Int.J.Curr.Microbiol.App.Sci (2021) *10*(01): 280-286

International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 10 Number 01 (2021)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2021.1001.034

Effect of Different Organic and Inorganic Seed Priming Method on Growth, Yield and Quality Parameters of Field Pea (*Pisum sativum* L.)

G. Abdul Wajid[1], KalneniJahnavi[1], Arun Kumar Chaurasia[1], N. Bharath Reddy[1] and B. Prudvi Raj Naidu[2]

[1]Department of Genetics and Plant Breeding, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, U. P., India
[2]State Institute for Management of Agriculture, Department of Agriculture, Govt. of. Uttar Pradesh, India

**Corresponding author*

Keywords

Field pea, GA_3, PEG 6000, KNO_3, $CaCl_2$, KH_2PO_4, Aloe Vera extract, Curry leaf extract, Ginger extract, Moringa leaf extract, Tulasi leaf extract, Priming, Germination, CRD

Article Info

Accepted:
04 December 2020
Available Online:
10 January 2021

A B S T R A C T

Pulses are referred to as poor man's meat, as they are major sources of protein and compliment the stable cereals in the diet with essential nutrients. Field pea is an annual cool season grain legume or pulse crop and majorly grown in rabi season and third most popular rabi pulse of India after chickpea and lentil. The study was conducted to determine the "Effect of different organic and inorganic seed priming method on growth, yield and quality parameters of field pea (*Pisum sativum* L.)" The experiment was carried out at Field Experimentation Centre and Seed Testing Laboratory of the Department of Genetics and Plant Breeding, Sam Higginbottom University of Agriculture, Technology & Sciences, Prayagraj (UP) during Rabi-2019. The experiment was laid out in Randomized Blocked Design for field studiesand Completely Randomized design for lab studies and comprised of 13 treatments and 3 replications. The treatments were T_0(Control), T_1(Distilled water), T_2 (Tulasi leaf extract@ 5%), T_3 (Pongamia Leaf Extract@ 5%), T_4(Curry Leaf Extract@5%), T_5 (Moringa Leaf Extract@5%),T_6 (Neem Leaf Extract @ 5%), T_7(KH2PO4@ 1%), T_8(KH2PO4@ 3%), T_9(KN03 @ 1%) T_{10} (KN03 @ 3%), T_{11}(GA_3 100ppm), T_{12}(PEG 6000 @20%) with a soaking duration of 12 hours. The results revealed that seeds primed with T_{10} (KN03 @ 3%) improved Germination%, Growth, yield and Seed quality Parameters followed by T_6 (Neem Leaf Extract @ 5%) and the least performance was observed in T_0 (control) when compared with other treatments. Hence, seed priming with ($KN0_3$ @3%) and Neem Leaf Extract @5% could be recommended for field pea as a pre-sowing seed treatment.

Introduction

Pulses are referred to as poor man's meat, as they are major sources of protein and compliment the stable cereals in the diet with essential nutrients. They occupy pivotal position particularly in developing countries like India, where most of the population is vegetarian. Pulses belong to the family Leguminosae and subfamily Papilionoidaceae. They provide 22-24 per cent protein and the seeds are considered

easily digestible and the increasing demand of protein rich raw material for animal feed or intermediary product for human nutrition, there is raising interest in these crops as a protein source (Santalla *et al.,* 2001).

Field pea (*Pisum sativum* L.) is represented as one of the world's most seasoned cultivated crop, before tenth and ninth centuries BC (Zohary, Hopf, 2000). *Pisum sativum* comprises of both the wild species (*P.fulvum* and *P.eratius)* and developed species (*P. abyssinicum)* started from the Mediterranean locale, principally in the Middle East (Ellis *et al.,* 2011). The crop is cultivated in numerous nations and right now India's position is fourth among the pulse production in the world with cultivated area of 6.33 million ha. (Source: Devi *et al.,* 2017).

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.

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 report2016-17).

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. Quality seed is the key for successful agriculture which demands that each and every seed should be ready to germinate and produce a vigorous seedling ensuring higher yield (Ananthi *et al.,* 2015). Annual loses due to deterioration can be as much as 25 % of the harvested pulses crop. It is one of the basic reasons for low productivity (Shelar, 2008).

Seed invigoration techniques are used to enhance germination and vigor of seed and seedling growth. It includes the pre-soaking of seeds that improves seed performance by rapid and uniform germination, normal and vigorous seedlings, which result in faster and higher rate of germination and emergence in different crops (Farooq *et al.,* 2007), which also helps seedlings to grow in biotic or abiotic stress condition (Ashraf and Foolad, 2005).

