

Original Research Article

<https://doi.org/10.20546/ijcmas.2023.1209.025>

Studies on Use of Medicinal Plant Extracts as Priming Treatments for Healthy Germination and Seedling Growth of Bhima Red and Bhima Super Varieties in Onion

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ABSTRACT

Keywords

Extracts, priming, seedling growth, germination, shoot growth and root growth

Article Info

Received:

20 July 2023

Accepted:

28 August 2023

Available Online:

10 September 2023

The present investigation of studies on the use of medicinal plant extracts as priming treatments for healthy germination and seedling growth in onion was carried out at the seed testing Laboratory, University of Horticultural Sciences Bagalkot. The varieties used in this study were Bhima red and Bhima super. The priming treatment of seeds has been carried on the varieties Bhima red and Bhima super with 4 treatments and 4 replications and treating the seeds with the extracts of Aloe vera (*Aloe barbadensis*), Calotropis (*Calotropis gigantea*), Neem (*Azadiracta indica*), Tulsi (*Ocimum sanctum*) with two different concentration of 0.25 and 0.50 % and primed seeds were kept in the incubator for 15 days and the seed germination, growth of shoot and root were measured. Variation in the growth has been significantly compared. The highest germination was recorded from Tulsi plant extract followed by the Aloe vera, Neem and Calotropis. The length of the root and shoot was recorded highest in the Tulsi followed by Aloe vera, Neem and calotropis.

Introduction

Onion is the commercial vegetable of India with huge foreign exchange earnings (Over 1443.09 crores). Genetic improvement of onion will positively affect the national economy. Jones and Mann (1963) have suggested Pakistan, Iran, and the mountainous areas of north India as its origin. India

has an area of 12.30 Lakh ha in the world with production of 215.64 lakh tons and productivity of 16.16t/ha. Maharashtra is the leading producer of onion followed by Karnataka and Madhya Pradesh. India stands third in export. (NHB, 2016-17)

Aloe vera is a succulent plant species of the genus Aloe. Having some 500 species, Aloe is widely

distributed and is considered an invasive species in many world regions. An evergreen perennial, it originates from the Arabian Peninsula but grows wild in tropical, semi-tropical, and arid climates around the world.

It is cultivated for commercial products, mainly as a topical treatment used over centuries. The species is attractive for decorative purposes and succeeds indoors as a potted plant

Tulsi (*Ocimum sanctum* L.) is a sacred plant of medicinal and spiritual significance in many cultures. Medicinal properties of Tulsi are ascribed to its phytochemicals with antioxidant capabilities.

Calotropisprocera (Aiton), a xerophyte, with a nutritional quality, antioxidant activities and concentration of phenolic acids in its leaves and roots has been used for seed priming.

Neem has been used as a pesticide and as a treatment for many fungal and bacterial diseases in crops (Girish and Bhat, 2008). Isolated chemicals, as well as neem seed extract, have been shown antibacterial (Coventry and Allan, 2001; Biswas *et al.*, 2002), antifungal (Achim and Schlosser, 1992; Coventry and Allan, 2001; Biswas *et al.*, 2002; Wang *et al.*, 2010) and anti-viral properties. Further, neem seed extract has been reported to have significant antioxidant activity (Nahak and Sahu, 2011; Revathi and Thambidurai, 2019). Free radicle damage and pathogenic effects are the main factors reducing the quality of seeds during storage (Copeland and McDonald, 2001).

Thus, we hypothesized that the antimicrobial and antioxidant effects of neem seed extract would improve the seed quality of traditional rice seeds. Furthermore, if neem seed extract is effective in improving seed quality it could be used as an organic treatment. Thus, the main objective of our study was to improve the seed quality of four selected traditional rice varieties in Sri Lanka with priming treatments using different concentrations of commercially available neem seed extract.

One of the methods that can overcome this problem is seed pre-planting treatments called priming which include water absorption at enough level to begin germination events that are accomplished by the subsequent drying.

The purpose of priming is to increase germination percent, decrease the mean germination time, and improve the growth and vigor of seedlings in very wide favor and unfavored environmental conditions. This method is successful in small seed plants and most medicinal plants that have great economic value with quick and uniform emergence requirements (Ellis and Roberts, 1981).

Materials and Methods

The present investigation on Studies on the use of medicinal plant extracts as priming treatments for healthy germination and seedling growth in onion was carried out at the seed testing Laboratory University of horticultural sciences Bagalkot. The genotypes used in this study were Bhima red and Bhima super.

