Int.J.Curr.Microbiol.App.Sci (2021) *10*(03): 317-323

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 10 Number 03 (2021)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2021.1003.042

Assessment of Different Seed Priming Treatments on Quality Parameters of Lentil (*Lens culinaris* Medik.) (Variety Mallika)

Prudvi Raj Naidu Bethapalli[1*], Prashant Kumar Rai[2] and Ajay kumar Rai[3]

[1]*Department of Genetics and Plant Breeding, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, U. P., India*
[2]*Director, State Institute for Management of Agriculture,* [3]*Department of Agriculture Economics, PRSU, Prayagraj- 211007, India*

**Corresponding author*

Keywords

Lentil, Osmo priming, Electric priming, Magnetic priming, Halo priming

Article Info

Accepted:
04 February 2021
Available Online:
10 March 2021

ABSTRACT

Lentil is one of the major and important legume grown in India. Application of commercial antioxidants and nutrients for seed enhancement is economic and easily accessible to the farmers. The hereby study was conducted in a completely randomized design with four replications in controlled conditions at Department of Genetics and Plant Breeding, SHUATS, Prayagraj (U.P) during 2018-2020, to assess the potential of different seed priming treatments for germination, seedling vigour and germination index in lentil. Priming is done by adopting different methods i.e., T_0- Unprimed seed as control, T_1-Hydro-priming with distilled water, T_2 &T_3-Hormonal priming with IAA (50ppm, 100ppm), T_4 –Osmo priming with PEG 6000 (10%), T_5 & T_6-Electrical priming at (100mA, 200mA), T_7 & T_8- Magnetic priming at (100mT, 200mT) and T_9, T_{10},T_{11},T_{12} –Halo priming with KNO_3 and KCl (1%, 3%).It was found that all the priming methods showed significant difference with the control and highest germination percentage (%), germination index, seedling length (cm), seedling fresh weight (g), seedling dry weight (g), and vigour indices were observed in KNO_3 (T_{10}) priming for 15 hours. Priming with PEG 6000(10%), Distilled water, KNO_3 (1%) were the most effective in boosting germination percent and germination index. This study showed that Halo-priming can be effective in enhancing seed quality parameters in lentil, and are cost effective and are, easily available.

Introduction

Lentil (*Lens culinaris Medik*. L.) is a diploid and self pollinated crop which is considered to be one of the oldest cultivated crops. It is a leguminous plant of the subfamily papilionoidaceae and belongs to general class of dicotyledons. Lentil consists of chromosome number 2n=14.It is native of Near East and rapidly spread to Egypt, central and southern Europe.

The plant is slightly pubescent and has a definite tap root system varying from 6 to 24 cm depth enabled this crop to well under severe droughts where other cereals even fail to stand. The nodules are comparatively smaller and develop on the entire root system. It is a bushy annual plant of legume family, known for its lens shaped seeds. It is about 40cm tall, and the seeds grow in pods, usually with two seeds in each. It bears compound leaves (4 -7 pairs of leaflets) with a tendril at each tip. Plant normally range from 30-50cm in height. Flowers can be white, liliac, or pale blue in color and are self pollinated.

The important lentil growing countries of world are India, turkey, Syria, Pakisthan, Spain, and Bangladesh. Saskatchewan is the most productive growing region in Canada, production of 95% of the national total. In India Madhya Pradesh and Uttar Pradesh are largest producers with more than 70% of the total. Other major producers include West Bengal and Bihar.

In India, lentil was cultivated on 1.47 million hectares area in 2014-2015 with a production of 1.04 metric ton (Anon., 2016). It is generally grown as rainfed crop during rabi season after rice, maize, pearl millet or kharif follow. In north-eastern parts of the country, lentil is also cultivated as sequential crop after rice, where seeds of lentil are broadcast in the standing crop of rice just before its harvest.

Lentil contains the essential amino acids *viz*., isoleucine and lysine. Lentils are an inexpensive source of essential proteins in many parts of the world, especially in west asia and the Indian Subcontinent, which have large vegetarian populations. Lentils are deficient in two essential amino acids, methionine and cysteine.

