

ASSESSMENT OF DIFFERENT ORGANIC PRIMING TREATMENTS ON SEED QUALITY PARAMETERS IN FOXTAIL MILLET (*SETARIA ITALICA* L.)

PREMARA BINNY JACOB^{1*}, ARUN KUMAR CHAURASIA², PRADEEP K. SHUKLA³, SMILY PRIYANKA NELAPATI⁺¹, C H SAI KIRAN⁺¹ AND POONAM DILIP PATIL⁺¹

^{1,2}Department of Genetics and Plant Breeding, NAINI, SHUATS, Prayagraj, U.P., India

³Department of Biological Science, NAINI, SHUATS, Prayagraj, U.P., India

(Received 10 August, 2021; Accepted 23 September, 2021)

Key words : Foxtail millet, Panchagavya, Neem leaf extract, Moringa leaf extract, Tulsi leaf extract, Cow urine, Coconut water.

Abstract – The present study was carried out to assess the effect of organic seed treatments on seed quality parameters of foxtail millet (*Setaria italica* L.). The study was carried out in the seed testing laboratory of Department of Genetics and Plant breeding, SHUATS, Prayagraj with the treatments as Panchagavya, Neem leaf extract, Moringa leaf extract, Tulsi leaf extract, Coconut water and Cow urine. Seeds primed with Panchagavya 5% germination % (93.18), root length (11.06cm), shoot length (12.78cm), seedling length (23.84cm), seedling fresh weight (7.99g), seedling dry weight (0.76g), vigour index I (2221.41), vigour index II (70.82) increased. Priming with coconut water, neem leaf extract, moringa leaf extract, tulsi leaf extract and cow urine were not found so effective in enhancing the seed quality parameters of foxtail millet

INTRODUCTION

Millets are recognized as important substitutes for major cereal crops to cope up with world wide food storage and to meet the demands of increasing population of both the developing and developed countries. They can be well exploited as special purpose food in view of their better nutritional and functional qualities by using a appropriate processing technologies. Millets occupy an important place in the world food and nutrition economy. They are dependable cash crops for small farmers. Millets have unique traits like fast maturing and therefore fit into intensive cropping systems. Foxtail millet (*Setaria italica* L.) is one of the oldest crops cultivated for hay, pasture and food grain. Foxtail millet is also known as Italian or German-Hungarian or Siberian millet. Among the millets, foxtail millet is a dry land crop belonging to the family of Gramineae. It mainly constitutes protein (11.7%), fat (3.9%), ash (3.0%), crude fiber (7.0%), carbohydrates (60.9 g), few major micro nutrients like Ca (31.0 mg), Fe (2.80 mg) and amino acids like

niacin (3.20 mg), thiamin (0.59 mg) and riboflavin (0.11 mg). Among millets, foxtail millet is the only crop possessing rich 14 genetic and genomic resources, and globally it is the second most 15 cultivated millet next to pearl millet. Millets are the significant food and fodder plants in semi-arid areas and are gaining more importance in globe. India is the world's biggest producer of millets and accounts for more than 40% of world's consumption. In India, foxtail millet cultivated over an area of 0.619 m.ha with the production of 0.442 mt and productivity of 714 kg per hectare. The area is mostly concentrated in Madhya Pradesh, Andhra Pradesh, Gujarat, Tamil Nadu, Maharashtra and Karnataka. With due climate change, the existence of unpredictable rainfall, most of the times farm saved grains are used as seeds, while the changing environment conditions also affect the crop establishment and leading to crop failure.

Seed priming is one of the key solution to overcome these problems and is very simple to adopt and being a low cost technology too, especially for dry land farmers. Priming is one of the

(¹M.Sc.Scholar, ²Associate Professor, ³Assistant Professor (Senior Grade)

most important physiological methods which improves the seed performance and provides faster and synchronized germination. The primed seeds give earlier, more uniform and greater germination and seedling establishment and growth.

Organic seed priming provides resistant to high temperature and low moisture especially in semiarid tropics. It encourages quicker germination, greater seedling vigour resulting in increased crop productivity especially in advanced countries it integrates the biological and physiological aspects of enhancing growth, disease control and increase in yield (Iswariya *et al.*, 2019)

MATERIALS AND METHODS

The study was carried out at seed testing laboratory of department of Genetics and Plant Breeding, Sam Higginbottom University of Agriculture Technology and Sciences (SHUATS), Naini Agriculture Institute (NAI), Prayagraj (U. P.).

