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Effect of seed priming treatments on seed quality parameters and storability of field pea (*Pisum sativum* L.)

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Abstract
In order to evaluate the effect of seed priming treatments on seed quality parameters and storability parameters of field pea (*Pisum sativum* L.) an experiment was conducted in the Seed Testing Laboratory of Department of Seed Science and Technology, C. S. Azad university of Agriculture and Technology, Kanpur during 2015-16 on pea variety KPMR-522 (Jay). The experiment was comprised of ten seed priming treatments *viz.*, T_0- Control, T_1- Seed priming with *Trichoderma harzianum* @ 1.5%, T_2- Seed priming with Vitavax power @ 0.25% T_3- Seed priming with GA_3 @ 50 ppm, T_4-Seed priming with GA_3 @ 50ppm + seed coating with *Trichoderma harzianum*@ 15g/kg seed,T_5 -Seed priming with sodium molybdate @ 500 ppm, T_6-Seed priming with sodium molybdate @ 500ppm + seed coating with *Trichoderma harzianum* @ 15 g/kg seed, T_7- Seed priming with leaf extract of Lantana camara @ 10%, T_8- Seed priming with water,T_9- Seed treatment with Bavistin @ 3g/kg seed. The present investigation revealed that seed priming with sodium molybdate @ 500 ppm + seed coating with *T. harzianum* @ 15g/ kg seed was significantly improved the seed quality of harvested seeds with percent improvement of 5.75 and 8.00 % in germination, 15.37 and13.73 % in shoot length, 17.03 and 16.05% in seedling dry weight, 13.06 and 17.96 % in seed vigour index-I, 24.50 and 26.90 % in vigour index-II over control during 2015-16.

Keywords: seed priming treatments, seed quality parameters, *Pisum sativum* L, *T. harzianum*

1. Introduction
Field pea (*Pisum sativum* L.) belongs to leguminous family fabaceae. It is cultivated in temperate regions at high elevations or during cool season in warm regions throughout the world. Pea is diploid with chromosome number 2n=14. India ranks third in area after China and USSR under pea (vegetable and pulse pea) cultivation. In India, the total area covered by pea is 0.442 million hectare with the production of 4.239 million tonnes whereas, productivity is 9.5 tonne per hectare. Uttar Pradesh is the highest producing state in India. In Uttar Pradesh, area under this crop is 0.178 million hectare with the production of 1.953 million tonnes and productivity 10.97 tonne per hectare (Anonymous, 2015). India is the largest producer of pulses (about 18.5 million tons) and processor of pulses in the world and also imports around 3.5 million tonnes. According to Indian Institute of Pulses research, Indian population is expected to touch 1.68 billion by 2030 and pulse requirement for the year 2030 is projected 32 million tonnes with required annual growth rate of 4.2 percent. The major pulse producing states in India are M.P. (23%), U.P.(18%), Maharashtra (14%), Rajasthan (9%), and Karnataka (6%) and rest (30%) Pulses are produced in other states of India.

Pea is herbaceous annual plant with tap root system. Stem is upright, slender and usually single leaves are pinnately compound with rachis terminating in single or branched tendrils. Gynoceum is monocarpellary with ovules (up to 13) alternately attached to the placenta. Pods are straight or curved and seeds are smooth and wrinkled. The crop is cultivated for its tender immature pods for use as vegetables and mature dry pods for use as a pulse. They are major source of protein for vegetarian human diet and improve the soil fertility through fixation of atmospheric nitrogen. Grain legume is the cheapest source of protein for both urban and rural population in tropics as well as in temperate region. (Rachie and Roberts, 1974) [11].

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 (Bradford, 1986) [1]. 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 (Taylor *et al.*, 1998) [17].

In seed priming, the osmotic pressure and the period for which the seeds are maintained in contact with the membrane are sufficient to allow pre-germinative metabolic processes to take place within the seeds up to a level limited to that immediately preceding radicle emergence.

Material & Methods

The seed treatment or priming was done by soaking of required quantity of seeds of Pea variety KPMR-522 (Jay) in tap water and various chemicals concentration for 12 hours. Then the seeds were shade dried to obtain the seed moisture content of 11-13%. 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 and 1000 seed weight (g) for the period 2015-16. 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 (1963) [4]

Results & Discussion

The different seed priming treatments viz., T_0 (Control), T_1 (Seed priming with *Trichoderma harzianum* @ 1.5%), T_2 (Seed priming with Vitavax Power @ 0.25%), T_3 (Seed priming with gibberalic Acid @ 50 ppm), T_4 (Seed priming with gibberalic Acid @ 50 ppm + Seed coating with *T. harzianum* @ 15g/ kg seed), T_5 (Seed priming with Sodium Molybdate @ 500 ppm), T_6 (Seed priming with sodium molybdate @ 500 ppm + seed coating with *T. harzianum* @ 15g/ kg seed), T_7 (Seed priming with leaf extract of Lantana camara @ 10%), T_8 (Priming with water and T_9 - Seed treatment with Bavistin @ 3g/ kg seed) were influenced significantly seed quality in terms of germination, shoot length, root length, seed vigour index-I, seed vigour index-II, electrical conductivity and 1000 seed weight. Similar findings were supported by Bhat *et al*. (2012) [5]; Saeedipour (2013) [13]; Kumar *et al*. (2014) [9] and Mohamedy *et al*. (2015) [3]

