www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(7): 3771-3774

www.thepharmajournal.com
Received: 13-06-2023
Accepted: 21-07-2023

Maneesh Kumar
Assistant Professor, Department of Seed Science & Technology, S.B. S. Agriculture College, Hanumangarh, Rajasthan, India

Mohammad Amir
Assistant Professor, Department of Seed Science & Technology, Lovely Professional University, Jalandhar, Punjab, India

Rishabh Kumar Singh
Assistant Professor, Department of Guest Faculty, Chandra Shekhar Azad University of Agriculture and Technology, Kanpur, Uttar Pradesh, India

Rohit Kumar
Assistant Professor, Department of Genetics & Plant Breeding, Mangalayatan University, Jabalpur, Madhya Pradesh, India

Corresponding Author:
Maneesh Kumar
Assistant Professor, Department of Seed Science & Technology, S.B. S. Agriculture College, Hanumangarh, Rajasthan, India

Studies of seed priming techniques on planting value of field pea (*Pisum sativum* L) under sub-optimal (Rain fed condition) condition

Maneesh Kumar, Mohammad Amir, Rishabh Kumar Singh and Rohit Kumar

Abstract
Seed priming of simple cost-effective technique which can be easily adopted by the farmers to improve the plant behavior in field. The experiment was conducted at CSUA&T Oil Seed Farm, Kalyanpur, Kanpur in split plot designs using two field pea varieties KPMR-522 and KPMR-400 *Rabi* season 2019-20 and 2020-21. Observation recorded like Germination (%), Seed Vigour-I, Seed Vigour-II, Field emergence and Seed viability. The results were observed seed priming significantly increased all the characters with treatment of in both of varieties KPMR-522, KPMR-400. Conclude that the overall finding of experiment Seed coating (on hydro-primed seeds) with Drought Alleviating Bacteria + Bio-NPK (on hydroprimed seeds for 8 hours and then air dried for 48 hours), is best performing combination.

Keywords: Seed priming, bio-NPK, bio-phos, bio-grow, *Pisum sativum* L., yield

Introduction
The cultivation of pea is a very ancient. Pea belongs to the Leguminosae family which represents the second most important family of crop plants after Poaceae, accounting for approximately 27% of the world's crop production Graham and Vance, (2003) [6]. Field pea is also attracting positive attention in health food markets, as they are rich in protein (23.5 g protein per 100 g) and a viable substitution to wheat and egg- based products. Protein extraction is reported to be most successful from field pea and the protein structure of pea most similar to egg and stabilizes snacks and cereals most similarly to gluten when compared to other alternate protein source (Rahman *et al.* 2018) [11]. Germination is complex process with regulatory network of many metabolic, cellular and molecular events inside the seed residing at below ground. Seed germination is usually the most critical stage in seedling establishment, determining the success of crop production especially under adverse field conditions (Almansouri *et al.*, 2001) [7]. Seedling establishment is important for the better growth and development of the plant either treated with priming agent or not. Halopriming have very important role in germination, seedling emergence, and plant growth at all developmental stage of the plants (Roy and Srivastava, 1999) [8].

Materials and Methods
The experiment was conducted at Oil Seed Farm, Kalyanpur, Kanpur during the year 2019-20 and 2020-21 in Rabi season for the evaluation of planting value and seed yield attributes in the field. The seeds were harvested separately from each plot and sampled for the assessment of seed quality parameters in the Departmental Laboratory of Seed Science and Technology, Chandra Shekhar Azad University of Agriculture and Technology, Kanpur. Geographically, Kanpur is situated in sub-tropical zone at 25026' to 26058' N latitude and 79032' and 80034' E longitude with an attitude of 125.90 meter above mean sea level. The primed seeds along with control (untreated) were sown in sub-plot with three replications and the varieties KPMR-522 (V_1), KPMR-400 (V_2) were placed in the main plot of Split Plot Design. Treatments used in this study like.

T_1	Control (Untreated)
T_2	Control (Crop and location specific recommended seed treatments as per package of practices)
T_3	Hydro priming- Soaking in water for 8h at 25 ºC and air drying at 25 ºC for 48h.
T_4	Halopriming- Soaking in KNO_3 (@0.3%) solution and drying
T_5	Halo priming- Soaking in KH_2PO4 (@0.5%) solution and drying
T_6	Halopriming Soaking in Zn_2SO_4 (@0.3%)+$MnSo_4$(@0.5%) solution and drying
T_7	Seed coating (on dry seeds) with *T. harzianum* @ 15g/kg seed (Mix 15g in 50 ml of water and applied on 1kg seed uniformly. Shade drying the seeds for 20-30 minutes before sowing
T_8	Seed coating (on hydroprimed seeds) with *T. harzianum*@ 15g/kg seed (Mix 15g in 50 ml of water and applied on 1kg seed uniformly. Shade drying the seeds for 20-30 minutes before sowing
T_9	Seed coating (on hydroprimed seeds) with BioNPK (containing 1x 109 cfu)
T_{10}	Seed coating (on hydroprimed seeds) with Biogrow (containing 1x 109 cfu)
T_{11}	Seed coating (on hydro primed seeds) with Biophos (containing 1x 109 cfu)
T_{12}	Seed coating (on hydroprimed seeds) with Drought Alleviating Bacteria + BioNPK)
T_{13}	Seed coating (on hydroprimed seeds) with Drought Alleviating Bacteria + Biogrow
T_{14}	Seed coating (on hydroprimed seeds) with Drought Alleviating Bacteria + Biophos

