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Effect of Seed Priming Treatments with Panchagavya, Jeevamrutha, Beejamrutha and Leaf Extracts, Sodium Molybdate on Seed Quality Parameters of Field Pea (*Pisum sativum)*

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

The present research study was conducted at the Seed testing laboratory of Sam Higginbottom Institute of Agriculture Technology and Sciences, Prayagraj, Uttar Pradesh in 2020-2021. The research study revealedthat effect of seed priming treatments with Panchagavya, Jeevamrutha, Beejamrutha and leaf extracts, Sodium molybdate on seed quality parameters of field pea was analyzed through Completely Randomized Design (CRD). Organic treatments are designated as Panchagavya 3% and 5%, Jeevamrutha 3% and 5%, Beejamrutha 5% are used as treatment 8Hrs respectively, botanical treatments are Tulasi leaf extract 6%, Lantana camara leaf extract for 6% are used as treatment for duration of 4 hours respectivelyin which the treatment T8- Sodium molybdate (3%) for 3 Hrs exhibited higher mean value for seed germination (76.75%), root length (6.49 cm), shoot length (7.84 cm), seedling length (14.33 cm), seed vigour index -I (1099.68) and Followed by value was exhibited by T6-Tulasi Leaf Extract (6%) with respect of Root length (6.79 cm)Seedling dry weight (1.725 g), Seed Vigour Index II (129.78), T0 (control) with respect of Germination percentage (71.75%) root length (6.30 cm), shoot length (6.60 cm) and seedling length (12.90 cm), seed vigour index I &II (925.60 & 98.13).

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Keywords: Field pea; organic priming; panchagavya, jeevamrutha; beejamrutha and leaf extracts; sodium molybdate; completely randomized design (CRD).

1. INTRODUCTION

Field pea (*Pisum sativum L*.) is a temperate crop grown in higher altitudes in tropical areas with temperature ranging between 7- 30°C. It is diploid with 2n=14, It is one of the sixth major pulse crops cultivated globally and is second highest yielding grain legume next to broad bean (*Vicia faba*). Field pea (*Pisum sativum L.*) is a self-pollinated rabi pulse crop which is developed for nourishment, feed and vegetables. India is the largest producer and importer of pulses in the world whereas; productivity is low as compared to China and USSR [1].

In India, Total pulse production is 25.23 M tonnes (2017-18) total area under pea production is 9.01 lakh ha and total production of 8.49 lakh tons were recorded. In India Uttar Pradesh ranked first both in area and production (37.90% and 41.58%) followed by Madhya Pradesh (38.67% and 32.98%) and Jharkhand (3.80% and 4.85%). In case of productivity Rajasthan holds first rank (1867 kg/ha) followed by Punjab (1297 kg/ha) and Jharkhand (1203 kg/ha). The lowest production was observed in Maharashtra (390 kg/ha) followed by Chhattisgarh (437 kg/ha). (Source: Annual statistical report 2016-17).

Nutritional value for 100 g. includes energy 81 Kcal, Carbohydrates -14.45 g, Protein 5.42 g, Total fat- 0.40 g, Dietary fiber- 5.1 g, Cholesterol – 0 mg (Source: USDA National Nutrient data base) Supply of good quality seeds is an important crucial point and it becomes imperative to evolve a strategy to produce quality seeds and made them available in time at a reasonable price to the farming community.

Pre-sowing seed treatment including chemical, polymer coating, botanical and priming treatments plays an important role in improve seed performance. Usually priming leads to improve plant performance through enhancement in vigour, germination and drought tolerance [2].

The most cost effective method available for better stand establishment is to sow the seed with high germination which shows quick early growth. The major constraints of good establishment are due to low quality seed in addition to lack of soil moisture [3]. These conditions result in poor emergence that may subsequently cause sparse plant stands [4].

Priming allows some of the metabolic processes necessary for germination to occur without germination take place. Priming is one of the most important physiological methods which improves the seed performance and provides faster and synchronized germination. The primed seeds give earlier, more uniform and sometimes greater germination and seedling establishment and growth [5].

In priming, seeds are soaked in different solutions with high osmotic potential. This prevents the seeds from absorbing in enough water for radicle protrusion, thus suspending the seeds in the lag phase [6].

In order to compete with weed species and better seed performance quick and synchronized germination is desirable to set crop successfully. This was achieved by priming, which involves controlled hydration that restricts germination but permit pre germinative physiological and biochemical changes to occur [7,8].

