T_{12}	-	Control

The seeds are subjected to different soaking intensities (0.5% and 1% solutions) over a period of 12hours. Then, in accordance with ISTA guidelines, soaked seeds were surface dried in the laboratory before being assessed for the standard germination test using the roll towel method. One hundred seeds in each replication for conducting germination test by roll towel method. Complete randomized design (CRD) with four replications was followed and observation was recorded for germination %, seedling length was measured for seedlings selected at random. The formula for calculating the seedling vigour index was germination (%) x (shoot + root length). and further recorded for dry matter production.

Results and Discussion

Table 2: Mean Performance of seed quality parameters due to various priming treatments in bhendi

Treatments	Germination%		Root length (cm)		Shoot length (cm)		Dry matter production (mg/10seedlings)		Vigour index	
	0.5%	1%	0.5%	1%	0.5%	1%	0.5%	1%	0.5%	1%
T_1	72.0	80.0	7.41	8.65	16.50	17.84	0.30	0.20	1729	2181
T_2	72.0	80.0	8.45	7.50	15.19	16.15	0.30	0.30	1698	2319
T_3	80.0	72.0	7.50	10.09	17.05	16.29	0.30	0.30	1718	1917
T_4	72.0	84.0	8.45	8.70	16.82	16.67	0.20	0.29	1821	2134
T_5	92.0	92.0	12.53	13.02	18.77	19.08	0.30	0.40	2730	2924
T_6	76.0	58.0	6.88	11.03	16.92	17.24	0.30	0.30	1979	1646
T_7	72.0	56.0	8.65	9.69	16.29	17.29	0.20	0.30	1624	1524
T_8	89.0	88.0	9.34	12.00	18.68	18.05	0.30	0.30	2064	2446
T_9	76.0	80.0	6.23	9.88	16.27	17.91	0.30	0.30	1953	2234
T_{10}	72.0	80.0	8.43	8.01	18.02	17.43	0.30	0.30	1910	2252
T_{11}	72.0	72.0	8.90	5.99	18.38	15.59	0.20	0.28	1862	1737
T_{12}	68.0	56.0	6.10	6.85	15.07	15.44	0.20	0.20	1439	1212
S.E.D	8.030	7.757	0.918	1.035	0.347	0.353	0.0287	0.0323	294.1	298.4
C.D%	16.574	16.010	1.8950	2.1364	0.7165	0.729	0.0592	0.0668	607.0	616.0

The present research on organic seed priming shown beneficial outcomes on various seed quality parameters. Significantly, seedlings treated with vermiwash showed the highest rate of germination (0.5% and 1%) followed by seed soaking in ocimum extract (0.5% and 1%) compared other treatments. Vermiwash possesses chemicals that promote growth, which has an positive impact on seed germination.

Among various treatments significant differences have been observed in T5 for vermiwash 1% showed maximum germination (92.33%), shoot length (18.77 cm), root length (13.02 cm), seedling vigour index (2400.707) and dry matter production (0.4) followed 0.5% vermiwash treartment and seeds treated with ocimum leaf extract. Minimum readings were recorded in T12 (Control). Vermiwash, a coelomic fluid extraction solution, contains micro and macronutrients as well as hormones such as gibberlines, cytokinins, and vitamins, which may be the cause of the elevated physiological parameters in seeds. (Buckerfield *et al*., 1999) [4]. As comparison to the vermicompost, the vermiwash had a neutral pH and was rich in Ca and MgNa salts (89.1%, 97.6%, and 97.8%, respectively). Also, a noticeably greater quantity of micronutrients was found in vermiwash. The germination and seedling outcomes correspond with Deshpande *et al*.'s (2006) [2] observations in Bengalgram.

Similar results were observed by Arumugam Shakila and Rajeswari (2008) [3] in okra, Arjun Sharma and Deshpande (2006) [2] in pigeon pea, Surindra Suthara (2010) [10] in cluster bean, and Rajan and Murugesan (2012) [7] in cowpea. Thus, it

is possible to improve seed quality by pre-soaking organic priming treatments using affordable, non-toxic, and environmentally acceptable organic sources.

In conclusion the priming increases the germinability, seeding length, drymatter production and vigour index significantly for bhendi seeds. Seed priming with vermiwash @1% for 12 hrs showed best result to enhanced germinability, vigour and seedling characters.