In field condition the plant to plant distance and row to row distance was kept 30 and 10 cm, respectively. Fertilizers were applied @ 20:40:20 (kg ha -1) N:P:K @ 50% at the time of sowing as basal dose. The field pea crop was cultivated using standard agronomic practices under sub-optimal condition. The observations were recorded in seed laboratory like Germination (%), Seed Vigour-I, Seed Vigour-II, Field emergence and Seed viability.

Methods of seed priming
Several types of seed priming methods have been developed and used successfully in order to invigorate the seeds and alleviate the environmental stress.

Hydro priming
Hydro-priming is a technique which uses water to soak seeds, drying it for dehydrating and then sowing the next day. This leads to increase in process of germination, accelerates seedling growth and strength (A.M. Musa *et al.* 1999) [1].

Halopriming
Halo-priming is a technique which involves submerging seeds in solutions of inorganic salts *viz.* sodium chloride, potassium chloride, potassium nitrate, calcium chloride etc. Some of these salt solutions may exert direct or indirect nutritional effects. Many studies have been undertaken using halo-priming technique to improve seed germination crop yield in alkaline soil (A.A. Bajehbaj *et al.* 2010) [3].

Biopriming
Bio-priming involves treatment of seeds with beneficial micro-organisms. Micro-organisms which protect plants from pathogens and improve their growth are used. (B. Karthikeyan *et al.* 2009) [2].

Field Emergence
Field emergence was recorded on 10th day after sowing with the help of following equation.

$$F.E.(\% = \frac{\text{Number of Seed emerged out of soil}}{Total\ number\ of\ seed\ sown} \times 100$$

Seed vigour index-I
Seed vigour index-I was calculated by multiplying the germination % and seedling length in cm. (Abdul Baki and Anderson, 1973) [4].

SVI-I = Germination % × Seedling length (cm)

Seed vigour index-II
It was calculated by multiplying germination % by dry weight of seedlings in (g).

SVI-II = Germination % × dry weight of seedlings (g)

Seed Viability- Viability percent was recorded by tetrazolium test using 2, 3, 5 - triphenyl tetrazolium chloride solution of 0.5%. One hundred seeds per replication from each treatment sample was used in three replications.

Results and Discussion
Mean performance
All the pooled mean performance of 14 treatments for 6 parameters and two varieties KPMR-522 and KPMR-400 was shown in (Table 1).

Influence of seed priming treatments under study were found to be most effective for significant but the interaction effect was not found significant for influencing the planting value of field pea.

The pooled data of both the year (Table. 1 & 2) the variety of field pea KPMR-522 was superior to KPMR 400 except seed germination (%) (89.42) and showed maximum seedling length cm (21.20) seedling dry weight (0.36) seed vigour Index-I (1874) Seed vigour Index-II (42.66) Seed viability (90.71) as compared to variety KPMR-400. (Shiferaw *et al*. 2013) [9]. Increase in seed germination is also due to availability of required quantity of NPK which has improved seed quality in terms of crude proteins, nitrogen and mineral contents in seeds. Higher standard germination might be due to synthesis of seed germination hormone like gibberellins which stimulate the activity of specific enzymes that promoted early germination and a-amylase that increase the availability of starch assimilation. The results are in incongruence with the findings of in faba bean.

