Int.J.Curr.Microbiol.App.Sci (2018) *7*(9): 3510-3514

International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 7 Number 09 (2018)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2018.709.435

Studies on Climate Smart Intervention on Induction of Drought Tolerance by Seed Priming with $CaCl_2$ in Chickpea Growth, Yield and Quality Parameters

Shankrayya[1*], Raju G. Teggelli[2] and Manjunath Patil[3]

[1]NICRA Project, KVK, Kalaburagi, India
[2]KVK, Kalaburagi, India
[3]Animal Science, KVK, Kalaburagi

**Corresponding author*

Keywords

Chickpea, Drought tolerance, $CaCl_2$, Seed yield, Seed priming, Seedling vigour

Article Info

Accepted:
24 August 2018
Available Online:
10 September 2018

A B S T R A C T

The present investigations were carried out in NICRA village (Melakunda B) of Krishi Vigyan Kendra (KVK), Kalaburagi to study the influence of drought tolerance by seed priming with $CaCl_2$ (2%) in chickpea growth, yield and quality parameters during 2017-18 under rainfed condition. The result reveal that, seed treatment with $CaCl_2$ (2%) recorded higher plant height (43.7 cm), leaf dry matter (2.15 g/plant), stem dry matter (7.14 g/plant), total dry matter (36.2 g/plant), total number of pods (48.7 pods/plant), seed yield (13.7 q/ha) and higher seed quality parameters like seed germination (94.8 %), root length (10.7 cm), seedling vigour (1564.2) and field emergence (91.7 %) compared to control under drought condition.

Introduction

In India, nearly 70% of cultivated land is rainfed and accounts about 42% of the total quantity of food grains produced. The low productivity under rainfed condition is due to soil moisture deficit, low and erratic rainfall, use of poor quality seeds, poor crop establishment and improper crop management. Seed treatment with CaCl2 is a practice adopted to alleviate the moisture stress or making the plant resistant to moisture stress through proper germination and crop establishment under drought situations. There are several studies done to show the beneficial effects of presowing seed treatment with CaCl2 in different crops. For example, Pothiraj and Sankaran (1984) and Rathinavel and Dharmalingam (2000) in cotton; Pawar *et al.*, (2003) in sunflower; Parvatikar *et al.*, (1975), Sheela and Alexander (1995) in rice; Singh *et al.*, (1975) in barley. Also there are reviews done by Kulkarni and Chittapur (2003) and Solaimalai and Subburamu (2004) on seed treatment with CaCl2 (2%) in different crops. The inorganic salts like NaCl, Na_2SO_4 KCl, KH_2PO_4, $CaCl_2$ and $MgSO_4$; organic acids like succinic acid, CCC and

auxins are used as prehardening agents. Seed treatment with $CaCl_2$ will modify the physiological and biochemical nature of seeds, so as toget the characters that are favorable for drought tolerance. Although, it varies from crop to crop, the principle remains same.

Chickpea (*Cicer arietinum* L.) is a major *Rabi* season pulse crop in Hyderabad-Karnataka region. It is generally grown on conserved moisture and moisture in the soil profile gradually recedes as the crop grows. As a consequence, plant experiences progressively increasing degree of terminal moisture stress. Thus, soil moisture stress assuming a major limiting factor for determining the growth, yield and quality parameters in chickpea (Verma and Pramilakumari, 1978). Therefore there is a need to identify suitable ameliorative measures to overcome the moisture stress effect. The pre-sowing seed treatment with CaCl2is one of the simple technique being employed to modify the marpho-physio-biochemical nature of seed, so as to induce the characters that are favorable for drought resistance. Keeping these views the investigation was under taken to study the influence of drought tolerance by seed priming with CaCl2 (2%) on growth, yield and quality parameters in chickpea.

Materials and Methods

An field demonstration were conducted to study the influence of drought tolerance by seed priming with $CaCl_2$ (2%) in chickpea growth, yield and quality parameter sduring 2017-18 under rainfed condition in NICRA village (Melakunda B) of Krishi Vigyan Kendra (KVK), Kalaburagi to Annual rainfall received was 720 mm during the year 2017-18.

The experiments consist of two treatments i.e contol and seed priming with $CaCl_2$. A day before sowing, the chickpea seeds were soaked in solution of $CaCl_2$ (2%) for six hours and later seeds were dried under shade to its original moisture. The seeds were sown in field by following all the normal chickpea packages of practices includes agronomic practices and plant protection measures for the crop.

To know the effect of seed soaking on germination and early seedling vigour, 100 seeds were sown in each plot. The germination count was taken from these plots. From this the percentage germination was worked out.

