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### Effect of seed-priming through chemicals on seed enhancement in chickpea (*Cicer arietinum* L.)

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#### Abstract

Chickpea is a diploid species with a chromosome number  $2n = 16$  Chickpea (*Cicer arietinum* L.) belongs to genus *Cicer*, family Fabaceae, and subfamily Papilionaceae. Chickpea is an important Rabi season, self-pollinated legume crop having extensive geographical distribution. The present investigation entitled "Suitability of bio-agent for priming the Seed enhancement in chickpea (*Cicer arietinum* L.)" was undertaken to find out the efficacy of seed priming for enhancing the standard germination, shoot length, root length, seedling vigour and electrical conductivity in harvested seeds. In chemical agent seed priming with  $GA_3$  50 ppm seed priming with  $KNO_3$  0.2% seed priming with KCl 2.0 % was used to check the suitability for priming the seed enhancement in chickpea. It was found that  $GA_3$  50 ppm was found the best treatment combination which enhanced the seed quality parameters namely in viability percent /germination percent, root length, shoot length, seedling length was enhancing the seed vigor and plant establishment and minimizing the incidence of Ascochyta Blight in chickpea. The maximum seed germination (91.33 %) was observed in hydro-priming for 8 hours ( $P_2$ ) in combination with chemical treatment with  $C_1$  ( $GA_3$  @ 50 ppm). The interaction effects of hydro-priming duration and seed treatment were found non-significant. However, the maximum germination (92.22%) was recorded with seed treatment with  $GA_3$  @ 50 ppm in combination hydro-priming for 8 hours. The interaction effects of chemical treatment and seed treatment were found non-significant. However, the maximum germination, emergence, establishment % viability %, root length cm, shoot length cm seedling length cm, vigor index and speed of germination were recorded with seed treatment with  $GA_3$  @ 50 ppm. The interaction effects of hydro-priming duration, chemical treatment and seed treatment were found non-significant.

**Keywords:** Chemical, priming, seed enhancement, suitability,  $GA_3$

#### Introduction

Chickpea (*Cicer arietinum* L.) is a rainfed, low inputs, winter leguminous crop used in various foods in several developing countries, particularly in India as a source of dietary protein. It is a rich source of highly digestible dietary protein (17-21 per cent), carbohydrate (61.5 per cent) and fat (4.5 per cent). It is also rich in calcium, iron, niacin, vitamin B and vitamin C. The major chickpea producing countries in Asia are India (65%), Pakistan (7.5%) and Turkey (6.5%). India grows chickpea on 8.56 million ha are producing 7.65 million tonnes (FAO, 2011) [4] and having productivity 858 kg/ha.

Among pulses, chickpea occupies a premier position in respect of area and production in the world. It is grown in an area 13.20 m ha and the production is around 11.60 m tonnes with an average productivity of 880 kg per ha. India is also greater consumer as well as importer of chickpea in the world. In India, chickpea is grown about 9.51 m ha producing 8.83 m tonnes grain with productivity of 929 kg per ha. In Uttar Pradesh, it is cultivated on area of 604 thousand ha with grain yield production is 732 thousand tonnes and productivity of crops is 1212 kg per ha respectively 2014 and whole India the chickpea production is 9.12 million tonnes in 2016-17. It is cultivated throughout the country except high altitude and coastal region. However, the major chickpea producing states are Madhya Pradesh, Rajasthan, Maharashtra, Karnataka and Andhra Pradesh. Which contribute more than 90 per cent of the national production (Anonymous, 2016) [2].

There are two types of chickpea viz desi and kabuli, grown in the world recognized visually by seed coat colour and seed size. The desi types is characterized by small seed size and thick seed coat with pale to dark brown in colour, whereas kabuli type is large seed size cream in colour with thick seed coat.