Among seed priming treatment the analysis of data of the both year on pooled basis show that T_{12} - Seed coating with BioNPK + DAB (on hydroprimed seed for 8 hours and air drying for 48hours) was significant superior in Germination percentage (94.75) seedling length cm (25.19) seedling dry weight (0.44) Seed vigour index (2421) seed vigour index-II (38.71) and seed viability (95.24) followed by T_6- Halo-priming (Soaking seed in Zn_2SO_4 @ 0.3% + $MnSo_4$ (@ 0.5% solution and drying) Germination percentage (93.91) seedling length cm (23.51) seedling dry weight (0.42) Seed vigour index-I (2284) seed vigour index-II (41.44) and seed viability (94.49) The increase in seed vigour index by seed priming may be due to the fact that the priming treatment is appropriate for metabolic response, improving seed germination performance and seedling growth (M Sedghi *et al.* 2010) [12]. In general, the result showed that seeds of different okra genotype showed different response to different priming treatment for seed vigour index II, the current result is consistent with the of (Kaura *et al*. 2015) [13] Harris *et al*. (2007) [10] reported that nutrient seed priming is a technique in which seeds are soaked in nutrient solution instead of pure water as an approach to increase seed nutrient content along with the priming effect to improve seed quality for better germination and seedling establishment. Maize seed priming with 1% $ZnSO_4$ not only enhanced plant growth but also increased the final grain yield and seed Zn content in plants grown on soil with limited Zn availability.

Table 1: Effects of seed priming technique on six characters in field pea

Treatments	Germination (%)			Seedling length (cm)			Seedling dry weight		
	KPMR-522	KPMR-400	Mean	KPMR-522	KPMR-400	Mean	KPMR-522	KPMR-400	Mean
T_1	85.5	84.50	85.00	16.81	13.48	15.15	0.29	0.28	0.28
T_2	86.00	85.33	85.67	17.57	15.21	16.39	0.3	0.29	0.29
T_3	86.33	86.01	86.17	18.15	17.84	18	0.31	0.30	0.30
T_4	86.83	86.5	86.67	19.43	18.94	19.18	0.31	0.31	0.31
T_5	87.17	87.00	87.08	24.8	22.84	23.82	0.32	0.32	0.32
T_6	94.50	93.33	93.915	24.03	22.99	23.51	0.43	0.42	0.42
T_7	88.33	87.83	88.08	20.35	20.12	20.23	0.33	0.32	0.33
T_8	88.67	88.33	88.50	20.82	20.71	20.76	0.36	0.35	0.35
T_9	89.17	89.01	89.08	21.43	21.01	21.22	0.37	0.36	0.36
T_{10}	89.83	89.33	89.58	21.84	21.51	21.67	0.37	0.37	0.37
T_{11}	90.50	90.17	90.33	19.88	19.66	19.77	0.4	0.38	0.39
T_{12}	95.67	93.83	94.75	26.73	23.65	25.19	0.44	0.44	0.44
T_{13}	92.51	92.17	92.33	22.51	22.07	22.29	0.41	0.41	0.41
T_{14}	91.50	91.33	91.42	22.44	21.8	22.12	0.41	0.4	0.40
Mean	89.42	88.95		21.20	21.13		0.36	0.35	
Factors	SE(m) ±	C.D. at 5%		SE(m) ±	C.D. at 5%		SE(m) ±	C.D. at 5%	
Variety	0.16	0.454		0.166	0.471		0.001	0.004	
Treatments	0.423	1.2		0.438	1.245		0.004	0.011	
Var x Treat	0.598	N/A		0.62	N/A		0.006	N/A	

(T_1): Control, **(T_2):** Control (*Rhizobium* culture), **(T_3):** Hydro-priming seed, **(T_4):** Halo – priming - Soaking in KNO_3 (@ 0.3%) solutionand drying, **(T_5):** Halo priming - Soaking in Kh_2Po_4 (@ 0.3%) + $MnSo_4$ (@ 0.5%) soluation and drying, **(T_6):** Halo priming - Soaking in Zn_2So_4 (@ 0.3%) + $MnSo_4$ (@ 0.5%) soluation and drying, **(T_7):** Seed coating (on dry seeds) with *T. harzianum* @ 15g/kg seed, **(T_8):** Seed coating (on hydro - primed seeds) with *T. harzianum* @ 15 g/kg seed, **(T_9):** Seed coating (on hydro - primed seeds) with Bio-NPK, **(T_{10}):** Seed coating (on hydro-primed seeds) with Bio-grow, **(T_{11}):** Seed coating (on hydro-primed seeds) with Bio-Phos, **(T_{12}):** Seed coating (on hydro-primed seeds) with DAB + Bio-NPK (on hydroprimed seeds), **(T_{13}):** Seed coating (on hydro-primed seeds) with DAB + Bio-grow, **(T_{14}):** Seed coating (on hydro-primed seeds) with DAB + Bio-Phos

