Int.J.Curr.Microbiol.App.Sci (2019) *8*(9): 109-113

International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 8 Number 09 (2019)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2019.809.015

Effect of Seed Hardening with Micronutrients and Botanicals on Seed Quality Parameters in Chickpea (*Cicer arietinum* L.)

B. Saicharan*, Bineeta M. Bara, Prashant Kumar Rai, B. Nihar and R. Pramod

Department of Genetics and Plant Breeding, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, UP-211007, India

**Corresponding author*

Keywords

Chickpea, Seed Hardening, Micronutrients, Botanicals and seed quality

Article Info

Accepted:
04 August 2019
Available Online:
10 September 2019

A B S T R A C T

An investigation was carried out to study the effect of seed hardening with micronutrients and botanicals on seed quality parameters in chickpea. The chickpea cv. PUSA-362 was imposed to various seed hardening treatments viz., Neem leaf extract @ 5%, Tulsi leaf extract@ 5%, Papaya leaf extract@ 5%, Moringaleaf extract @ 5%, $CaCl_2$@ 1% and 2%, KCl @ 1% and 2%, KNO_3 @ 1% and 2%, KH_2PO_4 @ 1% and 2%. The above treated seeds along with control for their seed quality parameters. The study revealed that seed hardening with KH_2PO_4 @ 2% in micronutrients and Neem leaf extract @ 5% in botanicals showed better performance in maximum seed quality parameters as compared to other treatments and control on the basis of lab studies.

Introduction

Pulses are the wonderful gift of nature plays an important role in both Indian economy and diet (Jat *et al.*, 2012). Among the pulses chickpea (*Cicer arietinum* L.) is having vital role in the diet of rural and urban masses. Chickpea is important food legume s for production worldwide. It is one of the most extensively grown *rabi* pulse crop in India.

Chickpea is the third most important pulse crop in the world, after dry beans and peas, produced in the world (Anon., 2011) chickpea occupies a prime position among the pulses in the country with a maximum hectarage, production and its high nutritive value. It is known to have originated in western Asia. Chickpea is a member of the legume, pea, or pulse family "Fabaceae". Among annual seed crops, it ranks 14th in terms of area and 16th in production. Chickpeas have an ancient history, and were one of the earliest cultivate vegetables. Remains from 7500 years ago have been found in the Middle East (Philologos, 2007). Chickpea is widely grown across the country and serves as a multipurpose crop (Shiferaw *et al.*, 2007).

First, it fixes atmospheric nitrogen in soils and thus improves soil fertility and saves fertilizer costs in subsequent crops. Secondly, it improves more intensive and productive use of land, particularly in areas where land is scarce and the crop can be grown as a second crop using residual moisture. Thirdly, it reduces malnutrition and improves human health especially for the poor who cannot afford livestock products. It is an excellent source of protein, fiber, complex carbohydrates, vitamins and minerals.

Seed hardening is a technique which has been used successfully for vigour enhancement in several seeds like rice, wheat (Basra *et al.*, 2003, 2004); Lee and Kim, 2000. In this technique, seeds may imposed to different conditions like alternate wetting an drying, chilling treatment or high temperature for different durations (Farooq *et al.,* 2005). Several researchers worked on hardening and other techniques for increasing in vigour of seeds and found hardening better than other. Hence the study was undertaken in chickpea cv. PUSA-362 with an objective to study the effect of seed hardening with micronutrients and botanicals on seed quality parameters in chickpea.

Materials and Methods

The present investigation was done in the Post graduate laboratory of seed science and technology, Department of Genetics and Plant Breeding, Sam Higginbottom University of Agriculture, Technology and Sciences. The experiment consisted of thirteen treatments including control viz., T_0: Control, T_1: Neemleaf extract @ 5%, T_2: Tulsileaf extract @ 5%, T_3: Papayaleaf extract@ 5%, T_4: Moringaleaf extract@ 5%,T_5: $CaCl_2$ @ 1%, T_6: $CaCl_2$ @ 2%, T_7: KCl @ 1%, T_8: KCL @ 2%, T_9: KNo_3 @ 1%, T_{10}: KNo_3 @ 2%, T_{11}: KH_2PO_4 @ 1%, T_{12}: KH_2PO_4 @ 2%. The seeds were soaked in the required solutions for 12 hours at temperature 25°C. After 12 hours of soaking the solution drained out and pre-soaked seeds were shade dried to obtain its original weight. A trail was laid out with about thirteen treatments adopting completely randomized design with four replications under controlled lab condition.

The observations on germination percentage (ISTA, 2001), root length, shoot length, seedling length, seedling fresh weight, seedling dry weight, vigour index I and vigour index II (Abdul-Baki and Anderson, 1973) were recorded in this experiment. The experimental data were subjected to analysis of Analysis of variance, mean, standard error and critical difference (Bradley and Christopher, 2009).