Objectives: a) To evaluate the effect of organic on seed quality parameters of field pea. b)To access the optimum suitable dosage among seed treatment for field pea.

2. MATERIALS AND METHODS

The present study was carried out in the laboratory of department of Genetics and Plant Breeding, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (Uttar Pradesh) during Rabi 2020-2021. The study was conducted in order to evaluate the effect of priming on seed quality parameters of field pea under distilled water condition. The experiments was conducted based on Completely Randomized Design with four replications and eight treatments and one (untreated) as control were T0- control, T1-panchagavya 3% (8hrs),T2-Panchagavya5% (8hrs), T3- Jeevamrutha 3% (8 hrs), T4-Jeevamrutha 5% (8 hrs) T5-Beejamrutha 5%(8 hrs), T6-Tulasi Leaf Extract 6% (4 hrs), T7-Lantana leaf Extract 6% (4 hrs), T8-Sodium molydate 3%(3 hr). The data were collected on ten randomly selected healthy seedlings from each replication and measurement of different

observations was recorded.The treated seeds along with control (untreated) were examined for all the quality parameters viz. Germination (%), shoot length (cm), seedling dry weight (g), seed vigour index-I, seed vigour index-II.The analysis of data was work out in CRD with the doses of treatments. The various statistical techniques were used for calculation of data as suggested by Fisher and Yates [9].

3. RESULTS AND DISCUSSION

The results of the present investigation that the response of crop for different seed treatments were interpreted in terms of Germination percentage, root length (cm), shoot length (cm), seedling length (cm) and Seedling fresh weight, seedling dry weight seed vigour index I &II. The collected data were analyzed statistically to evaluate the significance of variation due to different seed treatments.

Seed Germination Percentage: The seed germination percentage of pea it is evident from the Table 2 ranged from 71.75 to 78.75 with mean value of 74.77 in which significantly maximum increase in seed germination percentage (78.75) was recorded in T4 followed by T8.Similar findings regarding integrated use of different chemical and biofertilizers showed significant increase in germination percent, root-shoot length of seedlings and SVI compared to non-treated plants Amit Mishra et al. [10].

Root Length (cm): The root length it is evident from the Table 2 ranged from 6.29 cm to 6.79 cm with mean value of 6.51 cm in which maximum root length (6.79 cm) was recorded in T6 next followed by T4. Yakkala Siva Sankar et al. [11] conducted to the viability and vigour parameters of ten okra varieties were evaluated by following parameters such as root length, shoot length, seedling length, dry root weight, dry shoot weight, seedling dry weight, vigour index length.

Shoot Length (cm): The shoot length of pea it is evident from the Table 2 ranged from 6.602 cm to 7.835 cm with mean value of 6.97 cm in which maximum shoot length (7.84 cm) was recorded in T8 followed by T4. Deshpande [12] conducted experiment on Chickpea verities significant difference were observed on root and shoot length and vigor index.