Table 2: The different of seed vigour I and seed vigour II Seed viability

Treatments	Seed Vigour-I			Seed Vigour-II			Seed Viability		
	KPMR-522	**KPMR-400**	**Mean**	**KPMR-522**	**KPMR-400**	**Mean**	**KPMR-522**	**KPMR-400**	**Mean**
T_1	1438	1139	1289	24.51	24.56	24.54	87.33	86.33	86.83
T_2	1511	1299	1405	25.52	25.49	25.50	87.50	87.17	87.33
T_3	1567	1534	1551	26.62	26.60	26.61	88.00	88.25	88.12
T_4	1624	1588	1606	27.51	27.58	27.54	88.50	88.33	88.42
T_5	1693	1648	1671	29.60	29.60	29.60	89.17	88.83	89.00
T_6	2299	2268	2284	41.40	41.49	41.44	95.16	93.83	94.49
T_7	1755	1726	1741	31.78	31.59	31.68	89.50	89.17	89.33
T_8	1803	1776	1790	32.71	32.85	32.78	90.01	90.00	90.01
T_9	1857	1842	1850	33.69	33.88	33.78	90.33	90.33	90.33
T_{10}	1925	1877	1901	35.89	35.93	35.91	91.17	90.83	91.00
T_{11}	1977	1939	1958	38.55	38.88	38.71	91.83	91.50	91.67
T_{12}	2557	2285	2421	42.73	42.59	42.66	96.33	94.15	95.24
T_{13}	2176	2119	2147	24.51	24.56	24.54	93.50	93.00	93.25
T_{14}	2059	2016	2037	37.52	37.74	37.63	92.67	92.17	92.42
Mean	1874	1790		32.56	32.63		90.71	90.33	
Factors	SE(m) ±	C.D. at 5%		SE(m) ±	C.D. at 5%		SE(m) ±	C.D. at 5%	
Variety	14.53	41.26		0.132	0.376		0.114	0.323	
Treatments	38.43	109.16		0.35	0.995		0.301	0.856	
Var x Treat	54.35	N/A		0.495	N/A		0.426	N/A	

Conclusion

In rain-fed condition the planting value like that germination percentage, seed vigour index, and seedling length can be affected due to deficiency of moisture in the soil which decrease the planting value. Our finding result that Seed coating (on hydroprimed seeds) with Drought Alleviating Bacteria + BioNPK) is essay and use techniques for enhancing planting value of pea (*Pisum sativum* L) these effect of the improve final plat establishment and planting value in the field of adverse condition.

References

1. Musa AM, Johansen C, Kumar J, Haris D. Response of Chickpea to seed priming in the High Barind Tract of Bangladesh. Int. Chickpea Pigeonpea Newsl. 1999;6:20-22.
2. Karthikeyan B, Jaleel CA, Azooz MM. Individual and Combined Effects of Azospirillum brasilense and *Pseudomonas fluorescens* on Biomass Yield and Ajmalicine Production in *Catharanthus roseus*. Acad J Plant Sci. 2009;2(2):69-73.
3. Bajehbaj AA. The effects of NaCl priming on salt tolerance in sunflower germination and seedling grown under salinity conditions. Afr. J Biotechnol. 2010;9(12):1764-1770.
4. Abdul-Baki AA, Anderson JD. Vigor determination in soybean seed by multiple criteria. Crop Sci. 1973;13(6):630-633.
5. Rehman A, Farooq M, Wahid A, Cheema ZA. Seed priming with boron improves growth and yield of fine grain aromatic rice. Plant Growth Regul. 2012;68:189-201.
6. Graham PH, Vance CP. Legume importance and constraints to greater use. Plant Physiol. 2003;131:872-877.
7. Almansouri M, Kinet JM, Lutts S. Effect of salt and osmotic stresses on germination in durum wheat (*Triticum durum* Desf.). Plant Soil. 2001;231:243-254.
8. Roy NK, Srivastava AK. Effect of presoaking seed treatment on germination and amylase activity of wheat (*Triticum aestivum* L) under salt stress condition. Rachis. 1999;18:46-51.
9. Shiferaw D, Muleta D, Berecha G. Effect of phosphate solubilizing bacteria on seed germination and seedling growth of faba bean (*Vicia faba* L.); c2013.
10. Harris D, Rashid A, Hollington A, Jasi L, Riches C. Prospects of improving maize yield with on farm seed priming. In: Rajbhandari NP, Ransom JK, editors. Sustainable Maize Production Systems for Nepal. NARC and CIMMYT, Kathmandu; c2007. p. 180-185.
11. Rahman MJ, Ambigaipalan P, Shahidi F. Biological activities of camelina and sophia seeds phenolics: Inhibition of LDL oxidation, DNA damage, and pancreatic lipase and α-glucosidase activities. Journal of food science. 2018 Jan;83(1):237-45.
12. Sheykhbaglou R, Sedghi M, Shishevan MT, Sharifi RS. Effects of nano-iron oxide particles on agronomic traits of soybean. Notulae Scientia Biologicae. 2010 Jun 13;2(2):112-3.
13. Kaura V, Durga Prasad CS, Sharma S. Service quality, service convenience, price and fairness, customer loyalty, and the mediating role of customer satisfaction. International journal of bank marketing. 2015 Jun 1;33(4):404-22.