The priming treatment of seeds has been carried out by using the varieties Bhima red and Bhima super with 4 treatments and 4 replications have been used and treating the seeds with the extracts of Aloe vera, Calotropis, Neem, Tulsi in the concentration of 0.25 and 0.50 % namely they were kept soaked in the solution for 24 hrs and the seeds are dried for 12 hours and kept in on blotting paper which was placed on Petri dishes for germination then the plates are placed in the incubator for 15 days and the parameters like seed germination, Growth of shoot and root were measured and the variation in the growth has been significantly compared.

Different medicinal plant extracts have been prepared by the specific leaf extract until the formation of the solution (Huang *et al.*, 2007). The germination test was ended when the number of germinated seeds was equal in three sequential counting's. Germination percent (GP) was evaluated by counting the number of normal seedlings at the

end of the standard germination test. Germination Percentage (GP) was calculated by the following formula:

$$(GP) = \frac{\text{Seeds germinated} \times 100}{\text{Total seeds}}$$

Results and Discussion

Seed germination is one of the most critical phases of plant life and is greatly influenced by Various stresses and local governing biotic and abiotic factors (Dezfuli *et al.*, 2008). These can affect germination and seedling growth either by creating an osmotic pressure that prevents water uptake or by toxic effects of available ions in soil (Khan *et al.*, 2019).

Seed treatment of Bhīma red variety of onion at the concentration of 0.25 and 0.50 %

Germination was found to be highest in Tulsi followed by the Aloe vera, Neem and Calotropis. Tulsi has the highest germination percentage (96.75%) followed by Aloe vera and Neem (96%) and (95.12%) respectively at the concentration of 0.25%. Whereas at the concentration of 0.5% the seed germination was found highest in Tulsi (97.75%) followed by the Aloe vera and Neem showed 97.7 and 96.5% respectively.

The least germination percentage was found in calotropis (93.5%). However increase in the germination percentage have been observed by increase in concentration of the medicinal plants extracts. The Untreated seeds (control) showed lowest percentage of germination (77.5%).

The length of the root was highest in Tulsi plant extract (2.20 cm) followed by the Aloe vera and neem 2.10 cm and 1.92 cm respectively at concentration of 0.25%. Whereas at 0.50% concentration, the length of the root varied significantly and there was the increase in the length

of the roots. The maximum increase in the root length was observed in the Tulsi (2.85cm) followed by Aloe vera (2.62cm) and Neem (2.57cm) whereas as lowest root length was 2.17 cm.

Length of the shoot was highest in the Tulsi (5.4 cm) followed by the Aloe vera (5.06 cm) Neem (4.92cm) and Calotropis (4.8 cm). There was an increase in the length of shoot by an increasing the concentration to 0.50%. Tulsi recorded 5.85 cm of the shoot followed by Aloe vera (4.95cm) and Neem (5.85 cm). The untreated seeds (2.5cm) and Calotropis (4.95cm) primed seeds showed the lowest growth of the shoot.

Seeds treatment of Bhīma super variety of onion with the concentration of 0.25 and 0.50 %

Germination was found to be highest with a concentration of 0.25% in Tulsi followed by the Aloe vera, Neem and Calotropis. Tulsi has the highest germination percentage of 96.75% followed by Aloe vera and Neem (95.75 and 94.12%) respectively.

However with the concentration of 0.5% the seed germination was highest in Tulsi (97 %) followed by the Aloe vera (95.75%) and Neem (97%). Whereas increase in the germination percentage have been observed by increase in concentration of the medicinal plants extracts. The control showed the lowest percentage of germination at 76.5% followed by the Calotropis at 88%.