Current experiment conducted using Complete Randomized Design with four replication. Foxtail millet cultivar Suryanandi (SiA 3088) were used for experiment with different organic seed treatments T₀ to T₁₁. Lab experiment data analysis were assessed by ANOVA carried out according to procedure of Completely Randomized Design.

TREATMENTS

T₀- Control, T₁- Neem leaf extract 3% for 6hrs, T₂- Neem leaf extract 5% for 6 hrs, T₃-Tulasi leaf extract 3% for 6hrs, T₄- Moringa leaf extract 3% for 6hrs, T₅-

Moringa leaf extract 5% for 6hrs, T₆- Coconut water 3% for 6 hrs, T₇- Coconut water 5% for 6 hrs, T₈- Panchagavya 3% for 6hrs, T₉- Panchagavya 5% for 6 hrs, T₁₀-Cow urine 3% for 6hrs, T₁₁- Cow urine 5% for 6hrs.

METHODOLOGY

Panchagavya, a fermented product is literally prepared from five products of a cow *viz.*, milk, urine, dung, curd and ghee. These ingredients are placed in a pot and mixed twice daily to enhance the microbial activity; on the 15th day the enriched product panchagavya is formed. To prepare 3%, 5% solution; 30 ml, and 50 ml of the fermented panchagavya was taken in beaker and then 1000ml distilled water was added with constant stirring to get mixed up properly.

Neem leaf extract was prepared by taking Two hundred and fifty matured neem leaves (250g) were homogenized in a pre-chilled pestle and mortar using 250 ml chilled, sterilized distilled water. 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, 5 ml filtrate was added to 100 ml to get 3 percent, 5 percent solution. This solution is used for soaking the seeds. Seeds were soaked for 6 hrs. Then the seeds were air dried. The same procedure was followed for moringa and tulasi leaf extracts.

Locally available cow urine is used for seed treatment which acts as growth promoter by

Table 1. Mean performance on effect of treatments on seed quality parameters

Treatment	Particulars	G%	RL	SL	SDL	SFW	SDW	VI	VII
T0	Control	78.52	6.98	8.56	15.54	5.59	0.65	1220.20	51.04
T1	Neem leaf extract	91.35	7.63	10.96	18.59	7.22	0.73	1698.20	66.69
T2	Neem leaf extract	91.51	8.86	11.08	19.94	6.05	0.7	1824.71	64.06
T3	Tulasi leaf extract	84.92	8.08	10.12	18.2	7.92	0.73	1545.54	61.99
T4	Moringa leaf extract	85.65	8.43	11.25	19.68	7.83	0.74	1685.59	63.38
T5	Moringa leaf extract	87.05	8.67	12.36	21.03	7.65	0.68	1830.66	59.19
T6	Coconut water	87.87	8.75	10.84	19.59	6.36	0.72	1721.37	63.27
T7	Coconut water	90.76	7.88	11.69	19.57	6.71	0.74	1776.17	67.16
T8	Panchagavya	92.04	10.66	12.24	22.9	7.12	0.69	2107.72	63.51
T9	Panchagavya	93.18	11.06	12.78	23.84	7.96	0.76	2221.41	70.82
T10	Cow urine	83.63	7.3	12.04	19.34	6.68	0.68	1617.40	56.87
T11	Cow urine	84.63	7.63	12.45	20.08	7.03	0.7	1699.37	59.24
	GRAND MEAN	87.59	8.49	11.36	19.86	7.01	0.71	1745.70	62.27
	SE(d)	0.30	0.21	0.23	0.56	0.62	0.44	2.37	2.02
	C.D @ (5%)	0.60	0.43	0.47	1.13	1.24	0.89	4.76	4.06
	C.V.	2.26	1.56	2.14	5.69	5.52	0.86	8.65	7.51

preventing plant disease, 30 ml and 50 ml of cow urine were added separately in 100 ml water to get 30% and 50% of solutions which were used for seed treatment as per the required weight by volume ratio of seed to solution. Seeds soaked for 6 hrs for foxtail millet. 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.. seeds were soaked in coconut water for 6 hrs.