The benefits of priming are it decreases the time to germination. Increases the germination rate. Helps in uniform and faster emergence. Helps the crops in competing with weeds more effectively. Reduces the amount of seed borne fungi (Basra *et al.,* 2004).

Materials and Methods

The experimental study was carried out at Field Experimentation Centre and Seed Testing Laboratory of the Department of Genetics and Plant Breeding, Sam Higginbottom University of Agriculture,

Technology & Sciences, Prayagraj (UP) during Rabi-2019.

The field experiment was conducted in Randomized block design (R.B.D) with three replications and the variety used in this experiment was IP. The data was collected on five randomly selected plants from each plot and measurement of different observations was recorded.

The lab experiment was conducted in Completley Randomised Design (C.R.D) with four replications and the variety used in this experiment was IP-. The data was collected on ten randomly selected healthy seedlings from each replication and measurement of different observations was recorded.

The treatments were T_0 (Control), T_1(Distilled water), T_2 (Tulasi leaf extract @ 5%), T_3 (Pongamia Leaf Extract@ 5%), T_4 (Curry Leaf Extract @ 5%), T_5 (Moringa Leaf Extract @ 5%), T_6 (Neem Leaf Extract @ 5%), T_7 (KH2PO4 @ 1%), T_8 (KH2PO4 @ 3%), T_9 (KN03 @ 1%) T_{10} (KN03 @ 3%), T_{11} (GA_3 100ppm), T_{12} (PEG 6000 @ 20%) with a soaking duration of 12 hours

Priming Methods	Treatment Symbol	Treatments
T_0	**Control**	**Unprimed seeds**
T_1	Distilled Water	**Hydro priming**
T_2	Tulasileaf extract (5%)	**Organic priming**
T_3	Pongamialefextract(5%)	**Organic priming**
T_4	Curry leaf extract (5%)	**Organic priming**
T_5	Moringaleaf extract (5%)	**Organic priming**
T_6	Neemleaf extract (5%)	**Organic priming**
T_7	KH2PO4 (1%)	**Halo priming**
T_8	KH2PO4 (3%)	**Halo priming**
T_9	KNO3 (1%)	**Halo priming**
T_{10}	KNO3 (3%)	**Halo priming**
T_{11}	GA3 (100 ppm)	**Harmonal priming**
T_{12}	**PEG 6000 (5%)**	**Osmo priming**

Preparation of solutions

For preparation of solution, the required chemicals have been collected from Department of Genetics and Plant Breeding, Prayagraj and fresh leaves for organic priming were collected from Department of Horticulture Research Fields, SHUATS.

For the preparation of solutions of botanicals, fresh leaves (Tulasi, Pongamia, Curryleaf, Moringa, Neem) were shade dried and ground into fine powder. To make 5% solution, 5gm of each leaf powder was added to 100ml of distilled water in separate beakers.

For the preparation of 1% solution of KH_2PO_4, KNO_3 1gm of each salt was dissolved in distilled water to make the volume up to100ml. For the preparation of 3% solution of KH_2PO_4, KNO_3 3gm of each was dissolved in distilled water to make the volume up to 100ml. For the preparation of 100 ppm GA3 solution, 100mg of GA3 was dissolved in 1000ml distilled water. For the preparation of 20% solution of PEG 6000, 20 g of PEG 6000 was dissolved in distilled water to make the volume up to100ml.

After preparing all the above solutions, seeds of field pea were added to each of the prepared solution and soaked for about 12 hr

at 25˚C temperature. Untreated seed is known as control. After 12 hr of soaking, the solution was drained out from the beaker and pre-soaked seeds were air dried at room temperature to original weight and then placed for sowing and germination in the laboratory under controlled condition.

Results and Discussion

It is evident from the present investigation that priming treatments has significant effect on quality parameters in fenugreek. In general, most of the treatments have increased growth, yield, quality parameters as compared to control (untreated seeds). In terms of field parameters like Field emergence (%), Plant height (cm), Days to 50% flowering, Number of pods per plant, Number of seeds per pod, biological yield (g), seed yield per plot (g), Harvest index the treatment T_{10} - KNO_3 @ 3% (Halopriming) recorded as highest followed by T_6 – Neem extract @ 5% (Organic priming), T_2 –Distilled water(Hydro priming).

Saed-Moochesi *et al.*, (2014) also found similar results in the maize seed KNO_3 and urea priming lead to high activities of antioxidant defensive enzymes and increase the tolerance level to abiotic stresses such as salt and drought which increased the emergence rate (Table 1 and 2).

