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Original Research Article

Effect of Priming with Botanicals and Animal Waste on Germination and Seedling Length of Sorghum (*Sorghum bicolor* L.) Seeds

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Keywords

Sorghum, seed priming, Neem Leaf Extract, Parthenium Leaf Extract, Cow Urine and Coconut water, *Lantana camera* Extract

A B S T R A C T

Sorghum is the world's fifth most important cereal crop after rice, wheat, maize, and barley. *S. bicor* L. belongs to family graminaceae and is typically an annual, but some cultivars are perennial. It is commonly called as great millet, dutrra, jowari or milo. With a view to find out the Effect of priming with botanicals and animal waste on germination and seedling vigour in sorghum (*Sorghum bicolor* L.) In order to evaluate the effect of different seed priming techniques on germination and morphological characters of sorghum an experiment was conducted in 2013-014 in a experiment based on the complete randomized block design with two variety M-35-1 (Muguti 35-1) and DSH (Dharwad sorghum hybrid). Seeds were primed with six different priming media. Maximum seed germination percentage was observed when seed primed by Coconut water followed by Cow Urine Among the treatments LCE recorded minimum germination per cent. Moreover priming treatments have more pronounced effect DSH maintained highest quality parameters followed than M 35-1 of sorghum seeds.

Introduction

Sorghum (*Sorghum bicolor* (L.) Moench is the fifth major cereal crop in the world and occupies fifth position in acreage after wheat, rice, maize and barley. It is grown as a staple food crop throughout the Asian and African regions, besides as a forage and fodder crop for livestock in the developed countries like USA, Europe and Japan (Doggett, 1988). Major producers of sorghum in the world are Nigeria, USA, India, Mexico, Argentina, Sudan, Ethiopia, Brazil, China and Australia. It has been classified under family graminae, sub-family poaceae, tribe Andropogonae and genus *sorghum*, Sorghum is considered to be one of the drought tolerant crops. In India, Maharashtra stands first in production of sorghum followed by Karnataka and Andra Pradesh. Seed is considered as one of the important basic agricultural inputs for obtaining higher yield. Good quality seed acts as a catalyst for realizing the potential of all other inputs in agriculture. Without good seed, the investment incurred on fertilizer, water, pesticides and other inputs will not play the desired dividends.

Its importance has been realized with the passage of time and greater realization that efficiency is the key factor to be competitive

in all the agricultural ventures. Therefore, the availability of quality seed to the farmer at an affordable price and in time is considered crucial for enhancing and sustaining the agricultural productivity. Therefore, production of quality seed and maintenance of high seed germination is of utmost importance in a seed programme.

Recently many types of seed treatments such hydration pre-sowing, seed priming, seed coating with bio control agents and bio-priming. Seed treatments with such materials have been considerable and environmentally acceptable alternatives to the existing fungicide seed treatment. Thus many different primers have been used for treatment for yield improvement and pest and disease control. It is necessary to study the mechanism of seed primers by which it alters the plant metabolism leading to higher productivity in sorghum. And the response of different genotypes of sorghum to various seed primers needs to be studied to know the influence of fungicide and other biocontrol agents to get higher yields. By keeping in mind such things following research work has been carried out to know the efficacy of priming on sorghum seeds.

Materials and Methods

The laboratory experiments were conducted in the Department of Genetics and Plant Breeding, Allahabad School of Agriculture, Sam Higginbotham Institute of Agriculture Technology and Sciences, (Formerly Allahabad Agricultural Institute) Deemed-to-be University, Allahabad, Uttar Pradesh, India. Year 2014-15 to find out "Effect of priming with botanicals and animal waste on germination and seedling vigour in sorghum (*Sorghum bicolor* L.) seeds**.** The details of materials used and methods followed during the course of investigation are described in this aheads.

Experimental site

The research studies were carried out in the laboratory of Department of Genetics and Plant Breeding, Allahabad School of Agriculture, Sam Higginbotham Institute of Agriculture Technology and Sciences, (Formerly Allahabad Agricultural Institute) Deemed-to-be University, Allahabad, Uttar Pradesh, India.

Location

Allahabad region is located in the south eastern part of Uttar Pradesh and has a subtropical climate with extremes of summer and winter. Winter season temperature is as low as 1^0C while during the summer 48-50^0C. The average rainfall in this area is around 1013.4 mm annually. The soil type of experimental site was sandy loam low in organic carbon, nitrogen and phosphorus.