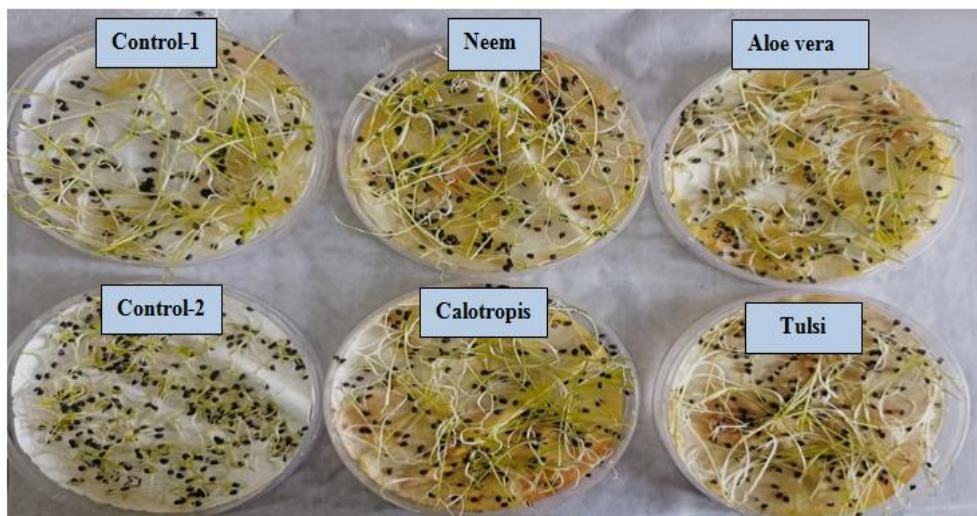
Length of the root was highest in Tulsi (2.8 cm) followed by the Aloe vera (2.6cm) and Neem (2.5 cm) with a concentration of 0.25%. Whereas with the concentration of 0.50% the length of the shoot varied significantly and there was an increase in the length of the roots. The maximum increase in the root length was observed in the Tulsi variety (3.15 cm) followed by the Aloe vera (2.8 cm) and the Neem (3.15 cm). Lowest length of the root was observed in the untreated seeds (1.70 cm)

Table.1 Seed priming treatment by medicinal plant extracts on Bhima red and Bhima super varieties of onion for seed germination, Shoot and root length

Treatment	BHIMA RED						BHIMA SUPER					
	0.25 %			0.50%			0.25%			0.5%		
	Germination %	Length of the root (cm)	Length of the shoot (cm)	Germination (%)	Length of the root (cm)	Length of the shoot (cm)	Germination %	Length of the root (cm)	Length of the shoot (cm)	Germination %	Length of the root (cm)	Length of the shoot (cm)
T-1	96	2.10	5.06	97.75	2.62	5.67	94.72	2.6	3.42	95.75	2.8	3.95
T-2	93.5	1.82	4.8	95.75	2.17	4.95	88	1.5	2.87	95	1.9	3.07
T-3	95.12	1.92	4.92	96.5	2.57	5.32	94.12	2.5	3.77	96.5	2.95	4.05
T-4	96.75	2.2	5.4	98	2.85	5.85	96.75	2.8	3.92	97	3.15	4.15
T5 (Control)	77.5	1.25	2.5	77.5	1.25	2.5	76.5	1.35	2.3	83.5	1.7	3.05
SEm	0.64	0.47	1.05	0.65	0.44	1.08	0.70	0.15	0.15	0.77	0.19	0.29
CD@1%	1.96	1.99	4.38	1.98	1.84	4.50	2.15	0.65	0.64	3.22	0.82	1.21

T-1 Aloe vera , T-2 Calotropis , T-3 Neem, T-4 Tulsi, T-5 Control

Fig.1



Length of the shoot values showed that the length of the shoot was highest in the Tulsi (4.15 cm) followed by the Neem (4.05 cm), Aloe vera (3.95 cm) and Calatrophis (3.07 cm). There was an increase in the shoot length by increase in the concentration of the medicinal plant. Tulsi showed 3.15 cm of the shoot length followed by the Aloe vera (3.95 cm) Neem (4.05cm) and Calatropis (3.07 cm). The untreated showed the lowest growth of the shoot by 3.05cm.

The results of the priming experiments revealed that priming with Tulsi has a higher germination percentage followed by the Aloe vera, Neem and Calatrophis. Root and shoot length of the plant was recorded highest in Tulsi followed by the Aloe veraNeem and Calatrophis. The lowest germination, shoot and root length was observed in the control treatment followed by the calatrophis.

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How to cite this article:

Shivayogi Ryavalad, B. S. Naveenkumar and Golagi, S. G. 2023. Studies on Use of Medicinal Plant Extracts as Priming Treatments for Healthy Germination and Seedling Growth of Bhima Red and Bhima Super Varieties in Onion. *Int.J.Curr.Microbiol.App.Sci.* 12(09): 264-269.

doi: <https://doi.org/10.20546/ijcmas.2023.1209.025>