Results and Discussion

According to the results, all studied traits were affected by the treatments and there was completely significant difference between control (unhardened seeds) and hardened seeds (Tables 1 and 2). Seed hardening means alternating drying and wetting of seeds (Pen aloza and Eira, 1993).

The mean performance of germination percentage ranged from 84.0 to 96.0 % with the mean value 90.2%. Significantly highest germination percentage in micronutrients was reported in the treatment T_6: $CaCl_2$ @ 2% (96.0%) and in botanicals, treatment T_1: Neem leaf extract@ 5% (94.0%) was recorded as higher germination percentage. The minimum germination percentage was recorded in the treatment T_0: Control (84.0%).

The mean performance of root length ranged from 9.2 to 24.1 cm with the mean value 16.3. The maximum root length in micronutrients was recorded in the treatment T_{12}: KH_2PO_4 @ 2% (24.1 cm) and in botanicals, treatment T_1: Neem leaf extract@ 5 % (21.3 cm) was

recorded maximum root length. The minimum root length was recorded in the treatment T_0: Control (9.2 cm).

The mean performance of shoot length ranged from 6.3 to 14.4 cm with the mean value 10.4 cm. The maximum shoot length in micronutrients was recorded in the treatment T_{12}: KH_2PO_4 @ 2% (14.4 cm) and in botanicals, treatment T_1: Neem leaf extract @ 5% (13.4 cm) was recorded maximum shoot length. The minimum shoot was recorded in the treatment T_0: Control (6.3 cm). The mean performance of seedling length ranged from 15.5 to 38.5 cm with mean value 26.7 cm.

Table.1 Analysis variance of seed quality parameters in chickpea cv. PUSA-362

S. No.	Characters	Mean sum of squares	
		Treatments (df=12)	Error (df=39)
1.	Germination percentage	63.90**	3.74
2.	Root length	85.80**	0.14
3.	Shoot length	34.02**	0.04
4.	Seedling length	224.7**	0.16
5.	Seedling fresh weight	11.92**	0.13
6.	Seedling dry weight	5.63**	0.05
7.	Vigour index I	2434462.4**	3602.1
8.	Vigour index II	57185.2**	473.2

*And** significant at 5% and 1% level of significance, respectively.

Table.2 Mean performance of 8 parameters of seed quality in chickpea cv. PUSA-362.

S. No.	Treatments	Germination (%)	Root length (cm)	Shoot length (cm)	Seedling length (cm)	Seedling fresh weight (g)	Seedling dry weight (g)	Vigour index I	Vigour index II
1	T_0	84	9.2	6.3	15.5	6.2	1.54	2080.4	129.0
2	T_1	94	21.3	13.4	34.7	10.4	4.67	3265.4	439.5
3	T_2	93	19.4	12.5	31.8	10.2	4.38	2961.0	407.4
4	T_3	85	10.6	6.8	17.4	6.8	1.95	1479.0	166.6
5	T_4	88	14.6	8.4	23.0	8.1	2.63	2019.9	231.6
6	T_5	91	15.2	9.0	24.2	8.6	3.37	2202.4	306.9
7	T_6	96	22.7	14.2	37.0	11.0	4.83	3547.4	463.5
8	T_7	86	13.2	8.0	21.2	7.6	2.34	1824.2	201.3
9	T_8	92	17.4	12.3	29.8	9.6	4.23	2739.3	389.2
10	T_9	86	11.5	7.2	18.7	7.3	2.18	1607.6	187.3
11	T_{10}	92	16.4	11.7	28.1	9.0	3.98	2586.6	366.3
12	T_{11}	90	16.1	10.8	26.8	8.8	3.70	2409.8	332.6
13	T_{12}	95	24.1	14.4	38.5	12.1	4.95	3659.0	470.4
Grand Mean		**90.2**	**16.3**	**10.4**	**26.7**	**8.9**	**3.44**	**2490.9**	**314.7**
C.D (5%)		2.77	0.54	0.29	0.57	0.52	0.33	85.8	31.1
SE(m)		0.97	0.19	0.10	0.20	0.18	0.11	30.0	10.8
SE(d)		1.37	0.27	0.14	0.28	0.26	0.16	42.4	15.38

The maximum seedling length was obtained in micronutrients in the treatment T_{12}:

KH_2PO_4 @ 2% (38.5 cm) and in botanicals, treatment T_1: Neemleaf extract @ 5% (34.7 cm) was recorded maximum seedling length. The minimum seedling length was recorded in the treatment T_0: Control (15.5 cm).