Seed source

The seeds of sorghum *Cv*. M-35-1, Muguti were obtained from Seed Unit, UAS, Raichur and Sorghum DSH was obtained from ARS, Dharwad for conducting the experiment.

Studies on seed priming in sorghum

The experiment was consisted of 06 different treatment combinations which are used for seed priming in and sorghum are mentioned below.

Treatment details

Crop: Sorghum

Factor I: Seed priming treatments

$T_{0:}$ Control

T_1: Neem leaf extract @ 3%
T_2: parthenium leaf extract @ 3 %
T_3: Cow urine @ 3 %
T_4: Coconut water @ 3 %
T_5: lantana camera extract @ 3%

Factor I: Genotypes

G_1: M-35-1
G_2: DSH

Design and layout

The experiment was laid out in Factorial Completely Randomized Block Design (FCRD) with Four replications.

Procedure for preparation of neem leaf extract

Neem leaf extract was prepared according to Paul and Sharma (2002). Two hundred and fifty matured neem leaves (250g) were homogenized in a pre-chilled pestle and mortar using 250 ml chilled, sterilized distilled water (d-ilution of 1:1). The extract was filtered through four layers of moistened muslin cloth. The supernatant thus obtained was designated as concentrated leaf extract and seeds were soaked by making dilution of required concentration. Further, 3 ml filtrate was added to 100 ml to get 3 per cent solution. This solution is used for soaking the seeds as per the required weight by volume ratio of seed to solution. Seed to solution ratio of 1:0.5 were made and soaked for 6 hrs for sorghum. Then the seeds were air dried overnight. The same procedure was followed for Parthenium and *Lantana camera* leaf extracts

Procedure for preparation of Cow urine

Locally available cow urine is used for seed treatment which acts as growth promoter by preventing plant disease, 03% ml and 50 ml of cow urine were added separately in 100 ml water to get 30% of solutions which were used for seed treatment as per the required weight by volume ratio of seed to solution. Seed to solution ratio of 1:0.5 were made and soaked for 6 hrs for sorghum. Then seeds were air dried overnight

Procedure for preparation of Coconut water

The tender coconut water is directly used as seed treatment. 50 ml and 75 ml of coconut water were added separately in 100 ml of water to get of solutions. Which were used for seed treatment as per the required weight by volume ratio of Seed to solution. Sorghum seeds were soaked in coconut water in the seed to solution ratio of 1:0.5 for 6 hrs and then seeds were air dried overnight.

The seeds of sorghum *Cv*. M-35-1, (Muguti) were obtained from Seed Unit, UAS, Raichur DSH (Dharwad sorghum hybrid) was obtained from Agriculture Research Station, Dharwad for conducting the experiment. Sorghum seeds primed with treatments (viz. Coconut water, cow urine, PLE, NLE, control) and were subjected to germination studies in laboratory and, seed germination per cent was recorded for ahead.

Germination per cent

Germination test was conducted in four replications of 100 seeds each by adopting paper towel method as described by ISTA procedures (Anon, 1999). Seeds were incubated at slanting position in Walk-in germinator room in growth cabinets. The temperature of 25 ± 10C and RH of 95 per cent was maintained during the germination test. Daily germination count were

performed until no further germination occurred for eight consecutive days, then germination percentage was calculated.

Germination (%) = Number of seeds germinated/ Total number of seeds kept for germination / 100

Results and Discussion

The response of seeds with different seed treatments were interpreted in terms of germination percentage and seedling length.

Speed of germination

The results obtained from the experimwnt exhibits a significant variation in seed germination percentage of sorghum.

It is evident from the table that significantly maximum increase in seed germination occurs by Coconut water (88.40 %) followed by Cow Urine (85.20%) while lowest germination (76.00%) was observed with unprimed control treatment. Coconut water priming was found to be at par with Cow Urine and LCE (78.00%), PLE (82.00%) with NLE (83.60%). Similar trend was also observed in M35-1 (51.2, 54, 60, and 78% respectively). Among the treatments PLE recorded minimum seed germination (68 %) followed by NLE (71%) (Table 1). Whereas, maximum seed germination was noticed in the Coconut water (87%). The interaction effect of variety and treatments results were found significant.

Sharma *et al.*, (2014) found similar results in okra where treatment with the coconut water solution was more effective in improving the rate of germination. Illago *et al.*, (1999) finds similar results who reported that matric priming for *Albizia lebeck* one established as best methods of priming treatment capable of improving speed of germination. Pegah *et al.*, (2008) find similar results who reported that halopriming increased speed of germination of small seeded crops.