Table.1 Mean performance of growth and yield parameters in field pea

S.No	Treatments	Field emergence (%)	Plant height (cm)	No of Branches	Days to 50% flowering	No. of pods per plant	No. of seeds per pod	Seed yield per plot	Biological yield	Harvest Index
1	**T_0**	76.333	77.053	7.333	55.600	8.833	3.313	242.690	357.263	0.679
2	**T_1**	86.867	89.667	9.333	49.600	12.733	3.660	527.940	651.830	0.810
3	**T_2**	86.637	81.007	9.000	50.133	10.467	3.500	417.110	538.060	0.772
4	**T_3**	79.833	83.720	9.333	58.000	10.400	3.347	488.863	604.697	0.792
5	**T_4**	78.167	83.200	9.667	52.200	9.767	3.460	436.323	562.650	0.775
6	**T_5**	83.237	85.993	9.000	51.000	12.000	3.620	348.073	473.200	0.734
7	**T_6**	89.523	90.733	10.667	49.000	12.833	3.767	554.463	685.063	0.809
8	**T_7**	82.377	80.827	8.667	57.467	10.667	3.553	347.233	467.567	0.739
9	**T_8**	84.757	82.770	10.333	51.400	9.667	3.523	442.160	555.503	0.782
10	**T_9**	78.080	82.093	8.667	54.667	9.667	3.470	394.593	499.653	0.774
11	**T_{10}**	**92.373**	**92.383**	**11.333**	**47.833**	**13.367**	**4.000**	**625.913**	**732.080**	**0.855**
12	**T_{11}**	89.033	130.433	9.667	61.733	9.000	3.733	181.933	301.850	0.601
13	**T_{12}**	78.000	86.070	10.000	52.800	10.100	3.447	366.783	490.473	0.741
Grand mean		83.47821	88.15205	9.461538	53.18718	10.73077	3.568718	413.3908	532.2992	0.758597
C.D.		2.742	1.610	0.59	1.772	0.655	0.226	163.221	165.163	0.069
SE(m)		0.934	0.548	0.715	0.603	0.223	0.077	55.590	56.251	0.023
SE(d)		1.321	0.775	1.011	0.853	0.316	0.109	78.616	79.551	0.033
C.V.		1.938	1.077	13.091	1.965	3.602	3.738	23.291	18.304	5.353

Table.2 Mean performance of seed quality parameters in field pea

Treatments	Germination %	Root length (cm)	Shoot length (cm)	Seedling length (cm)	Seedling fresh weight	Seedling dry weight (mg)	Vigour index-I	Vigour index-II	Seed Index
T0	80.000	6.750	18.000	24.750	2.725	1.300	1,979.200	103.875	**22.060**
T1	92.750	8.325	22.500	30.825	3.800	1.738	2,859.050	161.150	**24.020**
T2	91.000	7.875	22.125	30.000	3.700	1.625	2,730.300	147.913	**22.797**
T3	88.750	7.250	20.750	28.000	3.550	1.475	2,485.275	130.875	**22.387**
T4	86.500	7.175	19.925	27.100	3.475	1.388	2,343.475	120.013	**23.147**
T5	90.500	8.600	22.375	30.975	3.550	1.700	2,802.750	153.813	**23.893**
T6	93.750	8.750	22.875	31.625	4.225	1.888	2,965.650	177.013	**25.180**
T7	88.750	7.800	20.250	28.050	3.475	1.470	2,489.250	130.495	**23.443**
T8	91.250	7.700	21.825	29.525	3.750	1.590	2,693.850	145.025	**23.313**
T9	91.000	8.025	21.750	29.775	3.975	1.650	2,708.900	150.225	**23.820**
T10	**96.000**	**9.000**	**24.375**	**33.375**	**4.550**	**2.188**	**3,203.975**	**209.975**	**26.503**
T11	92.250	7.800	28.000	35.800	3.275	1.525	3,302.050	140.700	**24.250**
T12	90.250	7.575	21.350	28.925	3.250	1.638	2,610.850	147.850	**23.370**
Grand mean	90.211	7.894	22.00	29.901	3.638	1.620	2705.73	147.60	**23.70641**
C.D.	1.646	0.251	1.477	1.494	0.220	0.130	138.652	12.169	**1.207**
SE(m)	0.573	0.087	0.515	0.520	0.077	0.045	48.289	4.238	**0.411**
SE(d)	0.811	0.123	0.728	0.736	0.108	0.064	68.290	5.994	**0.582**
C.V.	**1.271**	**2.210**	**4.676**	**3.479**	**4.210**	**5.559**	**3.569**	**5.742**	**3.004**

Seed yield per plot is high in treatment combination of KNO_3 is due to the potassium (K) it is associated with the movement of water, nutrients and carbohydrates in plant tissues.