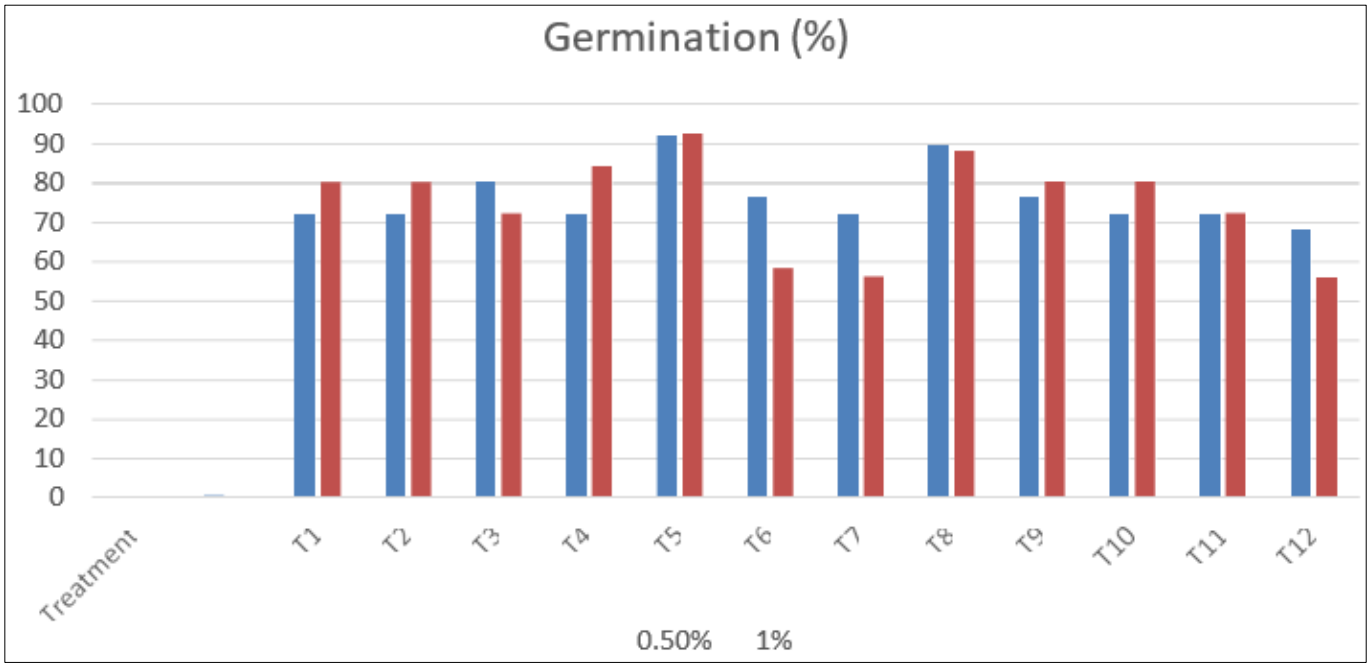

Fig 1: Mean Performance of germination percentage due to various priming treatments in bhendi