The seedlings were thinned out at 8 days. The observations on percent germination, root length, seedling vigour, 100 seed weight and field emergence were recorded at the beginning of crop growth. The observations on leaf dry matter, stem dry matter, total dry matter, total number of pods per plant and seed yield recorded after harvest of crop.

Results and Discussion

Rainfall: Ten days dry spell observed prior to sowing and after sowing i.e., between 22/10/2018 to 31/10/2018. The data shows that after sowing up to 10 days there was no rainfall received and hence there was moisture stress at germination and seedling growth in the chickpea field.

In the present study, seed priming with $CaCl_2$ (2%) under drought condition recorded significantly higher plant height (43.7 cm), leaf dry matter (2.15 g/plant), stem dry matter (7.14 g/plant), total dry matter (36.2 g/plant), seed yield (13.7 q/ha) and higher seed quality parameters like seed germination (94.8 %), root length (10.7 cm), seedling vigour (1564.2) and field emergence (91.7 %) compared to control.

The improvement in germination by seed priming with $CaCl_2$ (2%) under drought

condition lead to physicochemical changes within the cytoplasm leading to improvement in seed germination, seed viability, vigour, root length, shoot length and also yield parameters in chickpea crops has been recorded (Solaimalai and Subbaramu, 2004) and reviewed by many workers (Rathinavel and Dharnalingraju, 2000; Kulkarni and Chittapur, 2003). Many studies on the improvement of growth and yield due to pre sowing seed treatment with CaCl2 are documented (Solaimalai and Subbarmanu, 2004; Meek and Oosterhugs, 2005). Soaking the seeds for 24 hours in CCC under saline condition results an increase in seed cotton yield (Gabr and Ashkar, 1977) (Fig. 1; Table 1 and 2).

Fig.1 Influence of rainfall on seed primming with $CaCl_2$ in chickpea growth, yield and quality parameters in NICRA village KVK, Kalaburagi

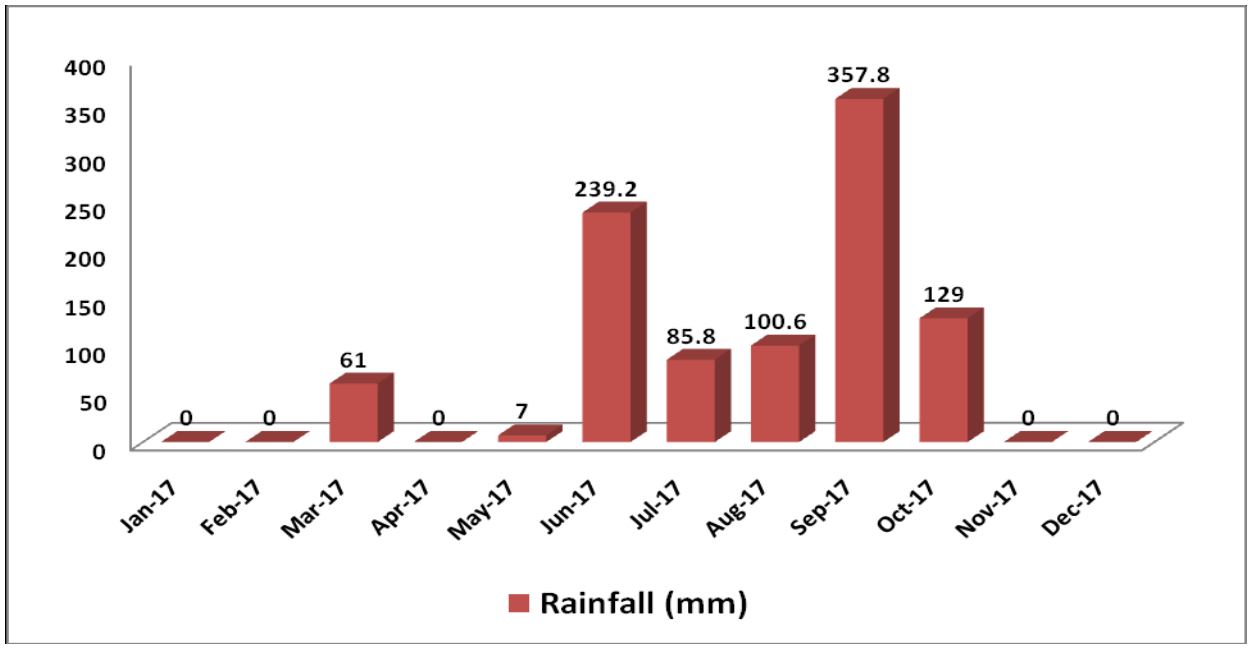

Table.1 Period of dry spell after seed priming with $CaCl_2$ in chickpea growth, yield and quality parameters in NICRA village KVK, Kalaburagi