Lentils also contain dietary fibre, folate, vitamin B1 and minerals. Red (or pink) lentils contain a lower concentration of fibre than green lentils. Health magazine has selected lentils as one of the five healthiest foods. The low levels of Readily Digestible Starch (RDS) 5% and high levels of Slowely Digested Starch(SDS) 30% make lentil of great interest to people with diabetes. The remaining 65% of starch is a resistant starch that is classified RS1,being a high quality resistant starch, which is 32% amylase.

Seed priming is one of the invigouration treatment that involves controlled hydration of seed to a level that permits pre-emergence metabolic activity to proceed, but that prevents actual emergence of radical (Vanangamudi *et al.*, 2010). Priming of seeds has shown to have beneficial effects on the germination and emergence of many species (Bradford,1986).The direct benefits of seed priming in crops include faster emergence, improved germination, uniformity, vigorous plants and higher yields. The indirect benefits are earlier sowing and harvest and decreased risk of crop failure (Harris *et al*.,2001).

Materials and Methods

The Research work was carried out in controlled laboratory conditions during Rabi season 2019-2020. Department of Genetics and plant breeding, Naini Agriculture Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P). The statistical designs were applied carried out with Completely Randomized Design (RBD) With 13 treatments and 4 replications. Seed material consists of Lentil (Mallika). The treatments were represented as T_0 – Control, T_1 – Distilled water @ 15 hrs, T_2 – IAA @ 50ppm for 15 hrs, T_3 – IAA @100ppm for 15 hrs, T_4 – PEG 6000 @ 10% for 4 hrs, T_5 – Electric Treatment @100 mA for 1 minute, T_6 – Electric Treatment @ 200 mA for 1 minute, T_7 –Magnetic treatment @ 100 mT for 5 minutes, T_8 – Magnetic Treatment @ 200 mT for 5 minutes, T_9 – KNO_3 @ 1% for 15 hrs, T_{10} – KNO_3 @ 3% for 15 hrs, T_{11} – KCl @ 1% for 15 hrs, T_{12} – KCl @ 3% for 15 hrs.

Method for electric treatment

Seeds of lentil were treated with electric field in the laboratory of Department of Physics, SHUATS, Prayagraj. To expose the seeds to electric field, an electric field generator was fabricated by using metallic conductor. A battery of 24V DC was used as power source for electric field. Battery is connected with ammeter to measure electric current and ammeter is connected with rheostat to adjust current supply. The seeds are placed on a metallic conductor and electric current of 24V DC was passed at required intensity.

Method for magnetic treatment

The magnetic treatment of seeds was done in the laboratory of Department of Physics, SHUATS, Prayagraj. To treat the seeds electromagnetic field generator "OMEGA EMU-10" with variable horizontal magnetic strength with a gap of 5cm between pole pieces was used. Magnetic field flows through the cylinders when we input the power supply. A DC power supply 230AC (0-4 Amp) (10% AC 50HZ) with continuously variable output current was used for the electromagnet. The seeds were treated at required intensity using a digital gauss meter OMEGA DGM-20 (230AC + 10% AC 50HZ). The metallic probe made of indium arsenide crystal and encapsulated to a non-magnetic sheet is used. This could measure in steps of the magnetic field treatment.

Seeds soaking in solutions

After preparation of solution of IAA, PEG 6000, KNO_3 and KCl lentil seeds were soaked in required solution for different durations at 25^0C temperature. Untreated seed is called as control. After soaking the solution were drained out from the beaker and pre-soaked were air dried to original weight. After seed treatments seed were grown in controlled laboratory conditions by between paper method for further recordings.

Results and Discussion

The laboratory experiment "Assessment of Different Seed Priming Treatments on Quality Parameters of Lentil (*Lens culinaris* Medik.)" was conducted with a view to study the influence of different seed priming agents on seed germination and other seed quality parameters in Lentil. Seeds treated with different priming agents recorded good germinability and vigour than those of untreated seeds of Lentil (*Lens culinaris* Medik.). Seeds treated with Salts have recorded significantly better performance.

