

Original Research Article

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Effect of Plant Extracts on Seed Germination Behaviour and Vigour of Okra [*Abelmoschus esculentus* (L.) Moench]

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ABSTRACT

Keywords

Leaf extracts, Okra, Phule vimucta, Seed quality, Seed priming

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The seed of okra [*Abelmoschus esculentus* (L.) Moench] have slow and poor germination when seeds are sown in early spring season due to low temperature. Laboratory experiment was conducted to study the effect of seed priming using plant extract on seed quality characters of okra. Various botanical leaf extracts used like Arjuna, Bael, Harad, Bahed, Arrapu, Neem, Reetha, Amla, Tulsi, Prosopis and Cow urine on seedling quality characters of phule vimucta variety of okra. The result concluded that priming with Arrapu (*Albizia amara*) Leaf Extract at (3%) for 12hrs increased the germination and seed vigour in Okra. Its exhibited high mean value for Seedling characters like seed germination percentage (96.50%), Speed of germination (09.77), root length (12.22cm), shoot length (16.39cm), seedling length (28.80), seedling fresh weight (1.03gm) and seedling dry weight (0.35gm), seed vigour index I (2427.95) and seed vigour index II (19.36).

Introduction

Okra is one of the most widely known and utilized species of the family Malvaceae (Naveed *et al.*, 2009). This crop is suitable for cultivation as a garden crop as well as on large commercial farms. It is grown commercially in India, but its original home is Ethiopia and Sudan. In Indian cooking, it is sauteed or added to gravy-based preparations. It medicinally used as plasma replacement or blood volume expander. Industrially, mucilage is usually used to glaze certain papers and also useful in confectionary (Benchasri, 2012). It provides an important source of vitamins,

calcium, potassium and other mineral matters (IBPGR, 1990). Also called “a perfect villager’s vegetable” due to robust nature and presence of fibre in the form of gums and pectin.

When these okra seeds are sown in early spring season, they show poor germination due to low temperature. Another major problem in germination of okra seeds is hard seed coat which restricts the water imbibition and uniform growth and development of embryo (Merreddy *et al.*, 2000).

Seed priming has presented promising, and even surprising results, for many crop seeds

(Bradford, 1986). Seed priming is a pre-sowing seed treatment in which seeds are allowed to imbibe water to start pre-germinative metabolic processes but insufficient for radical protrusion and also helps to soften the hard seed coat. The activity of many enzymes involved in mobilization of food reserves is triggered (Srinivasan *et al.*, 2009). Seed deterioration can be controlled through priming prior to storage because priming activates antioxidant enzymes examples like catalase, peroxidase, superoxidase and lowers per-oxidation in seed (Rahman *et al.*, 2013). (Moosavi *et al.*, 2009) reported that primed seeds significantly improved the germination percentage, speed of germination, root length and seed vigor.

Botanical seed treatment is a liquid formulation it has synergistic effect on early and uniform seed germination and enhances tolerance to pest and disease during early crop stage. Microbes are effective in inducing plant growth as they secrete plant growth and enhance seed germination and root growth. Hence, present studies were undertaken to determine the effect of plant extracts on germination and vigour characters of okra in early spring season.

Materials and Methods

Seed of okra of variety Phule Vimukta, obtained from Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra, India and the fresh leaves of Arjuna, Bael, Harad, Baheda, Arrapu, Neem, Reetha, Amla, Tulsi and Prosopis were collected from K.C. Ajmera Ayurved Mahavidyalaya for conducting experiment. Present investigation was carried out at Post- Graduate Laboratory of Department of Genetics and Plant Breeding, Sam Higginbottom, University of Agriculture, Technology and Sciences, Paryagraj (U.P.) during 2018-2019.

Procedure of preparation of leaf extracts

Make the powdered of separately shade dried leaves using electric grinder. Take three gram Powder and dissolved in 100 ml of distilled water to make 3 per cent leaf extract solution. These solutions were kept at room temperature for 48 hours. After 48 hours the leaf extracts were filtered by two layer of muslin cloth to remove unwanted material and leaf debris. Seeds were soaked independently in different leaf extracts at room temperature for twelve hours.

Preparation of cow urine extract

Locally available cow urine is used for organic seed priming which acts as growth promoter by preventing plant disease. 3ml of cow urine were added separately in 100 ml water to get 3% of solution which were used for seed treatment.