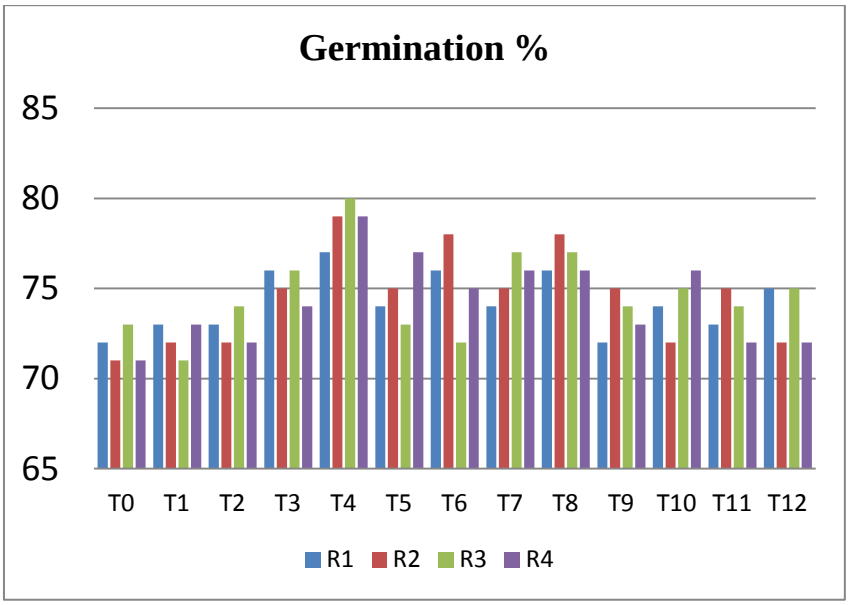

Fig. 1. Histogram depicting germination percentage due the effect of treatment

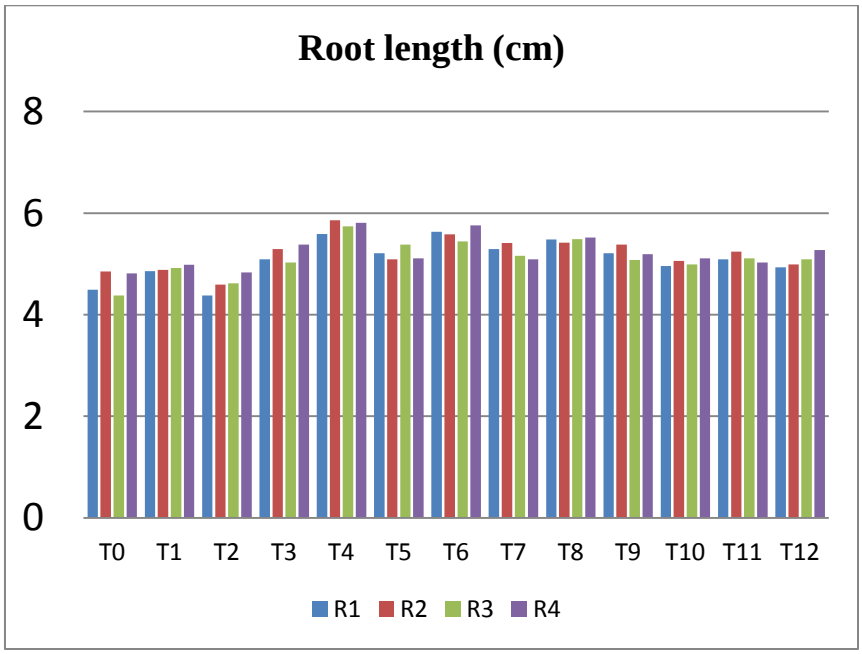

Fig. 2. Histogram depicting root length due the effect of treatment

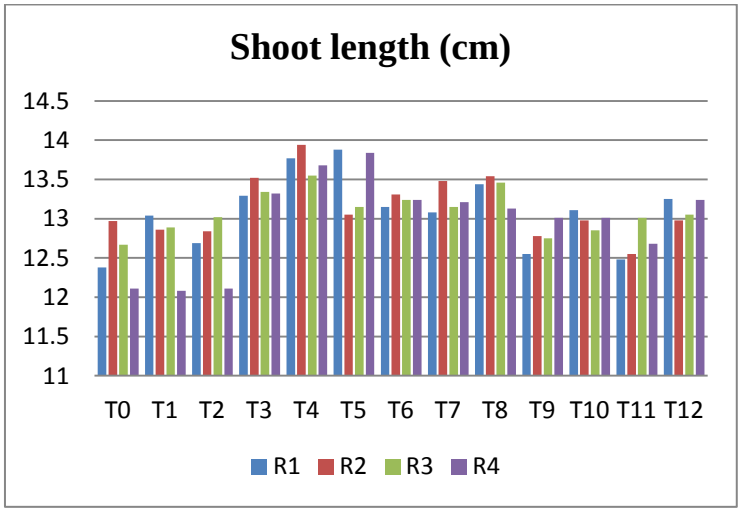

Fig. 3. Histogram depicting shoot length due the effect of treatment

Seedling Length (cm): The seedling length it is evident from the Table 2 ranged from 12.9 cm to 14.32 cm with mean value of 13.49 in which maximum seedling length (14.32 cm) was recorded in T8 next followed by T4.Ramesh Kumar Bhardwaj et al. [13] assess to know the nature and magnitude of association among yield and different seed characters on thirty diverse genotypes of cucumber collected from different indigenous sources in which seed germination, dry seedling weight, seedling length, seed vigor index-I and seed vigor index-II is reliable for yield improvement in cucumber.