Seed priming with Sodium Molybdate @ 500 ppm + Seed coating with *T. harzianum* @ 15g/ kg seed showed significantly highest seed germination, root length, shoot length, seedling length, seedling dry weight, seed vigour index-I, seed vigour index-II showed 8.00, 13.73, 8.19, 16.05, 17.96 and 26.90 % improvement over control during 2015-16. These findings were in conformity with Khan and Hedge (1989) [7]; *El-Hefny et al*. (1999) [2] and Khanal *et al*. (2004) [8] But this treatment of seed priming with sodium molybdate @ 500 ppm + Seed coating with *T. harzianum* @ 15g/ kg seed was statistically at par with Seed priming with Sodium molybdate@ 500 ppm for germination; seed priming with sodium molybdate @ 500 ppm, priming with water and seed treatment with Bavistin @ 3g/ kg seed for shoot length; seed priming with Sodium molybdate@ 500 ppm, Sodium molybdate@ 500 ppm + Seed coating with *T. harzianum* @ 15g/ kg seed, Priming with water and Seed treatment with Bavistin @ 3g/ kg seed for root length; Seed priming with Sodium molybdate@ 500 ppm, Seed priming with leaf extract of Lantana camara @ 10%, Seed treatment with Bavistin @ 3g/ kg seed for seedling dry weight; Seed priming with Sodium molybdate@ 500 ppm for vigour index-II. These findings were in accordance with Srivastava and verma (1985) [15] and Subedi and yadav (2013) [16].

The value of electrical conductivity test revealed by variety "KPMR-522" of pea significantly affects by different treatments. Seed priming with GA_3 was found significant for most of the characters and improving the storability by scoring less value and this treatment showed at par performance to T_2 - seed priming with Vitavax Power @ 0.25%, T_9 - Seed treatment with Bavistin @ 3g/ kg seed and T_8 – priming with water. Whereas, maximum value (0.17) of E.C. was observed in T_5 - Seed priming with Sodium molybdate@ 500 ppm. These findings were in accordance with Anitha *et al*. (2013) [10]; Mummigati *et al*., (2013) [10]; Ipsita kar *et al*. (2014) [6]; Kumar *et al*. (2014) [9]; Rathod *et al*. (2015) [12] and Sharma and Jain (2016) [14].

The minimum (2.50 %) seed mycoflora was recorded in treatment T_6 (- Seed priming with Sodium molybdate@ 500 ppm + Seed coating with *T. harzianum* @ 15g/ kg seed) followed by 5.00 % in treatments T_4 (Seed priming with Gibberalic Acid @ 50 ppm + Seed coating with *T. harzianum* @ 15g/ kg seed) and T_3 (Seed priming with Gibberalic Acid @ 50 ppm). Maximum (12.50 %) mycoflora was recorded in treatment T_1- (Seed priming with *Trichoderma harzianum* @ 1.5%) and T_8 (Priming with water).

Table: Mean Effects of Seed Priming Treatments on Seed Quality Parameters and Storability of Field Pea (*Pisum sativum* L.)

S. No.	Treatments	Seed Germination (%)	Root Length (cm)	Shoot Length (cm)	Seedling Dry Weight (g)	Seed Vigour Index- I	Seed Vigour Index- II	EC (dsm^{-1})	Seed Mycoflora
T_0	Control	87.00	**6.90**	6.79	1.50	1191.03	130.50	0.14	10.00
T_1	*Trichoderma harzianum* @ 1.5%	88.00	6.36	6.47	1.38	1129.04	121.44	0.15	7.50
T_2	Vitavax Power @ 0.25%	90.00	6.36	6.47	1.38	1175.40	127.80	0.12	7.50
T_3	Gibberalic Acid @ 50 ppm	91.00	6.70	6.88	1.54	1235.78	140.14	0.11	7.50
T_4	T_3+ Seed coating *T. harzianum*	94.00	6.60	7.71	1.57	1314.14	147.58	0.15	5.00
T_5	Sodium Molybdate @ 500 ppm	93.00	6.73	7.70	1.63	1341.99	151.59	0.17	2.50
T_6	T_5+Seed coating *T. harzianum*	94.00	6.88	7.79	1.69	1378.98	158.86	0.14	2.50
T_7	Leaf extract Lantana camara @ 10%	90.00	6.70	7.01	1.45	1233.90	130.50	0.13	7.50
T_8	Water	90.00	6.60	7.54	1.53	1272.60	137.70	0.12	10.00
T_9	Bavistin @ 3g/ kg Seed	91.00	6.62	7.38	1.52	1274.00	138.32	0.12	7.50
	Grand Mean	90.80	6.65	7.17	1.52	1136.69	138.44	0.135	6.75
	S.E.M.	0.24	0.01	0.01	0.003	2.49	0.26	0.005	2.39
	C.D. 5%	0.77	0.04	0.03	0.008	7.40	0.82	0.014	NS

Conclusion

It was concluded from the present investigation that Seed priming with sodium molybdate @ 500 ppm + seed coating with *T. harzianum* @ 15g/ kg seed on pea variety "KPMR-522 (Jay)" was found to be best as it significantly improved the seed quality of harvested seeds with percent improvement 5.75 % in germination, 13.73 % in shoot length, 16.05% in seedling dry weight, 17.96 % in seed vigour index-I & 26.90 % in vigour index-II over other treatments as well as control respectively.

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