Table.1 Effect of priming treatments on speed of germination (%) in sorghum seeds. (*Sorghum bicolor* L.)

Treatments (T)	**Variety**	
	V_1 -M35-1	V_2-DSH
T_0- Control	50.00	76.00
T_1-NLE	60.00	83.60
T_2-PLE	54.00	82.00
T_3-Cow Urine	78.00	85.20
T_4-Coconut water	86.00	88.40
T_5- LCE	51.20	78.00
Mean	63.20	82.20
Range	50.00 - 86.00	76.00-88.40
F- test	2369.83*	63.31*
S. Ed. (±)	0.441	0.816
C. D. (P = 0.05)	0.935	1.731

Table.2 Effect of priming treatments on seedling length (cm) in sorghum (*Sorghum bicolor* L.) seeds

Treatments (T)	Variety	
	V_1 -M35-1	V_2-DSH
T_0- Control	26.17	28.16
T_1-NLE	30.18	36.09
T_2-PLE	28.29	34.20
T_3-Cow Urine	30.86	39.53
T_4-Coconut water	34.30	40.28
T_5- LCE	27.55	33.40
Mean	29.56	35.28
Range	26.17-34.30	28.16-40.28
F- test	14.07*	55.61*
S. Ed. (±)	1.089	0.844
C. D. (P = 0.05)	2.308	1.790

Fig.1 Histogram Effect of priming treatments on seed germination (%) in sorghum (*Sorghum bicolor* L.) seeds

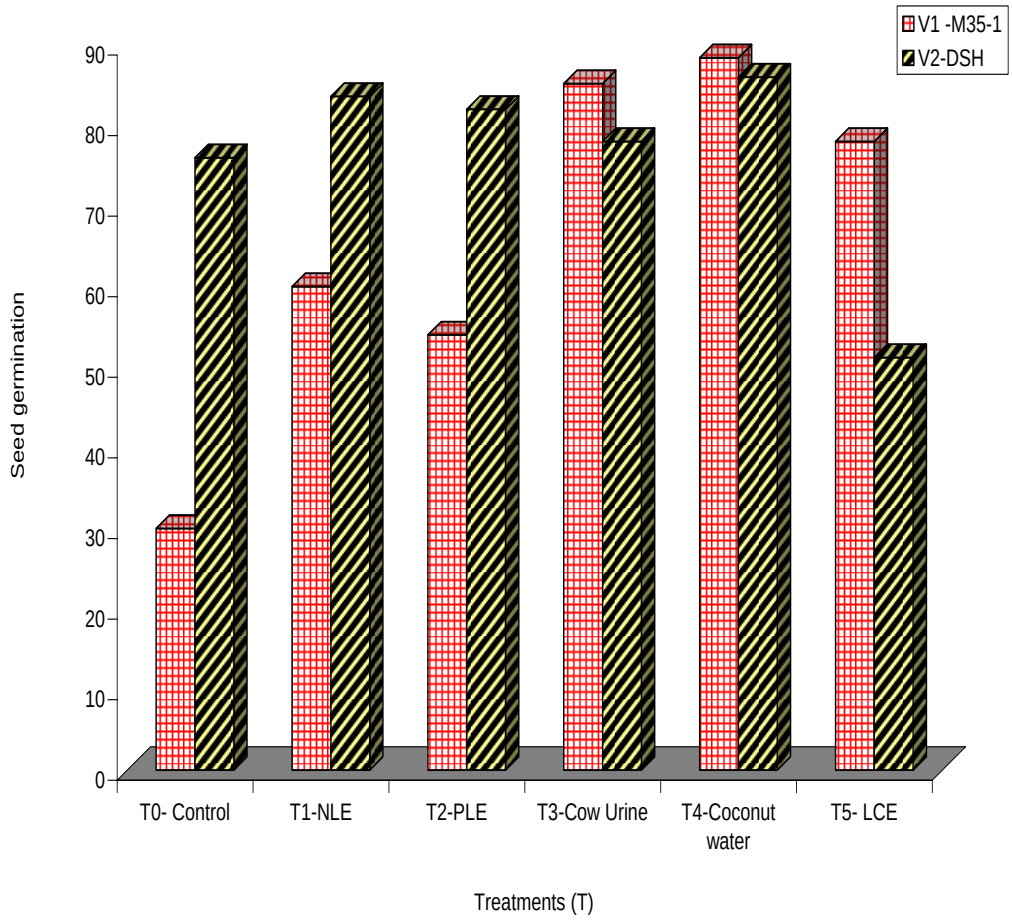
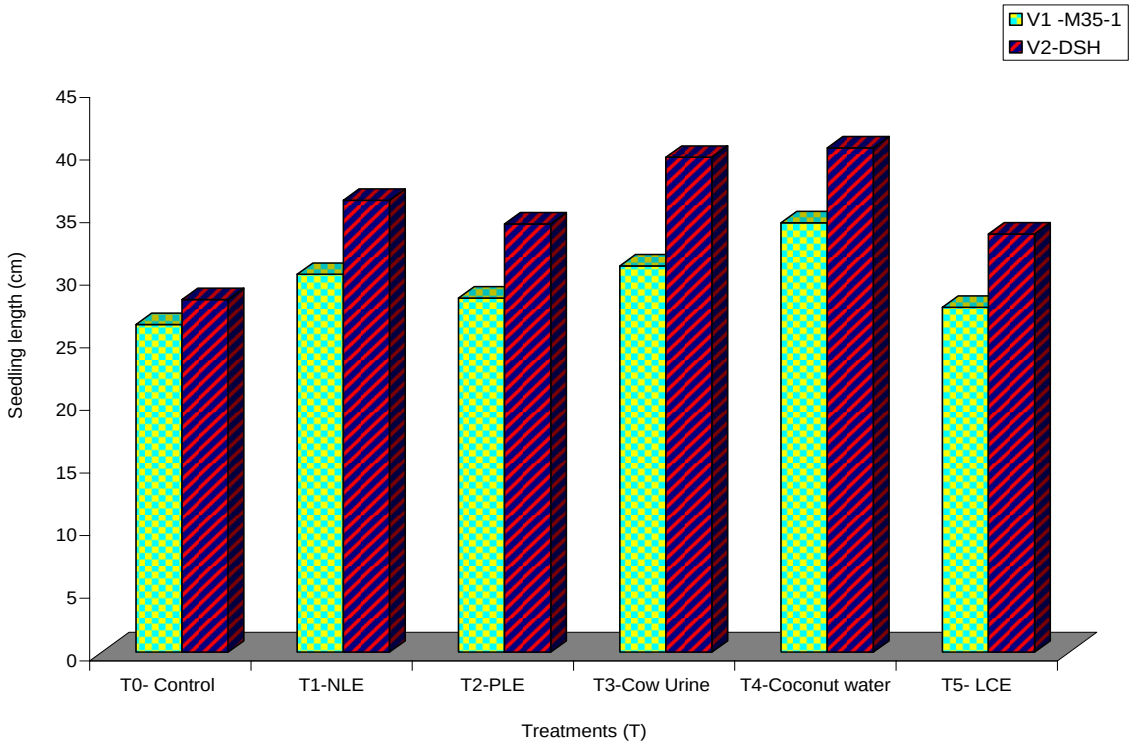