The treatment T_{10}(KNO_3 @3%) showed better performance among all treatments in terms of germination percent, germination energy, speed of germination, root length, shoot length, seedling length, fresh weight, dry weight, seed vigor index-I, seed vigor index-II (Table 1).

The treatment T_0 control has recorded lowest values among all treatments in terms of germination percent, germination energy, speed of germination, root length, shoot length, seedling length, fresh weight, dry weight, seed vigor index-I, seed vigor index-II.

Maximum germination was recorded in treatment T_{10}(KNO_3 @3%) - 93.75%, followed by treatment T_4 (PEG 6000 @10%)-91.25% when compared with control T_0 Control -77.25% which is lowest.

Maximum germination energy was recorded in treatment T_{10}(KNO_3 @3%) - 46.25%, followed by treatment T_4 (PEG 6000 @10%)-44.75% when compared with control T_0 Control - 31% which is lowest.

Table.1 Mean performance of lentil for 10 seedling characters

S.no	Treatments	Germination percentage (%)	Germination Energy (%)	Speed of germination	Root length(cm)	Shoot length(cm)	Seedling length(cm)	Seedling fresh weight(g)	Seedling Dry Weight(g)	Seedling vigour Index-I	Seedling vigour Index-II
1	T_0	77.25	31.00	63.06	7.850	12.125	19.975	2.275	0.175	1543.7	13.505
2	T_1	90.00	43.75	76.445	12.150	18.875	31.025	2.825	0.245	2793.2	22.07
3	T_2	85.50	38.50	74.475	10.80	17.60	28.4	2.55	0.22	2430.05	18.772
4	T_3	86.50	41.00	72.247	11.50	18.075	29.575	2.725	0.222	2557.65	19.245
5	T_4	91.25	44.75	81.595	12.75	20.1	32.85	3	0.28	2997.9	25.555
6	T_5	79.75	33.75	75.927	8.775	15.575	24.35	2.575	0.2	1942.92	15.967
7	T_6	81.50	35.50	64.867	8.825	15.225	24.05	2.45	0.185	1959.92	15.072
8	T_7	86.25	37.00	66.232	8.85	14.3	23.15	2.625	0.215	1996.57	18.527
9	T_8	86.50	40.25	73.932	8.05	17.225	25.275	2.475	0.227	2187.25	19.687
10	T_9	89.75	41.75	71.567	12.4	18.9	31.3	2.35	0.202	2809.55	18.182
11	T_{10}	**93.75**	**46.25**	**86.84**	**13.45**	**20.6**	**34.05**	**3.2**	**0.302**	**3192.35**	**28.325**
12	T_{11}	83.50	35.75	71.837	9.35	18.425	27.775	2.55	0.205	2318.3	17.135
13	T_{12}	83.75	37.25	72.647	10.025	17.825	27.85	2.725	0.21	2332.87	17.587
Grand mean		**85.788**	**38.961**	**73.205**	**10.367**	**17.296**	**27.663**	**2.640**	**0.222**	**2389.404**	**19.202**
C.D.		2.644	2.641	5.289	0.788	1.677	1.958	0.325	0.034	197.407	2.973
SE(m)		0.921	0.920	1.842	0.274	0.584	0.682	0.113	0.012	68.752	1.035
SE(d)		1.302	1.301	2.605	0.388	0.826	0.964	0.160	0.017	97.229	1.464
C.V.		2.147	4.722	5.032	5.295	6.754	4.931	8.561	10.780	5.755	10.783

Maximum speed of germination was recorded in treatment T_{10}(KNO_3 @3%)- 86.84, followed by treatment T_4 (PEG 6000 @10%)- 81.595 when compared with control T_0 Control- 63.06 which is lowest.