The productivity level of pulses is not sufficient due to unavailability of quality seeds of improved varieties, several biotic and abiotic stresses and poor crop management practices. The planting value of seed is one of the key factors for proper plant establishment and performance, particularly under moisture stress conditions. Use of quality seed alone has been reported to improve productivity in chickpea from 15-20 percent (Dahiya *et al.*, 1997) [3]. The most cost effective method available for better stand establishment is to sow the seed with high germination which shows quick early growth. The major constraints of good establishment are due to low quality seed in addition to lack of soil moisture (Gurumu and Naylor, 1991) [5]. These conditions result in poor emergence that may subsequently cause sparse plant stands (Saxena *et al.*, 1997) [15].

The seed priming process simply involves soaking the seed overnight (for about 8 hrs), surface drying them and sowing within the same day (Musa *et al.*, 2001) [12] to hasten germination, enhances crop establishment and promotes seedling vigor (Harris *et al.*, 1999) [6].

### Materials and Methods

The present experiment was carried out to study the "Suitability of chemical for priming the Seed enhancement in chickpea (*Cicer arietinum* L.)"

### Materials

The experiment was conducted at Department of Seed and Technology Section, N D University of Agriculture and Technology, Kumarganj Ayodhya, (U.P.) on Chickpea variety "Pusa 362" having germination above IMSCS (85%). The seeds were procured from Seed Testing Lab, Seed Technology Section, Kumargang Ayodhya. Gibberellic Acid (GA<sub>3</sub>), Potassium Nitrate (KNO<sub>3</sub>), Potassium Chloride (KCl), bio-agents namely, *Trichoderma viridea*.

### Methods

The experiment was conducted under Seed Testing laboratory condition of the Department of Seed Technology Section, N D University of Agriculture and Technology, Kumarganj Ayodhya. The following methods were adopted for successful experimentation.

### Soaking further bio-agents of the Seed in solution

After preparation of solution, seeds of the variety Pusa 362 were soaked in desired solution for 4, 8, and 12 hours at 20 - 25°C temperature. Simultaneously. After prescribed period of soaking, solution was drained out from the beaker and soaked seeds were air dried and then placed for germination in controlled laboratory conditions.

### Seed germination (%)

Standard germination was conducted in Seed Testing laboratory of the Section. Germination test was carried out by following the procedure out lined by ISTA rules (ISTA, 1999) [7]. Four replications of 100 seeds for each treatment, were uniformly placed on moist germination paper and rolled with wax paper to prevent moisture evaporation during test period. Samples were placed in plastic tray in stand upright position and the trays were shifted to seed germinator maintained at 20-21 °C temperature and 90±3 per cent relative humidity

after 7 days final count. Normal seedling, abnormal seedling and dead seeds were observed and counted.

### Viability (%)

Viability of seed placed undereach treatment was measured through percent (%) Accetocorum solution.

### Root length (cm)

Root length of fifteen random seedlings was measured from same seedlings whose shoot length (cm) was taken.

### Shoot length (cm)

The shoot length (cm) was measured taking twenty five seed kept in two layered moist germination papers and rolled in four replications. The samples were kept in seed germinator maintained at 20±1<sup>0</sup> C. fifteen seedling were randomly taken.

### Seedling length (cm)

At the end of germination test period fifteen randomly ten normal seedlings were carefully removed from each replication. The distance between the collar and tip of the primary root as root length (cm) and between the collar and tip of shoot as the shoot length (cm) was measured. Total value of root and shoot length are named as seedling length (cm).

### Vigour index

The vigour index was calculated as per the method prescribed by Abdul- Baki and Anderson 1973 expressed in whole number:-

Vigour index = Mean germination (%) X Mean seedling length (cm).