In terms of lab parameters like Germination (%), Root length (cm), Shoot length (cm), Seedling length (cm), Seedling fresh weight (g), Seedling dry weight (g), Vigour index I, Vigour index II the treatment T_{10} - KNO_3 @ 3% (Halopriming) recorded maximum values, followed by T_6 – Neem leaf extract @5% (Organic priming),T_{11} –GA3 @100ppm (Hormonal priming).

Muhammad Amjad *et al.,* (2007), also found similar results by priming seeds with distilled water (hydro priming) and salts (halo priming) and observed that seeds treated with KNO_3(3%) showed increase of seed germination over control and all other treatments.

Mohammad Armin *et al.,* (2010) investigated the effect of seed priming on germination and seedling growth of watermelon, and found that KNO_3 had the most effective impact on emergence and seedling growth. Compared with the non-primed seeds, seed priming with KNO_3 increased the germination by 17.87%.

On the basis of results obtained from the present investigation, it is concluded that seed priming improves germination, vigour, growth and yield parameters of field pea. Treated seeds performed better than untreated seeds(control). Of all the treatments, seed priming with T_{10}-KNO3 (3%)(Halo priming) recorded best results, followed by T_6-Neem leaf extract (5%)(Organic priming) and T_1-Distilled water(Hydro priming) for field parameters and seed priming with KNO3 (3%)(Halo priming) recorded best results, followed by T_6-Neem leaf extract (5%)(Organic priming) and T_{11}-GA3(100ppm) (Hormonal priming) for quality parameters.

References

Afzal, I., S.M.A. Basra, N. Ahmad and M. Farooq. (2005). Optimization of hormonal priming techniques for alleviation of salinity stress in wheat (*Triticum aestivum* L.). Caderno de Pesquisa Série Biologia, 17: 95-109.

Anonymous. 1983. Association of Official Seed Analysis (AOSA). Seed vigor testing handbook. Contribution No. 32 to the handbook on seed testing.

Armin, M., Asgharipour, M., &Razavi-Omrani, M. (2010). The effect of seed priming on germination and seedling growth of watermelon (*Citrullus lanatus*). *Advances in Environmental Biology*, *4*(3), 501-505.

Chavan, N. G., Bhujbal, G. B., &Manjare, M. R. (2014).Effect of seed priming on field performance and seed yield of soybean [Glycine max (L.)Merill] varieties. *The Bioscan*, *9*(1), 111-114

Gunasekar, J., Kamaraj, A., &Padmavathi, S. (2017).Effect of botanical seed priming on seed quality characters in blackgram [*Vigna mungo* (l.) Hepper] cv. CO6. *Plant Archives*, *17*(2), 1383-1387.

Hamidi, R., Pirasteh-Anosheh, H., &Izadi, M. (2013). Effect of seed halo-priming compared with hydro-priming on wheat germination and growth. *International Journal of Agronomy and Plant Production*, *4*(7), 1611-1615.

Saed-Moocheshi, A., Shekoofa, A., Sadeghi, H., and Pessarakli, M. (2014). Drought and salt stress mitigation by seed priming with KNO_3 and urea in various maize hybrids: an experimental approach based on enhancing antioxidant responses. *Journal of plant*

nutrition, *37*(5), 674-689.

Sajjan, A. S., Dhanelappagol, M. S., and Jolli, R. B. (2017). Seed quality enhancement through seed priming in pigeonpea [*Cajanus cajan* (L.) Millsp.]. *Legume Research-An International Journal*, 40(1), 173-177.

Santalla, M., Amurrio, J. M., and De Ron, A. M. (2001).Food and feed potential breeding value of green, dry and vegetable pea germplasm. *Canadian Journal of plant science*, *81*(4), 601-610.

Sharma, A. D., Rathore, S. V. S., Srinivasan, K., and Tyagi, R. K. (2014). Comparison of various seed priming methods for seed germination, seedling vigour and fruit yield in okra (*Abelmoschus esculentus* L. Moench). *Scientia Horticulturae*, *165*, 75-81.

Shehzad, M., Ayub, M., Ahmad, A. U. H., and Yaseen, M. (2012). Influence of priming techniques on emergence and seedling growth of forage sorghum (Sorghum bicolor L.). *J Anim Plant Sci*, *22*(1), 154-158.

Zohary D. and Hopf M. (2000). Domestication of Plants in the Old World.3 rd edition. Oxford University Press. Pp. 316.

How to cite this article:

Abdul Wajid, G., Kalneni Jahnavi, Arun Kumar Chaurasia, N. Bharath Reddy and Prudvi Raj Naidu, B. 2021. Effect of Different Organic and Inorganic Seed Priming Method on Growth, Yield and Quality Parameters of Field Pea (*Pisum sativum* L.). *Int.J.Curr.Microbiol.App.Sci.* 10(01): 280-286. doi: https://doi.org/10.20546/ijcmas.2021.1001.034