Fig.2 Histogram Effect of priming treatments on seedling length (cm) in sorghum (*Sorghum bicolor* L.) seeds



Seedling length (cm)

The results of the investigation exhibit a statistically significant variation in seedling length of sorghum. It is evident from the table that maximum increase in seedling length occurs by Coconut water (34.23 cm) followed by Cow Urine (34.13cm) while lowest seedling (29.72 cm) was observed with unprimed control treatment. Coconut water priming was found to be at par with Cow. Similar trend was also observed in M35-1. Among the treatments LCE recorded minimum seedling length (30.90) followed by PLE (32.03 cm). Whereas, maximum seedling length was noticed in the Coconut water (34.78 cm) (Table 2). The interaction effect of variety and treatments results were found significant.

Abasdokht *et al.,* (2010) reported similar results in wheat. The affects of osmotic priming has improved seedling emergence. Abebe *et al.,* (2009) found similar results in dry beans where soaking of seeds water (hydropriming) resulted increased seedling length. Caserio (2004) reported that the Halopriming effects on seedling length of onion. Vyankarnahal *et al.,* (1998) reported that matriconditioning for sunflower are established as best improving seedling length.

As per the above investigations it has been concluded that priming with different botanicals and animal waste is very much useful in obtaining good germination percentage and good seedling growth in sorghum by protecting them with various biotic and abiotic stresses which intern helps in getting good growth of the plants and higher yield. From the various treatments imposed coconut water and cow urine @ 3 per cent found very effective when

compared to other treatments on the sorghum varieties DSH and M-35-1.

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