Seedling Fresh Weight (g): The Seedling Fresh weight it is evident from the Table 2 ranged from 5.86g to 10.60 g with mean value of 7.710 g in which maximum seedling fresh weight (10.60 g) was recorded in T3 next followed by T2. These findings were in accordance with Mummigati et al. [14]; Kumar et al. [15]; Rathod et al. [16] and Sharma and Jain [17] Saeedipour [18].

Seedling Dry Weight (g): The Seedling dry weight it is evident from the Table 2 ranged from 1.36 g to 1.72 g with mean value of 7.710 g in which maximum seedling dry weight (1.72 g) was recorded in T6 next followed by T4. On-farm

seed priming is a simple, low cost intervention, and its impact is large enough to induce farmers to make other, changes in agronomic practices, perhaps more risky or more costly, in order to make further gains [19]

Seed Vigour Index- I (SVI-I): The seed vigour index -I it is evident from the Table 2 ranged from 925.59 to 1099.68 with mean value of 1764.38 in which maximum seed vigour index-I (1009.49) was recorded in T8 next followed by T4.R. K. Panda et al., [20] conducted the impact of integrated nutrient management on production of quality seeds in cowpea.

Seed Vigour Index- II (SVI-II): The seed vigour index -II it is evident from the Table 2 ranged from 98.132 to 129.77 with mean value of 1764.38 in which maximum seed vigour index-I (129.77) was recorded in T6 next followed by T4. C. K. Pramila et al., [21] revealed that highest seed germination (89.42%) was recorded in fenugreek followed by fennel (76.82%) and lowest (64.33%) in coriander.

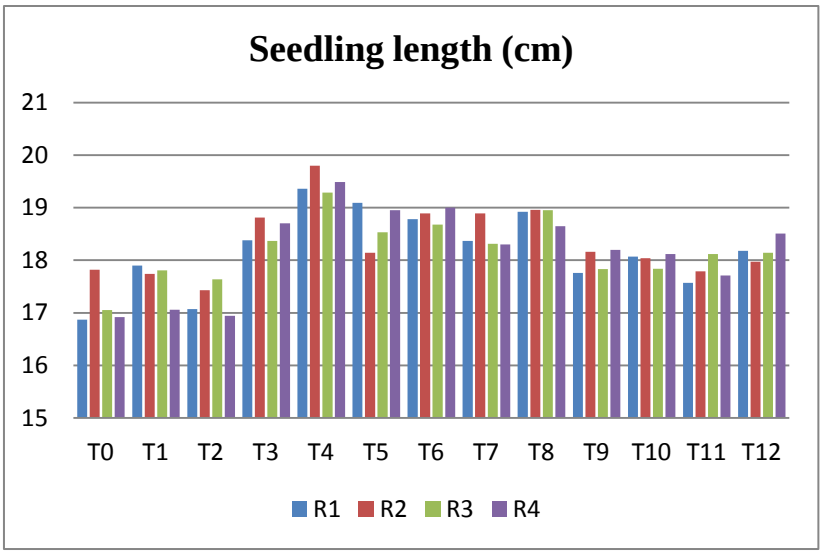

Fig. 4. Histogram depicting Seedling length due the effect of treatment

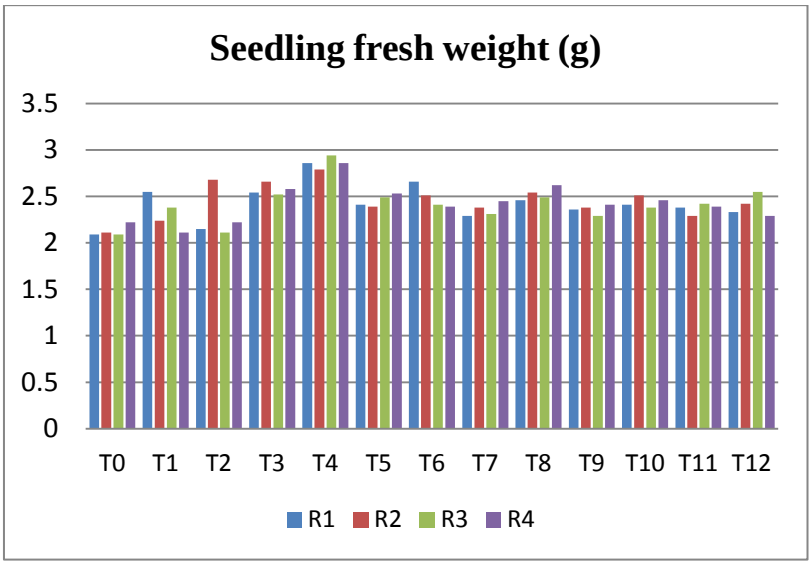

Fig. 5. Histogram depicting seedling fresh weight due the effect of treatment)