Rainfall 2017-18		March	April	May	June	July	August	September	October
No. of dry spells during 2017-18	>10 days	-	-	1	-	-	-	-	1(dry spell) i. e (10 days) after chickpea sowing
	>15 days	2	-	1	-	-	-	-	-
	>20 days	-	-	-	-	-	-	-	-
No. of Rainy Days			2	-	1	6	8	12	6
No. Intensive Rain-Spells (2017	>60 mm per day	1	-	-	1	1	1	1	1

Table.2 Effect of seed priming with $CaCl_2$ and yield trait in Chickpea under drought condition

Dry spell period	Particulars	Control	Seed treatment with $CaCl_2$ demonstration plot
Dry spell from 22/10/2018 to 31/10/2018 (10 days)	1) Plant height (cm)	42.2	43.7
	2) Leaf dry matter (g/plant)	1.78	2.15
	3) Stem dry matter (g/plant)	5.13	7.14
	4) Total dry matter (g/plant)	32.4	36.2
	5) Total number of pods/plant	43.5	48.7
	6) Seed yield (g/pl)	12.18	15.63
	7) 100 Seed weight (g)	21.46	24.67
	8) Seed germination (%)	86.5	94.7
	9) Root length (cm)	8.9	10.7
	10) Seedling vigour	1376	1564.2
	11) Field emergence (%)	87.4	91.7
	12) Seed yield (q/ha)	12.2	13.7

The improvement in yield and yield parameters in pulse crops has been attributed to the beneficial effects of seed priming with CaCl2 due to increased bound water content, triggering of biosynthesis of nucleic acids and rapid germination and growth of seedlings resulting in increased uptake of nutrients and the ability of the treated seeds to with stand high temperature for prolonged periods under dry condition (Swaminathan and Sujatha, 2001).

The pre sowing seed treatment with CaCl2 - 2% improved yield and seed quality parameters of chickpea over control. This simple technique may be employed by the growers to realize the potential yield and seed quality parameters.

Acknowledgements

We acknowledge the financial support obtained from ICAR-CRIDA, Hyderabad to run NICRA project at KVK, Kalaburagi. We also would like to acknowledge Director, ICAR-ATARI Banglore, for his guidance and support for implementation of the project

References

Gabr, A. I. and S. A. Ashkar (1977). The effect of different combinations of soil salinity and CCC on dry matter accumulation and yield of cotton plants *Biologia Plantarum*, 19: 391-393.

Kulkarni, S.S. and B.M. Chittapur (2003). Seed treatment technology in crop production-A review, *Agric. Rev.*, 24 (4): 308-312.

Meek C. R. and D. M. Oosterhugs (2000). Proceedings of the 2000 Cotton Research Meeting, AAES Special report.

Parvatikar, S.R, M.V. Kulkarni and T.G. Prasad (1975). Physiological studies on sorghum: response of Sorghum varieties to seed- hardening treatment. *Sorghum Newslett.*, 18 : 35.

Pawar, K.N., A.S. Sajjan and B.G. Prakash (2003). Influence of seed hardening on growth and yield of sunflower, *Karnataka J. Agric. Sci.*, 16 (4): 539-541.

Pothiraj, P. and S. Sankaran (1984). Effect of seed hardening on the physiological

vigour of the cotton seedlings, *India J. Plant Phy.*, 27(3): 300-302.

Rathinavel, K. and C. Dharmalingam (2000). Upgradation of seed quality by hardening cum halogenations treatment in uppam Cotton, *Seed Research*., 28 (1): 5-9

Sheela, K.R. and V. Thomas Alexander (1995).Physiological response of rice varieties as influenced by soil moisture and seed hardening. *Indian J. Plant Physiol*., 38(3): 269-271.

Singh, K.N., B.N. Misra and Mahabir Prasad., (1975). Effect of time of sowing, seed rate and seed soaking on grain yield of rainfed Barley, *Indian J. Agron.*, 20 (1) : 26-28.

Solaimalai, A. and K. Subburamu (2004). Seed hardening field crops-A Review., *Agric Rev.* 25 (2): 129-140.

Swaminathan C. and K. Sujatha (2001). Presowing seed hardening in two forage grasses. *Seed Research* 29 (2): 229-230.

Verma, S.K and Pramilakumari. (1978). Nature, extent, productivity and intensity of flower and pod shedding in gram (*Cicer arietinum.* L.) *Legume research*, 1; 108-114.

How to cite this article:

Shankrayya and Raju G. Teggelli. 2018. Studies on Climate Smart Intervention on Induction of Drought Tolerance by Seed Priming with $CaCl_2$ in Chickpea Growth, Yield and Quality Parameters. *Int.J.Curr.Microbiol.App.Sci.* 7(09): 3510-3514.
doi: https://doi.org/10.20546/ijcmas.2018.709.435