Maximum root length was recorded in treatment T_{10}(KNO_3 @3%)- 13.45 cm, followed by treatment T_4 (PEG 6000 @10%)- 12.75 cm when compared with control T_0 Control-7.850 cm which is lowest.

Maximum shoot length was recorded in treatment T_{10}(KNO_3 @3%)- 20.6 cm, followed by treatment T_4 (PEG 6000 @10%)- 20.1cm when compared with control T_0 Control- 12.125 cm which is lowest.

Maximum seedling length was recorded in treatment T_{10}(KNO_3 @3%)- 34.05 cm, followed by treatment T_4 (PEG 6000 @10%)- 32.85 cm when compared with control T_0 Control- 19.975 cm which is lowest.

Maximum fresh weight was recorded in treatment T_{10}(KNO_3 @3%)- 3.2 g, followed by treatment T_4 (PEG 6000 @10%)- 3 g when compared with control T_0 Control- 2.275 g which is lowest.

Maximum dry weight was recorded in treatment T_{10}(KNO_3 @3%)- 0.302 g, followed by treatment T_4 (PEG 6000 @10%)- 0.28 g when compared with control T_0 Control- 0.175 g which is lowest.

Maximum seed vigour index-I was recorded in treatment T_{10} (KNO_3 @3%) - 3192.35, followed by treatment T_4 (PEG 6000 @10%)- 2997.9 when compared with control T_0 Control- 1543.7 which is lowest. Maximum seed vigour Index-II was recorded in treatment T_{10}(KNO_3 @3%)- 28.325, followed by T_4 (PEG 6000 @10%) - 25.555 when compared with control T_0 Control - 13.505 which is lowest.

On the basis of results obtained from the present investigation it is concluded that seed priming treatments played an effective role in improving germination and vigour parameters of lentil seeds. Pre sowing seed treatment with KNO_3@3% was found to be suitable in all other treatments and showed superior performance on seedling parameters of lentil followed by PEG 6000 @10% and Distilled water.

Pre sowing seed treatment with potassium nitrate (KNO_3) has long been known as suitable method for germination, seedling growth, and water relation behavior of grain. The positive effect of KNO_3 might be due to the role in influencing the permeability of cell membranes which further activates enzymes involved in protein synthesis and carbohydrate metabolism. The ions from KNO_3 solutions accumulate within the seeds, reducing water potential and increasing water absorption (seeds imbibitions). Pre-sowing treatment with is economical, KNO_3 and easily accessible. These conclusions are based on the result of six months investigation and therefore further investigation is needed to arrive at valid recommendations.

References

Abdul-Baki, A. A., and Anderson, J. D. (1973). Vigor determination in soybean seed by multiple criteria 1. *Crop science*, *13*(6), 630-633.

Ashraf, M., and Foolad, M. R. (2005). Pre-sowing seed treatment—A shotgun approach to improve germination, plant growth, and crop yield under saline and non-saline conditions. *Advances in agronomy*, *88*, 223-271.

Afzal, I., Basra, S. A., and Iqbal, A. (2005). The effects of seed soaking with plant growth regulators on seedling vigor of wheat under salinity stress. *Journal of Stress Physiology and*

Biochemistry, *1*(1).

Amjad, M., Ziaf, K., Iqbal, Q., Ahmad, I., Riaz, M. A., and Saqib, Z. A. (2007). Effect of seed priming on seed vigour and salt tolerance in hot pepper. *Pakistan Journal of Agricultural Sciences*, *44*(3), 408-416.

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.

Arief, R., Koes, F., and Komalasari, O. (2012). Effect of priming on seed vigor of wheat (*Triticum aestivum* L.). *AGRIVITA, Journal of Agricultural Science*, *34*(1), 50-54.

Afzal, I., Noor, M. A., Bakhtavar, M. A., Ahmad, A., and Haq, Z. (2015). Improvement of spring maize performance through physical and physiological seed enhancements. *Seed Science and Technology*, *43*(2), 238-249.