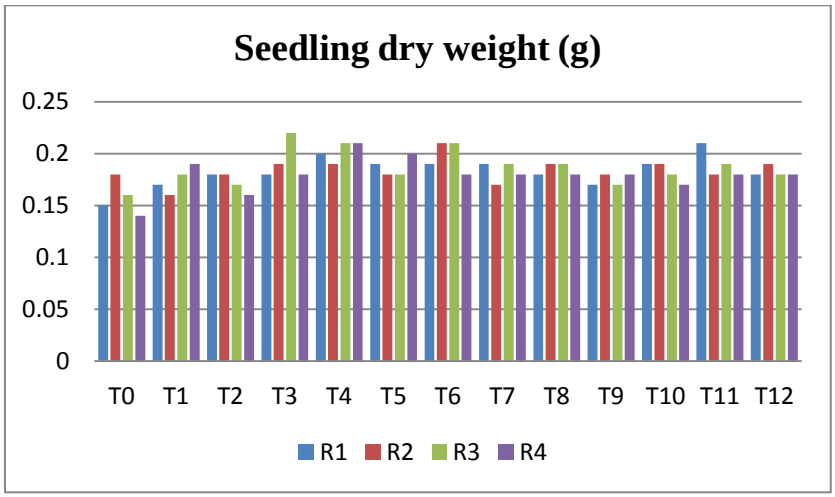

Fig. 6. Histogram depicting Seedling dry weight due the effect of treatment)

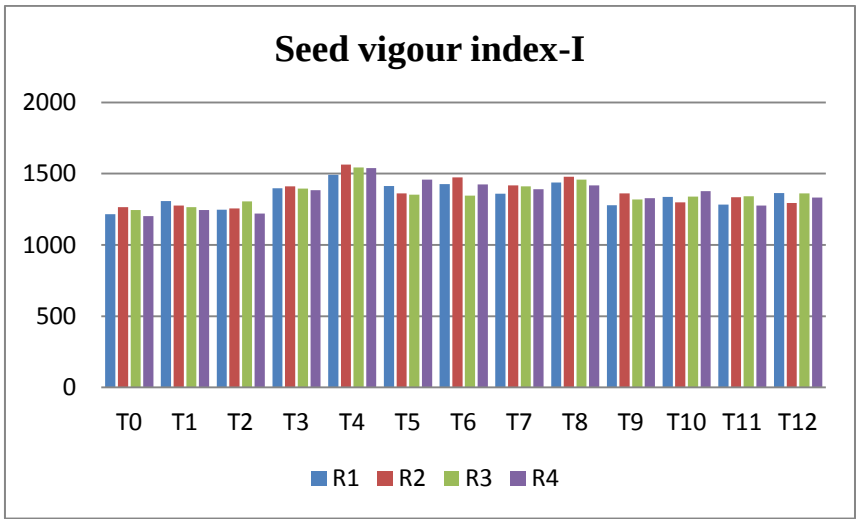

Fig . 7. Histogram depicting Seed vigour index -I due the effect of treatment)