Further the seeds were dried under shade to bring back to its safer (original moisture content) and were subjected for seed quality testing. Seed germination percentage was worked out as per the procedure given by ISTA, shoot length, root length, seedling dry weight, Seedling vigour index I = Germination per cent × [Root length (cm) + Shoot length (cm)] and Seedling vigour index II = Germination per cent × Seedling dry weight (g)

RESULTS AND DISCUSSION

Germination (%) : The observations on

germination% of foxtail millet were statistically analyzed. A range of 78.52% to 93.18% of germination percent with 87.59% mean value. The maximum amount of germination percent (93.18%) recorded with T9 (Panchagavya 5%) and minimum germination percent (78.52%) recorded with T₀ (control). Germination percentage data were collected and statistically analyzed found significant difference among the traits.

Root length (cm): The observations on root length of foxtail millet were statistically analyzed. A range of 6.98 to 11.06 of rootlength with 8.49 mean value. The maximum amount of root length (11.06) recorded with T9 (Panchagavya 5%) and minimum rootlength (6.98) recorded with T₀ (control). Root length data were collected and statistically analyzed found significant difference among the traits.

Shoot length (cm): The observations on shoot length of foxtail millet were statistically analyzed. A range of 8.56 to 12.78 of shoot length with 11.36 mean value. The maximum amount of shoot length (12.78) recorded with T9 (Panchagavya 5%) and minimum shoot length (8.56) recorded with T₀ (control). Shoot length data were collected and statistically analyzed found significant difference among the traits.

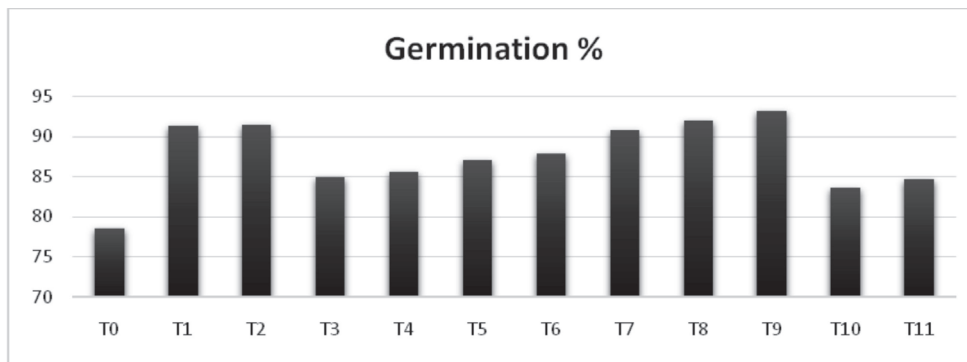


Fig. 1. Germination% as influence by different priming treatments on foxtail millet seeds

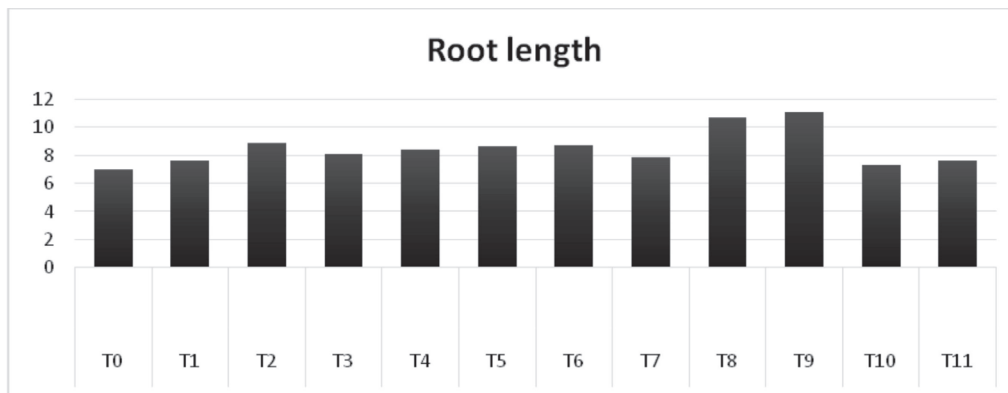


Fig. 2. Root length as influence by different priming treatments on foxtail millet seeds

Seedling length (cm): The observations on seedling length of foxtail millet were statistically analyzed. A range of 15.54 to 23.84 of seedling length with 19.86 mean value. The maximum amount of seedling length (23.84) recorded with T9 (Panchagavya 5%) and minimum seedling length (15.54) recorded with T₀(control) respectively.