Basra, S. M. A., Zia, M. N., Mehmood, T., Afzal, I., and Khaliq, A. (2002). Comparison of different invigoration techniques in wheat (*Triticum aestivum* L.) seeds. *Pakistan Journal of Arid Agriculture (Pakistan)*.

Bradford, K. J. (1986). Manipulation of seed water relations via osmotic priming to improve germination under stress conditions. *Hort Science (USA)*.

Bewley JD and Black M. (1982). Seed: Physiology of development and germination (2nd eds). Plenum Press. New York, USA. p. 60-198.

Copeland, L. O., and M. McDonald B.(1995). Principles of seed science and technology.

Dawood, M. G. (2018). Physiological effect of melatonin, IAA and their precursor on quality and quantity of chickpea plants grown under sandy soil conditions. *Agricultural Engineering International: CIGR Journal*, *19*(5), 35-44.

Di Girolamo, G., and Barbanti, L. (2012). Treatment conditions and biochemical processes influencing seed priming effectiveness. *Italian Journal of Agronomy*, e25-e25.

Dursun, A., and Ekinci, M. (2010). Effects of different priming treatments and priming durations on germination percentage of parsley (*Petroselinum crispum* L.) seeds. *Agricultural Sciences*, *1*(01), 17.

Demir, I., and Mavi, K. (2004). The effect of priming on seedling emergence of differentially matured watermelon (*Citrullus lanatus* (Thunb.) Matsum and Nakai) seeds. *Scientia horticulturae*, *102*(4), 467-473.

Faqenabi, F., Tajbakhsh, M., Bernoosi, I., Saber-Rezaii, M., Tahri, F., Parvizi, S.,. .. and Sedqi, H. (2009). The effect of magnetic field on growth, development and yield of safflower and its comparison with other treatments. *Res. J. Biol. Sci*, *4*(2), 174-178.

Farooq, M., Basra, S. M., and Khan, M. B. (2007). Seed priming improves growth of nursery seedlings and yield of transplanted rice. *Archives of Agronomy and Soil Science*, *53*(3), 315-326.

Ghiyasi, M., Seyahjani, A. A., Tajbakhsh, M., Amirnia, R., and Salehzadeh, H. (2008). Effect of osmopriming with polyethylene glycol (8000) on germination and seedling growth of wheat (Triticum aestivum L.) seeds under salt stress. *Res. J. Biol. Sci*, *3*(10), 1249-1251.

Ghassemi-Golezani, K., Sheikhzadeh-Mosaddegh, P., and Valizadeh, M. (2008). Effects of hydro-priming duration and limited irrigation on field performance of chickpea. *Res. J. Seed Sci*, *1*(1), 34-40.

Gashi, B., Abdullai, K., Mata, V., and Kongjika, E. (2012). Effect of gibberellic acid and potassium nitrate on seed germination of the resurrection plants *Ramonda serbica* and *Ramonda nathaliae*. *African Journal of Biotechnology*, *11*(20), 4537-4542.

Hasanuzzaman, M., Bhuyan, M. H. M., Nahar, K., Hossain, M., Mahmud, J. A., Hossen, M and Fujita, M. (2018). Potassium: A vital regulator of plant responses and tolerance to abiotic stresses. *Agronomy*, 8(3), 31.

Hassini, I., Baenas, N., Moreno, D. A., Carvajal, M., Boughanmi, N., and Martinez Ballesta, M. D. C. (2017). Effects of seed priming, salinity and methyl jasmonate treatment on bioactive composition of *Brassica oleracea* var. capitata (white and red varieties) sprouts. *Journal of the Science of Food and Agriculture*, *97*(8), 2291-2299.

How to cite this article:

Prudvi Raj Naidu Bethapalli, Prashant Kumar Rai and Ajay Kumar Rai. 2021. Assessment of Different Seed Priming Treatments on Quality Parameters of Lentil (*Lens culinaris* Medik.) (Variety Mallika). *Int.J.Curr.Microbiol.App.Sci.* 10(03): 317-323.
doi: https://doi.org/10.20546/ijcmas.2021.1003.042