For seedling characters, the germination test was conducted using three replications of 100 seeds from each sample in sand and between paper methods as per procedure described by ISTA (1999). Seedling dry weight and vigour index I and II were determined by Baki and Anderson (1973).

Treatment details

T ₀ - Control
T ₁ - <i>Terminalia arjuna</i> Leaf Extract@ 3%
T ₂ - <i>Aegle marmelos</i> Leaf Extract@ 3%
T ₃ - <i>Terminalia chebula</i> Leaf Extract@ 3%
T ₄ - <i>Terminalia bellirica</i> Leaf Extract@ 3%
T ₅ - <i>Albizia amara</i> Leaf Extract@ 3%
T ₆ - <i>Azadirachta indica</i> Leaf Extract@ 3%
T ₇ - <i>Sapindus mukorossi</i> Leaf Extract@ 3%
T ₈ - <i>Phyllanthus emblica</i> Leaf Extract@ 3%
T ₉ - <i>Ocimum tenuiflorum</i> Leaf Extract@ 3%
T ₁₀ - <i>Prosopis juliflora</i> Leaf Extract@ 3%
T ₁₁ - Cow Urine@ 3%

Data analysis

In order to calculate the Germination (%), Speed of Germination, Shoot, Root and Seedling length, Seedling Fresh and Dry Weight, Vigour Index (I and II), by formula 1, formula 2, formula 3, formula 4, formula 5 and formula 6 were used:

$$\text{Germination\%} = \frac{\text{Number of germinated seeds}}{\text{Total number of seeds sown}} \times 100$$

$$\text{S.P} = \frac{G_1}{D_1} + \frac{G_2}{D_2} + \dots + \frac{G_n}{D_n}$$

Root and shoot length: Root and shoot length of five fresh seedlings was measured in centimeters up to one decimal. Total seedling length was calculated by adding root and shoot length.

Seedling dry weight: The seedlings used for recording were dried in an oven at 103°C for 12 hours. Measurement of dried samples was record on an electronic balance upto three decimals in gm.

V.I. (I) = Germination percentage (Normal seedling) X Seedling length (cm)

V. I. (II) = Germination percentage (Normal seedling) X Dry weight of the seedling (gm)

Result and Discussion

Effect of plant extracts on germination

In the present study, seeds of okra priming with different plant leaf extracts and used for sowing. Presowing seed priming has a positive significance which is influences the germination and viability characters of okra. *Albizia amara* Leaf Extract 3% primed seed (T₅) recorded maximum germination percentage (96.50) and the untreated seed (T₀) recorded minimum germination percentage (88.25). High speed of germination observed in (T₅) *Albizia amara* Leaf Extract 3% primed

seed (9.77) and minimum speed found in (T₃) *Terminalia chebula* Leaf Extract 3% primed seed (7.15). Many researchers suggested that highest germination observed due to large amount of microbes presents in plant extracts and microbes are effective in inducing plant growth as they secrets plant growth promoters (auxins, abscisic acid, gibberellic acid, cytokines, and ethylene) and enhance seed germination and increase the speed of germination. Leaf of *Albizia amara* presence of wide variety of bioactive compounds such as alkaloids, triterpene saponins, phenols, flavonyl glycosides, tannins, sterols In addition, the plant extract possess the pharmacological properties like antihyperlipidemic, antiinflammatory, antimicrobial, analgesic and antioxidant activities (Indravathi *et al.*, 2013). (Vadivelu *et al.*, 1985) concluded Bengal gram seed treated with arappu leaf powder @ 50 g kg⁻¹ of seed maintained germination up to two seasons.

Effect of plant extracts on growth (shoot length, root length and seedling length)

Shoot length and root length of okra influenced significantly by the extracts of different plant leaves. Shoot length of okra to be maximum with the treatment (T₅) leaf extract of *Albizia amara* Leaf Extract 3% primed seed (16.39 cm) and maximum root length also recorded in treatment (T₅) leaf extract of *Albizia amara* Leaf Extract 3% primed seed (12.22 cm). Seedling length is related to shoot and root length i.e seedling length also recorded higher in (T₅) *Albizia amara* Leaf Extract 3% primed seed (28.80 cm). The other treatments showed moderate performance except the treatment (T₁₀) leaf extract of *Prosops juliflora* (10.14cm) and treatment (T₄) *Terminalia bellirica* (10.45 cm) which found to decreased the shoot, root length respectively comparison with control. Results also demonstrated the inhibitory effect of aqueous leaf extract of treatment (T₆)

Azadirachta indica 3% primed seed on growth (seedling length) in okra (21.44 cm).