Seedling fresh weight (g): The observations on seedling fresh weight of foxtail millet were

statistically analyzed. A range of 5.59 to 7.96 of seedling fresh weight with 7.01 mean value. The maximum amount of seedling fresh weight (7.96) recorded with T9 (Panchagavya 5%) and minimum seedling fresh weight (5.59) recorded with T₀ (control) respectively.

Seedling dry weight (g): The observations on seedling dry weight of foxtail millet were statistically analyzed. A range of 0.65 to 0.76 of

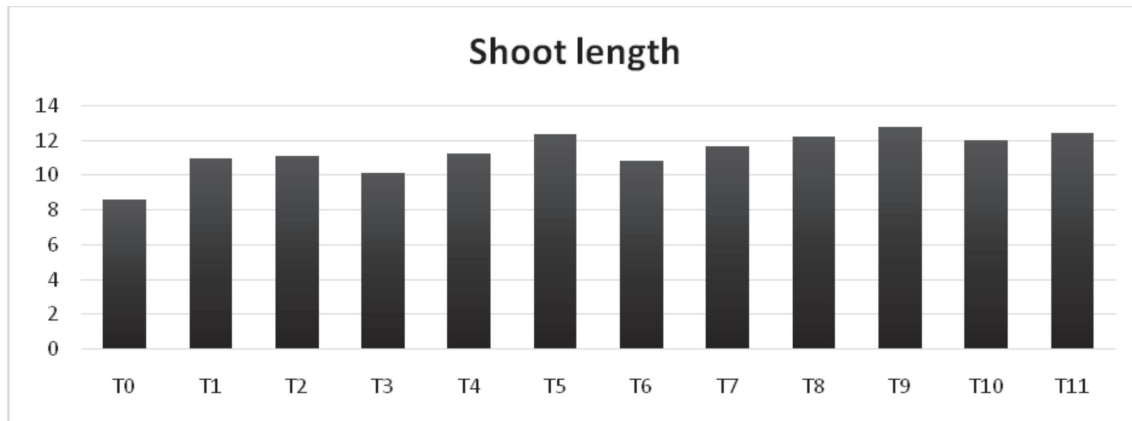


Fig. 3. Shoot length as influence by different priming treatments on foxtail millet seeds

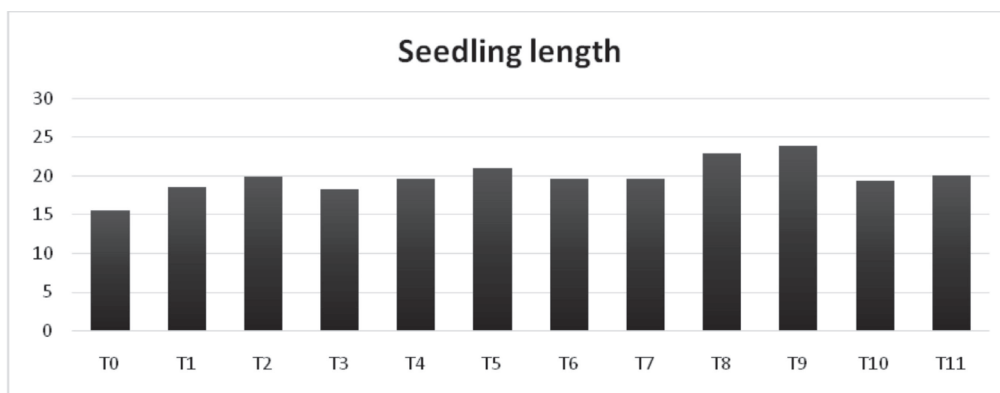


Fig. 4. Seedling length as influence by different priming treatments on foxtail millet seed