### Field emergence (%)

Field emergence of 8 the no. of chickpea seed from each treatments in was used for the field emergence studies. The seed was covered with soil. Field emergence count was taken on the 15<sup>th</sup> day after sowing and emergence percentage was calculated taking in to account the number of seedling emerged three centimeter above the soil surface.

$$\text{Field emergence (\%)} = \frac{\text{Number of seedlings emerged on 15th days}}{\text{Total number of seeds sown}} \times 100$$

### Establishment

The material used for study of field emergence were rejected to observe the plant establishment rate after 35 days after maximum percentage over 1000 seeds sown. Genotype in three replications was used for the field establishment studies. The seed and covered with soil. The establishment of seeds would be take from field emergence condition.

### Result and Discussion

The present investigation was carried out on "Suitability of bio-agent for priming the Seed enhancement in chickpea (*Cicer arietinum* L.)" had been deeply elaborated in the previous chapter i.e. experimental findings and now discussed in this chapter. The result recorded during the experimental findings have been discussed and their effects relationships with seed quality.

**Table 1:** Effect of chemical on germination, root length, shoot length, seedling length on the Seed enhancement through priming in chickpea (*Cicer arietinum* L.)

Effect on observation	GA <sub>3</sub> 50 ppm	KNO <sub>3</sub> 0.2%	KCl 2.0 %
Germination	89.41	88.07	86.89
Root Length	15.20	14.36	13.52
Shoot Length	4.96	4.49	4.01
Seedling Length	19.62	18.17	16.98

Table no 1 shows that hydropriming duration is significant effect on germination the highest 89.41 % germination in terms of normal seedling was found in GA<sub>3</sub> followed by KNO<sub>3</sub> 88.07 % and KCl 86.89 % in second observation the seed treatment with chemical and fungicides showed significant effect on root length the highest 15.20 cm root length in terms of normal seedling was found with GA<sub>3</sub> and in third observation the highest 4.96 cm shoot length was maximum found in effect of GA<sub>3</sub> 50 ppm.

Seed treatments with chemical and fungicide showed highest 19.62 cm seedling length in terms of normal seedling was found with GA<sub>3</sub> 50 ppm similar observation was recorded by several workers such as Lal *et al*, 2014.

**Table 2:** Effect of chemical on vigour index, Viability, emergence establishment on Seed enhancement through priming in chickpea (*Cicer arietinum* L.)

Effect	GA <sub>3</sub> 50ppm	KNO <sub>3</sub> 0.2 %	KCl 2.0 %
Vigor Index	1762.83	1607.19	1480.54
Viability	90.96	89.70	88.15
Emergence	87.56	86.30	85.04
Establishment	81.56	79.93	78.44

Table no 2 shows that maximum effect vigor index 1762.83 by using of GA<sub>3</sub> 50 ppm followed by using of KNO<sub>3</sub> 0.2 % and KCl 2.0 % and in second observation the effect is shows that KNO<sub>3</sub> 0.2 % is also very effective on Viability of chick pea seeds so Emergence and Establishment also shows the effective result GA<sub>3</sub> 50 ppm on use of on priming the seed enhancement in chickpea Seed priming treatments play an important role in improving seed germination, shoot length, root length, seedling dry weight, seed vigour index-I and electrical conductivity in most of the crop as stated by Rokadia *et al*, 2014, Mazid Mohd, 2014 in pea, Kumar *et al.*, 2015,<sup>[14, 10, 8]</sup>

Such enhanced performance has also been reported in other crops (Musa *et al.*, 2001; Murry and Swensen, 1992; Pandey *et al.*, 2005; Usha and Dadlani, 2014; Singh *et al.*, 2014)<sup>[12, 11, 13, 17, 16]</sup>. Field emergence was varieties specific with desi types having more emergences largely because of high germination and more seedling length. On ageing not only reduced emergence but also slow in speed of emergence. Hence seed enhancement treatment plays important role in better plant establishment.