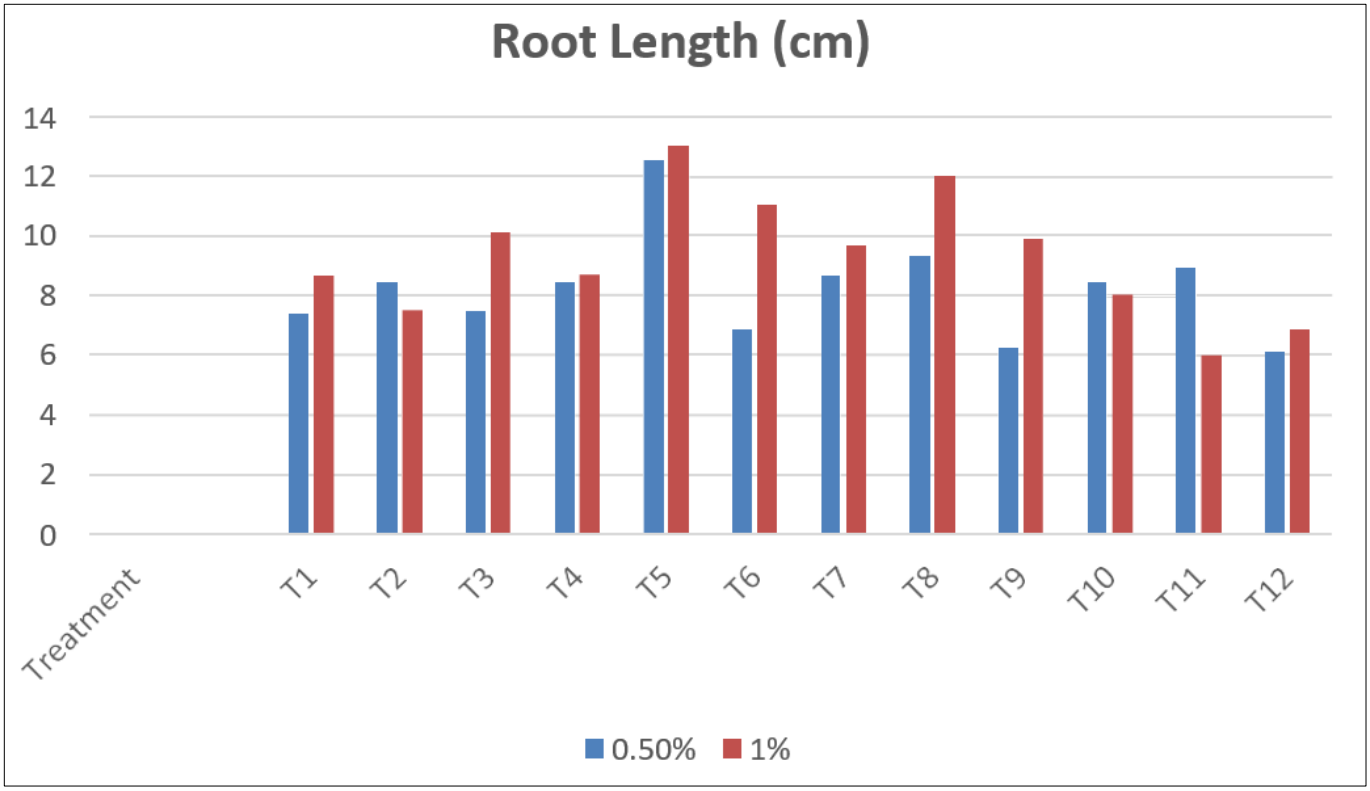

Fig 2: Mean Performance of Root length (cm) due to various priming treatments in bhendi

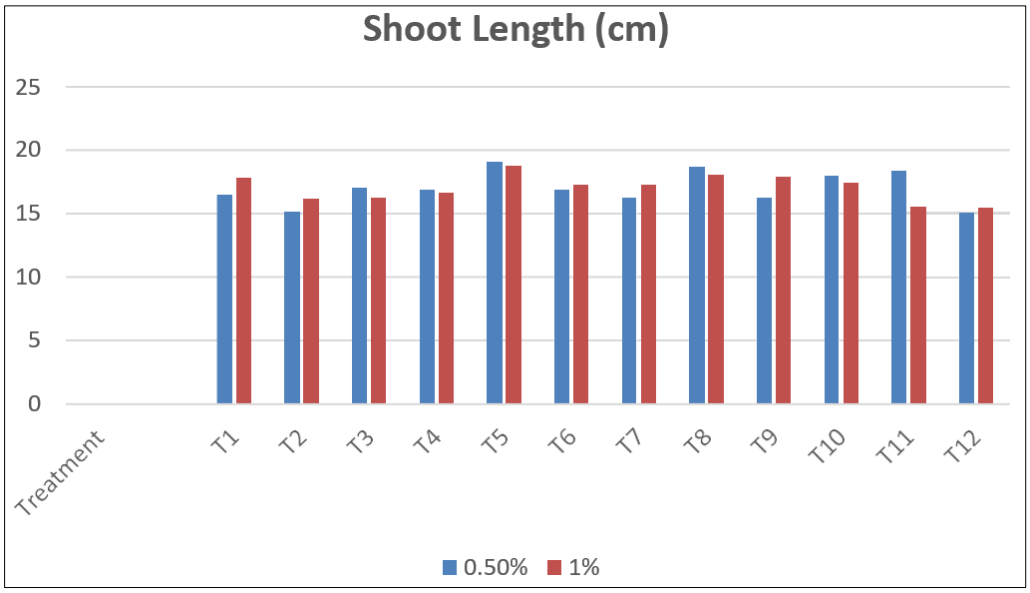

Fig 2: Mean Performance of Shoot length (cm) due to various priming treatments in bhendi