Sarika *et al.*, (2013) conducted a lab experiment to study various physiological and biochemical changes by priming in French bean at Bangalore. They reported that herbal priming with different leaf extract improved the seed quality and showed improved seedling length, seedling dry weight which in turn improved higher seedling vigour index, germination speed and mean germination time.

As per (Salam *et al.*, 2010) neem leaves may

contain growth inhibitory substances and may possess allelopathic potential. Therefore, neem leaves may be a possible candidate for the isolation and identification of allelopathic substances and for the development of natural herbicides for sustainable agricultural production

Effect of plant extracts on seedling weight and vigour index

This result of study indicates that okra seedlings which are exposed to various seed priming treatments have shown increase in fresh, dry weight content and vigour index.

Table.1 Effect of different plant extracts on seed quality parameters of okra

Treatments	Germination percentage	Speed of germination	Root length (cm)	Shoot length (cm)	Seedling length (cm)	Fresh weight of seedling (g)	Dry weight of seedling (g)	Seedling vigour index I	Seedling vigour index II	
T ₀	88.25	7.27	12.21	15.84	28.15	0.90	0.19	2,364.60	17.52	
T ₁	93.25	7.72	10.74	14.96	25.70	0.88	0.15	2,175.95	12.71	
T ₂	89.00	7.75	10.99	11.61	22.92	0.82	0.23	1,913.67	16.14	
T ₃	92.00	7.15	10.96	12.22	23.93	0.86	0.15	2,021.08	12.66	
T ₄	93.25	7.25	10.45	12.00	22.33	0.90	0.16	1,881.46	13.40	
T ₅	96.50	9.77	12.22	16.39	28.80	1.03	0.35	2,427.95	19.36	
T ₆	95.50	8.87	10.87	10.57	21.44	1.02	0.17	1,794.56	14.83	
T ₇	91.00	8.25	11.85	12.24	24.07	0.84	0.17	2,040.94	14.00	
T ₈	93.00	8.37	12.15	11.17	23.33	0.77	0.22	2,047.90	18.41	
T ₉	92.50	7.60	10.84	11.17	21.73	0.98	0.19	1,920.65	16.54	
T ₁₀	95.50	7.32	11.35	10.14	21.58	0.77	0.18	1,867.69	15.17	
T ₁₁	92.36	7.63	11.51	13.29	23.82	0.63	0.20	2,200.01	18.47	
Grand Mean	92.67	7.91	11.34	12.63	23.98	0.86	0.19	2,054.71	15.76	
CD 5%	1.88	1.52	0.76	0.81	1.42	0.12	0.02	183.00	3.41	
S E	0.65	0.52	0.26	0.28	0.49	0.04	1.34	63.32	1.18	
CV	1.40	13.29	4.68	4.48	4.09	9.32	153.97	6.20	15.20	
Range	Max	96.50	9.77	12.22	16.39	28.80	1.03	0.35	2,427.95	19.36
	Min	88.25	7.15	10.45	10.14	21.44	0.63	0.15	1,794.56	12.66

Vigour I and seedling vigour II were found for treatment (T₅) *Albizia amara* 3% extract primed seed followed by treatment (T₁₁) Cow Urine 3% primed seed (Table 1).

Renugadevi *et al.*, (2008) also concluded that seed fortification with arappu leaf extract at one and two per cent concentrations for three hours expressed superior germination, vigour and field emergence in clusterbean.

As per the (Ambika *et al.*, 2014) pre-sowing treatments with bovine urines of cow, buffalo, sheep, goat and pig. The paddy, maize, sorghum, cumbu and irungu cholam seeds (local type) were soaked for 3h with different concentrations of 5 and 10% along with control (dry treatment). The seed quality parameters viz., speed of germination, germination percentage, seedling length (cm) and vigour index were evaluated. Among the bovine urines treatment best performance was observed in cow urine (5%) in all the cereals.

As a result of these studies, effect of plant extracts on seedling characters carefully observed. From the present study, it is suggested that the seeds primed with *Albizia amara* 3% leaf extract is recommended to enhance the seed quality parameters of okra.

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