## Conclusion

Hydro-priming duration showed significant effect on seed quality found significant. The highest germination, emergence, establishment % viability %, root length cm, shoot length cm seedling length cm, vigor index and speed of germination in terms of normal seedling was found with hydro-priming for 8 hours. It was statistically at par with the P<sub>1</sub> (4 hr). However, Minimum germination, emergence, establishment % viability %, root length cm, shoot length cm seedling length cm, vigor index and speed of germination exhibited in Control. Chemical priming showed significant

effect on germination, emergence, establishment % viability %, root length cm, shoot length cm seedling length cm, vigor index and speed of germination was found with C<sub>1</sub> (GA<sub>3</sub> @50ppm). However, Minimum g germination, emergence, establishment % viability %, root length cm, shoot length cm seedling length cm, vigor index and speed of germination exhibited in Control.

## References

1. Abdul-Baki AA, Anderson JD. Vigor determination in soybean seed by multiple criteria. *Crop Sci.* 1973; 13:630-633.
2. Anonymous. ICAR- Indian Institute of Pulses Research, Kanpur Annual Report, 2016.
3. Dahiya OS, Tomer RPS, Ashwani. Evaluation on the viability and vigour parameters with respect to field emergence in chickpea (*Cicer arietinum* L.). *Seed Research.* 1997; 25(1):19-24.
4. FAO. Production Year Book, Food and Agriculture Organizations of United Nations (FAO), Rome Italy, 2011.
5. Gurumu M, Naylor REL. Effects of low water potential on germination of two sorghum varieties. *Seed Sci. and Tech.* 1991; 19:373-383.
6. Harris D, Joshi A, Khan PA, Gothkar P, Sodhi PS. On farm seed priming in semiarid agriculture: development and evaluation in maize, rice and chickpea in India using Participatory methods. *Experimental Agric.* 1999; 35: 15-29.
7. ISTA International rules for seed testing. *Seed Sci. and Technol.* 1999; 9(Supl):1-348.
8. Kumar MA, Kumar RK, Yadav SK, Yadav R, Kumar J. Effect of seed enhancement treatment on field performance of chickpea. *J Applied and Natural Sci.* 2015; 7(2):557-561.
9. Laal N, Mahmoodi TM, Khaliliaqdam N. Effect of hydro-priming and hormonal priming on Germination traits of chickpea cultivars. *Biological Forum - An Int. J.* 2015; 7(1):1693-1697.
10. Mazid Mohd. Seed priming application of Gibberellic Acid on growth, biochemical, yield attributes and protein status of chickpea. *Int. J of Genetic Engineering and Biotech.* 2014; 5:17-22.
11. Murry GA, Swensen JB. Emergence of spring and summer planted onion following osmotic priming. *Horticulture Sci.* 1992; 27(5):409-411.
12. Musa AM, Johansen C, Kumar J. Short duration chickpea to replace fallow after amen rice: The role of on farm seed priming in the high barren track of Bangladesh. *International Chickpea and Pigeonpea Newsletter.* 2001; 6:20-22.
13. Pandey S, Kumar J, Parmer BS. Polymer seed coating on soybean and maize for seed quality enhancement and better emergence. *Annals Agric. Res. New Series.* 2005; 26(4):509-513.
14. Rokadia P, Singh T, Ram Baldev. Seed priming and foliar urea application for enhancing productivity of chickpea, under rainfed conditions. *National Academy Sci. Letters.* 2014; 37(5):407-411.
15. Saxena NP, Saxena MC, Johansen C. Chickpea ideotypes for low-and- high input conditions. In A.N. Asthana and M Ali (Eds.), "Recent Advances in Pulses Research," pp.217-231. Indian Society of Pulses Research and Development, Indian Institute of Pulse Research (IIPR), Kanpur, India, 1997.

16. Singh PK, Pandita VK, Tomar BS, Seth R. Germination and field emergence in osmotic and solid matrix priming in onion (*Allium cepa*). *Indian Journal of Agric. Sci.* 2014; 84(12):1561-1564.
17. Usha TN, Dadlani M. Enhancement of planting value and storage performance of different cultivars with various germinability of soybean (*Glycine max*) seed by pre-treatment. *Legume Res.* 2014; 37(5):467-472.