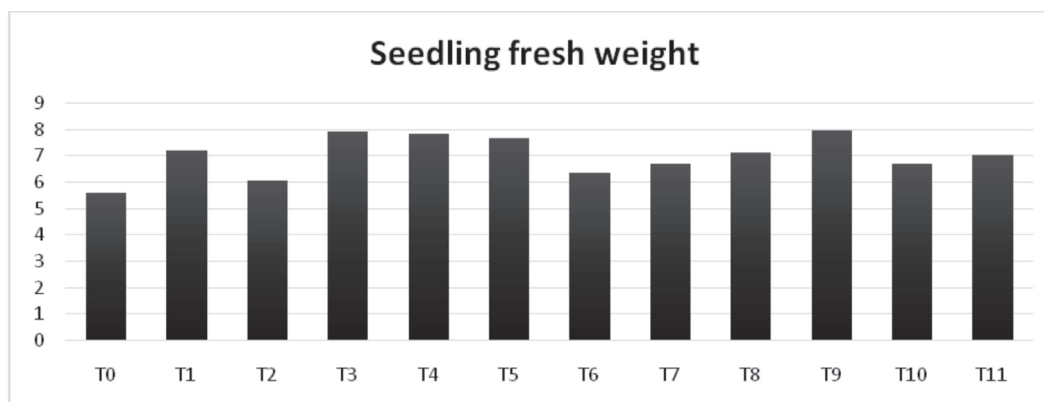


Fig. 5. Seedling fresh weight as influence by different priming treatments on foxtail millet seeds

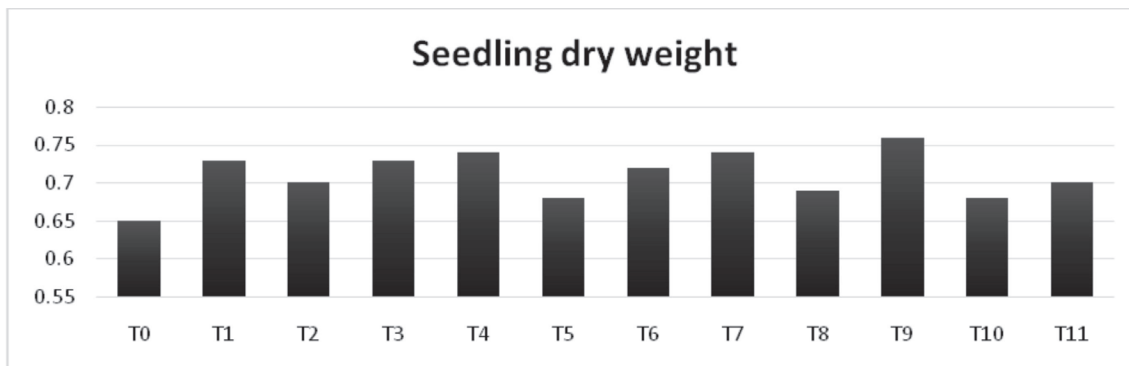


Fig. 6. Seedling dry weight as influence by different priming treatments on foxtail millet seeds

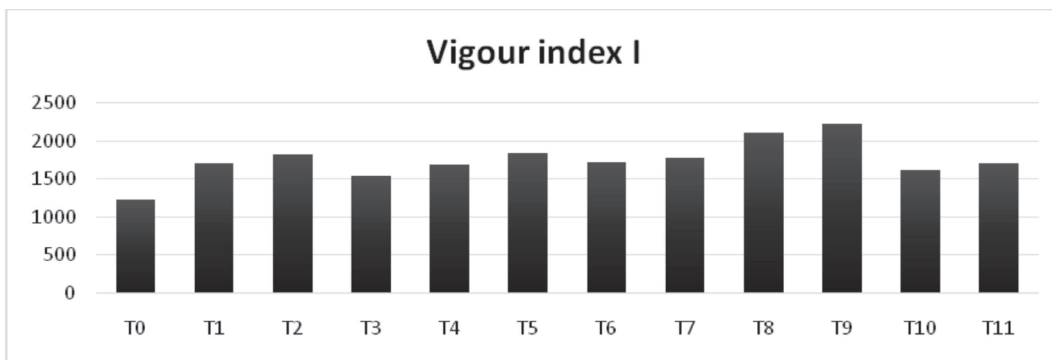


Fig. 7. Vigour index I as influence by different priming treatments on foxtail millet seeds