The mean performance of seedling fresh weight ranged from 6.2 to 12.1 g with the mean value 8.9 cm. The highest seedling fresh weight was in micronutrients was recorded in the treatment T_{12}: KH_2PO_4 @ 2% (12.1 g) and in botanicals, treatment T_1: Neem leaf extract@ 5% (10.4 g) was recorded higher seedling fresh weight. The lowest seedling fresh weight was recorded in the treatment T_0: Control (6.2 g).

The mean performance of seedling dry weight ranged from 1.54 to 4.95 g with the mean value 8.9 g. The highest seedling dry weight in micronutrients was recorded in the treatment T_{12}: KH_2PO_4 @ 2% (4.95 g) and in botanicals, treatment T_1: Neem leaf extract@ 5% (4.67 g) was recorded highest seedling dry weight. The lowest seedling dry weight was recorded in the treatment T_0: Control (1.54 g). The mean performance of vigour index I range from 1479.0 to 3659.0 with the mean value 2409.8. The highest vigour index I in micronutrients was obtained by the treatment T_{12}: KH_2PO_4 @ 2% (3659.0) and in botanicals, treatment T_1: Neemleaf extract @ 5% (3265.4) was obtained higher vigour index I. The lowest vigour index I was obtained in the treatment T_4: Moringa leaf extract@ 5% (1479.0).

The mean performance of vigour index II ranged from 129.0 to 470.4 with the mean value 314.7. The higher vigour index II in micronutrients was obtained by the treatment T_{12}: KH_2PO_4 @ 2% (470.4) and in botanicals, treatment T_1: Neem leaf extract@ 5% (439.5) was obtained higher vigour index II. The lowest vigour index II was obtained in the treatment T_0: Control (129.0).

On the basis of present investigation, it can be concluded that the seed hardening treatment found effectiveness withKH_2PO_4 @ 2% in micronutrients and Neem Leaf extract @ 5% in botanicals showed superior performance on seed quality parameters.

The study showed improvement in seed hardening treatment to the seed is simple easy and in expensive approach to enhance the seed performance and thereby agricultural productivity especially in dry land resources of poor farmers. This clearly indicates the mode of action differs for the micronutrients and botanicals.

Acknowledgement

Authors are thankful to Dr. Bineeta M.Bara, Assistant Professor, Department of Genetics and Plant Breeding, SHUATS, Prayagraj, (U.P.) for providing necessary facilities, encouragement and support.

References

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

Anonymous, FAOSTAT (2011). http://faostat.fao.org/site/567/DesktopDefault.aspx. (Accessed 12th December 2011).

Basra SMA, Farooq, M. and Khaliq A. (2003). Comparative study of pre-sowing seed enhancement treatments in fine rice (*Oryza sativa* L.).*Pakistan Journal Life and Social Science.* 1: 5-9.

Basra SMA, Farooq, M. and Tabassum, R. (2004). Physiological and biochemical aspects of seed vigor enhancement treatments in fine rice (*Oryza sativa* L.). *Seed Science and Technology.* 33: 21.

Bradley, and Christopher, J.N. (2009) Split

designs; what, why and how. *Journal of quality technology*. 41(4).

Farooq, M., Basra, S.M.A., Ahmad, N. and Hafeez, K. (2005). Thermal Hardening: A New Seed Vigor Enhancement Tool in Rice. *Journal of Integrative Plant Biology*. 47: 187−193.

International Seed Testing Association (2001). International rules for seed testing rules 1996. *Seed Science and Technology*. 24.

Jat, N.R., Rana, B.S. and Jat, S.K. (2013). Estimation of losses due to pulse beetle in chickpea. *The Bioscan*, 8: 861-863.

Lee, S.S. and Kim, J.H. (2000). Total sugars, α-amylase activity, and germination after priming of normal and aged rice seeds. *Korean Journal of Crop Science.* 45: 108–111.

Pen Aloza A.P.S., Eira M.T.S. 1993. Hydration-dehydration treatments on tamato seeds (*Lycopersicum esculentum* Mill). *Seed Science and Technology*, 21, 309-316.

Philologos. 2007. Chickpeas, *Forward Association*. Retrieved August 2, 2008.

Shiferaw, B. and Hailemariam, T. (2007). Structure and functioning of chickpea markets in Ethiopia: Evidence based on analyses of value chains linking smallholders and markets. *International Production Management System Working Paper* 6, ILRI, Nairobi, Kenya. 55.

How to cite this article:

Saicharan, B., Bineeta M. Bara, Prashant Kumar Rai, B. Nihar and Pramod, R. 2019. Effect of Seed Hardening with Micronutrients and Botanicals on Seed Quality Parameters in Chickpea (*Cicer arietinum* L.). *Int.J.Curr.Microbiol.App.Sci.* 8(09): 109-113.
doi: https://doi.org/10.20546/ijcmas.2019.809.015