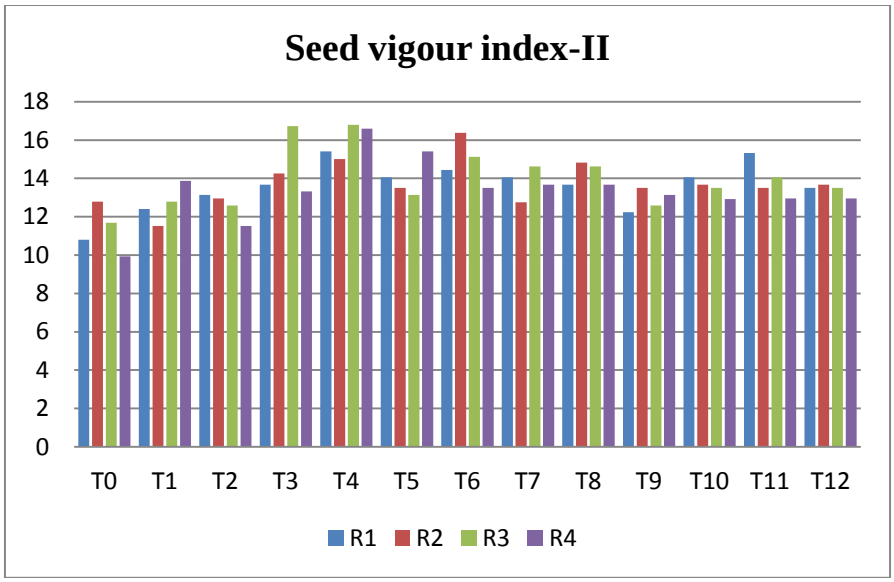

Fig. 8. Histogram depicting Seed vigour index -II due the effect of treatment)

Table 1. Details of priming treatments for field pea

Sl. no	Treatment	Intensity	Duration
T0	**Control**	**-**	**-**
T1	Panchagavya	3%	8HRS
T2	Panchagavya	5%	8HRS
T3	Jeevamrutha	3%	8HRS
T4	Jeevamrutha	5%	8HRS
T5	Beejamrutha	3%	8HRS
T6	Tulasi leaf extract	6%	4HRS
T7	Lantana camara extract	6%	4HRS
T8	Sodium Molybdate	3%	2HRS

Table 2. Mean performance of field pea for 8 seedling characters

Sr. No	Characters	Mean sum of squares	
		Treatments df (12)	**Error df (39)**
1.	Germination%	20.152**	1.888
2	Root length (cm)	0.07427**	0.015484
3	Shoot length (cm)	0.5588**	0.060718
4	Seedling length(cm)	0.626897**	0.077472
5	Seedling Fresh weight (g)	6.87**	1.74
6	Seedling Dry weight (g)	0.045**	0.004
7	Seed Vigour index – I	12199.43**	747.2136
8	Seed Vigour index – II	402.1503**	25.7897

***Significant at 5% level of significance*
****Significant at 1% level of significance*

Table 3. Analysis of variance for 8 seedling characters in field pea

Sr.no	Treatment	Germination (%)	Root length (cm)	Shoot length (cm)	Seedling length (cm)	Seedling Fresh weight (g)	Dry weight (g)	Seedling Vigour index- I	Seedling Vigour index- II
1.	T_0	71.75	6.29	6.602	12.9	5.86	1.36	925.59	98.132
2.	T_1	72.25	6.48	6.85	13.33	7.59	1.437	963.09	103.88
3.	T_2	72.75	6.49	6.937	13.43	8.525	1.455	977.16	105.88
4.	T_3	75.25	6.45	6.892	13.35	10.60	1.427	1004.54	107.38
5.	T_4	78.75	6.48	7.28	13.77	7.695	1.582	1084.16	124.60
6.	T_5	74.75	6.65	6.73	13.385	7.73	1.44	1000.83	107.66
7.	T_6	75.25	6.79	6.857	13.647	7.3	1.725	1027.18	129.77
8	T_7	75.5	6.52	6.765	13.287	6.72	1.472	1003.17	111.135
9.	T_8	76.75	6.49	7.835	14.32	7.35	1.447	1099.68	111.045
Grand Total		2692	234.71	251.03	485.74	277.57	53.42	36341.75	3998.02
F Test		S	S	S	S	S	S	S	S
SE(m)		0.687	0.0622	0.123	0.139	0.6601	0.0325	13.66	2.53
CV		1.8373	1.90086	3.533	2.062	17.123	4.391	2.70	4.572
C.D (5%)		1.994	0.18053	0.357	0.40	1.915	0.127	39.65	7.368

4. CONCLUSION

Seed priming treatment enhances the plant stand through improvement in seed health and vigour which ensure seed, food and economic security of the resource poor small and marginal farmers. The present study revealed that there is significance difference of seed priming treatment for seed yield, yield component and seed quality attributes. It is concluded from the present investigation that treatment T8 (Sodium Molybdate) followed by T6-Tulasi Leaf Extract (6%) exhibited higher mean value for seed germination percentage, Root length, Shoot length, Seedling length, seedling fresh weight , seedling dry weight and Seed Vigour Index I & II. . Molybdenum as a cofactor of enzymes involved in nitrogen assimilation leads to increase in the protein content in field pea finally lading to increase in yield and seed quality attributes, Thus, it indicates that the above findings of results of the study clearly indicated the Botanical, Leaf extract, chemical were significant on increase the seed quality parameters of field pea.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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