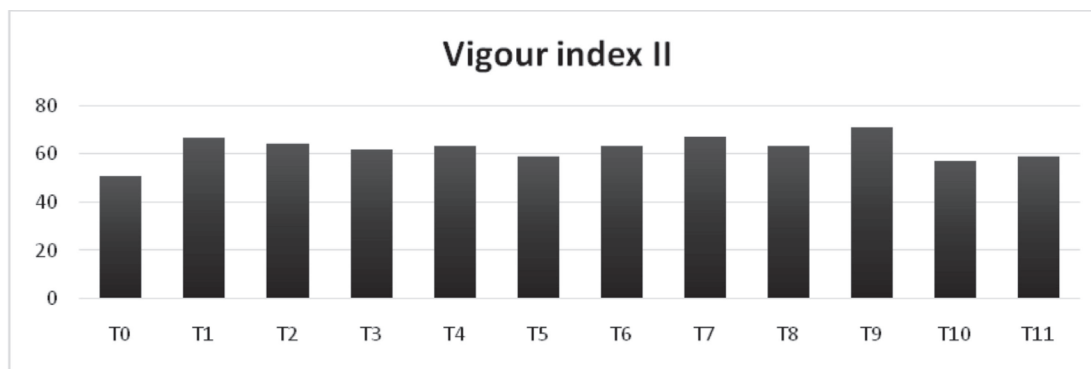


Fig. 8. Vigour index II as influence by different priming treatments on foxtail millet seeds

seedling dry weight with 0.71 mean value. The maximum amount of seedling dry weight (0.76) recorded with T9 (Panchagavya 5%) and minimum seedling dry weight (0.65) recorded with T₀ (control) respectively.

Seedling vigour index-I: The observations on vigour index I of foxtail millet were statistically analyzed. A range of 1220.20 to 2221.41 of vigour index I with 1745.70 mean value. The maximum amount of vigour index I (2221.41) recorded with T9 (Panchagavya 5%) and minimum vigour index I (1220.20) recorded with T₀ (control) respectively.

Seedling vigour index-II: The observations on vigour index II of foxtail millet were statistically analyzed. A range of 51.04 to 70.82 of vigour index II with 62.27 mean value. The maximum amount of vigour index II (70.82) recorded with T9 (Panchagavya 5%) and minimum vigour index II (51.04) recorded with T₀ (control) respectively.

DISCUSSION

Seed priming treatments had profound, influence on seed quality parameters of foxtail millet. The

reasons for increased seed physiological parameters may be due to the fact that in panchagavya cow urine contains physiological active substances *viz.*, growth regulators, nutrients (about 1.0 per cent nitrogen, traces of P_2O_5 and 1.0 per cent K_2O). Seedpriming with organic liquids increase the free radical scavenging enzymes to improve seed viability and strength.

Among the seed priming treatments panchagavya at 5% (T_9) recorded significantly higher germination percent (93.18%) higher shoot length (12.78cm) higher root length (11.06 cm) and total seedling length (23.84 cm) compared over control (78.52%, 8.56 cm 6.98cm), respectively and other treatments. However panchagavya at 5% (T_9) was on par with neem leaf extract at 5% (91.51%, 11.08 cm, 8.86 cm) respectively.

Rapid germination of seeds due to priming ultimately could lead to the production of larger seedlings. The results presented confirm that primed seed exhibit early vigour and produce significantly taller root and shoot and thereby heavier seedlings due to enhanced activity of alpha-amylase.

The presence of beneficial macro and essential micro nutrients, vitamins, essential amino acids, growth promoting substances like indole acetic acid (IAA), gibberlic acid (GA) and beneficial microorganisms in cow urine might be helpful in the initial seed germination phase and seedling growth.

Among the priming treatment, seed priming with panchagavya at 5% (T_9) significantly influenced seedling vigour index - I (2221.41), seedling vigour

index -II (70.82), seedling dry weight (0.76mg), compared to control (1220.20, 51.04, 0.65mg) and was on par with neem leaf extract 5% T_2 (1824.71, 64.06, 0.7mg)

The enhancement in seedling vigour indices and seedling dry weight may be attributed due to the action of growth promoting substances such as GA, kinetin and microbes present in panchagavya which may be responsible for enhanced microbial activity resulting in increased nitrogen content this is responsible for increased seed germination and seedling length.

CONCLUSION

Seed quality of foxtail millet was significantly influenced by organic seed priming treatments. Seed priming with Panchagavya at 5% (T_9) was found to be significant compared to control (T_0). The study reveals that foxtail millet seeds primed with Panchagavya 5% germination %, root length, shoot length, seedling length, seedling fresh weight, seedling dry weight, vigour index I, vigour index II increased. GA_3 is the best seed treatment for seedling growth traits of foxtail millet. These conclusions are based on the results of three months investigation and therefore further investigation is needed to arrive at valid recommendations

REFERENCES

- Iswariya, K., Sujatha, Subhashini, R. 2019. Enhancement of seedling vigour through bio-priming for Barnyard Millet Var. MDU 1 S. *Int. J Curr. Microbiol. App. Sci.* 8(4) : 2254-2259.