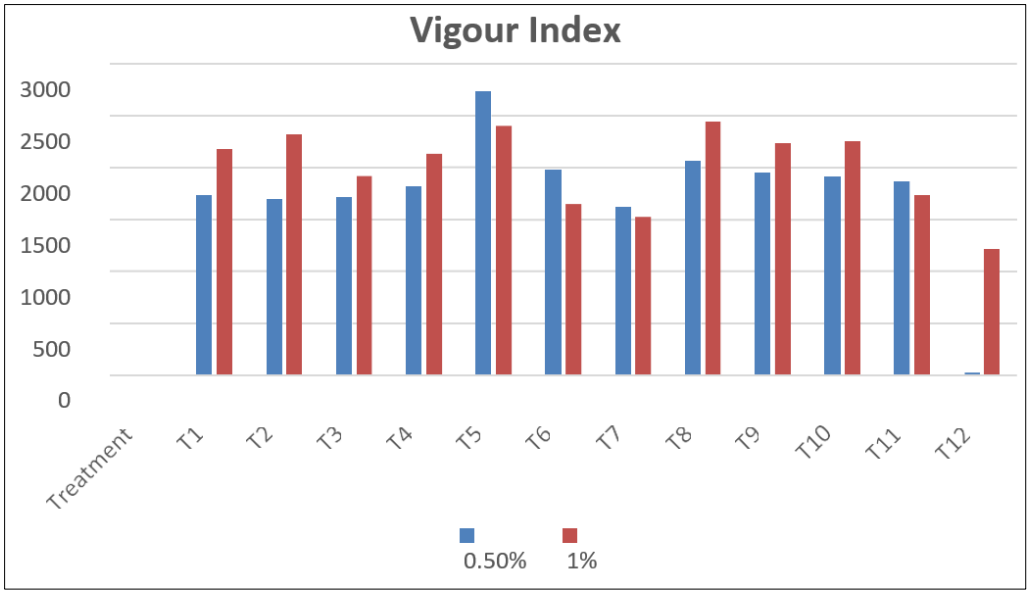

Fig 4: Mean Performance of vigour index due to various priming treatments in bhendi

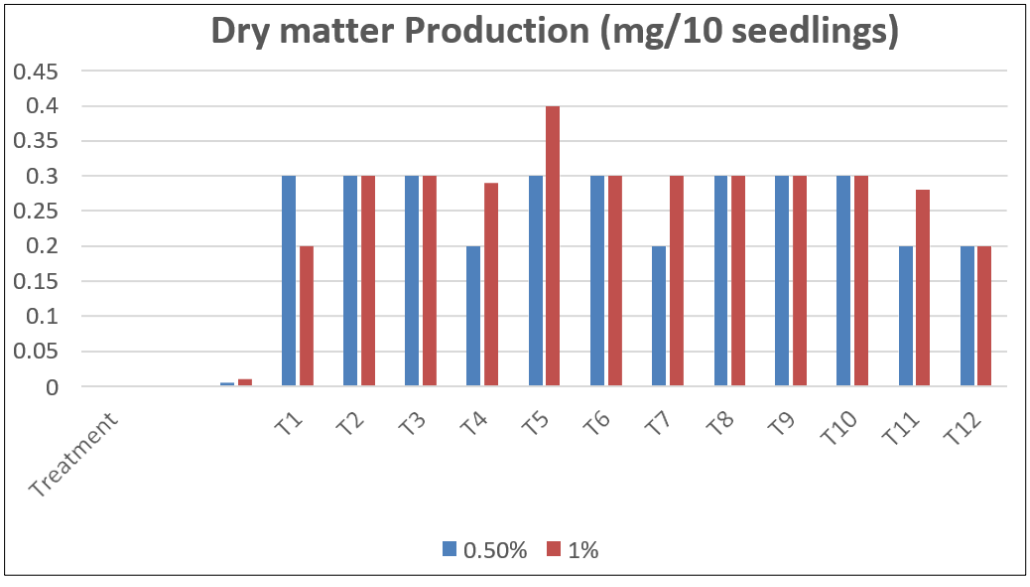

Fig 5: Mean Performance of Dry matter production due to various priming treatments in bhendi

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