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Effect of integrated seed treatments on seed quality and storability of chickpea (*Cicer arietinm* L.)

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ABSTRACT

The experiment was carried out during *rabi* season of 2017-18 to know the effect of integrated seed treatments at seed quality and storability characters of chickpea. Chickpea variety KWR-108 seed were treated with following treatments *viz*. carbendazim @ 0.1% (T_1), imidacloprid @ 0.1% (T_2), rhizobium + PSB @ 2.5 g each /100g seed (T_3), *Trichoderma harzianum* @ 0.2% (T_4), $T_1 + T_2 = (T_5)$, $T_3 + T_4 = (T_6)$, $T_1 + T_2 + T_3 = (T_7)$, $T_1 + T_2 + T_3 + T_4 = (T_8)$ and untreated (T_0) and treated seeds were sowed at Oil Seed Farm of C. S. Azad University of Agriculture & Technology Kanpur. Agronomic package and practices was applied as per recommendation and after harvesting seeds were tested on seed quality parameters *viz*. germination %, seedling length, seedling dry weight, SVI-I & SVI-II further seed were stored at ambient condition for eight month and again seed quality were tested at the end of experiment treatment T_8 showed significantly maximum seed quality (99.6% seed germination, 22.10cm seedling length, 0.61g seedling dry weight, 2199.4 SVI-I & 62.1 SVI-II) at just after harvest as well as (91.6% germination, 21.80 cm seedling length, 0.57g seedling dry weight, 1997.8SVI-I & 52.2 SVI-II) after eight months of storage followed by treatment T_7 over untreated seeds.

Key words: *Chickpea, Seed quality, Carbendazim, Imidacloprid, Rhizobium, Trichoderma*

Introduction

Chickpea (*Cicer arietinum* L.) was originated in south eastern turkey (Redden *et al.,* 2007). It is the most significant pulse crop of India, and occupies 10.56 million ha area with a production of 11.23 million tonnes, with an average productivity of 1063 kg per ha (GOI 2017-18). It provides a protein rich diet to the vegetarian population of the country and complement the diets with proteins, essential amino acids, vitamins and minerals (Pingoliya *et al.,* 2013). Chickpea seed production is constrained by diseases and insect-pests, disease and pest may cause up to 100 % yield losses and yield quality under favorable conditions. Several factors like temperature, moisture, humidity, micro-organism etc. are mainly responsible for deteriorating the seed quality and viability during storage under adverse environmental conditions. Prolonging storage period also reduced seed quality (Ebrahim *et al.,* 2009), (Channabasanagowda *et al.,* 2008), and (Prasad and Joshi, 2017). Besides these, genetic and physiological conditions of seed can also affect the quality and longevity. All such factors can be managed to improve and maintain the seed quality and prolong the viability by adopting some practices In general, soil

borne diseases (Fusarium wilt, collar rot, dry root rot, etc.) are more prevalent in central and peninsular India, whereas foliar diseases (ascochyta blight, botrytis gray mold, etc.) are important in northern, northern-western and eastern India. Among the insect-pests, pod borer is the most severe yield reducer throughout India, while the bruchids cause severe damage in storage. Many of them infect seed and infected seed can provide primary inoculums for infestation of new crops and seed borne pathogens may be dispersed for long distances with it. Several pest and disease management methods are available with their limitations. Only one measure can not be beneficial therefore, there is a need for integration of chemical and biological measures. Integrated Pest Management is a sustainable approach for managing pests by combining biological, cultural, physical and chemical tools in a way that minimizes economic, health, and environmental risks. Various pre-sowing chemical, biological, seed treatments have been practiced to manage pest and disease, and enhancement of seed yield and quality of chickpea. Chickpea and *Rhizobium leguminosarum subsp*. *ciceri* association annually produces upto 176 kg N ha^{-1} depending on cultivar, bacterial strain and environmental factors (Yadav *et al.,* 2010). Symbiotic nitrogen fixation has a high Phosphorous demand because the process consumes large amounts of energy (Schulze *et al.,* 2006) and energy generating metabolism strongly depends upon the availability of Phosphorus (Plaxton, 2004). Singh and Sale (2000) reported that Phosphorus fertilization stimulates root growth, photosynthesis and increases hydraulic conductibility of roots. Nitrogen fixer and phosphate solubilizing microorganisms play an important role in supplementing nitrogen and phosphorus to the plant, allowing a sustainable use of nitrogen and phosphate fertilizers (Tambekar *et al.,* 2009). Chickpea can restore soil fertility due to a deep penetrating root system which enables them to utilize the limited available moisture (Tripathi *et al.,* 2015). Seed treatment with Trichoderma and carbendazim enhanced seed quality (Anitha *et al.,* 2013), (Singh *et al.,* 2007) and (Kumar *et al.,* 2014). Chemical seed treatment is the cheapest and most effective means of controlling most seed borne pathogens. Fungicidal seed treatment may kill or inhibit seed borne pathogens and may form a protective zone around seeds that can reduce decay and seedling blight caused by soil borne pathogens, resulting in healthy and vigorous seedlings. Seed viability can be maintained upto 90% for 10 month of storage through seed treatment with carbendazim and imidacloprid (Sherin and John, 2003) seed coating treatment with carbendazim + imidacloprid can increase 12-13% seed germination (Praveena, 2005). Keeping all these in mind, this experiment was planned to assess the Effect of integrated seed treatments on seed quality and storability of chickpea.

Materials and Methods

The field experiment was conducted at Oil Seed Farm, Kalyanpur, C.S. Azad University of Agriculture and Technology, Kanpur (U.P.) during November – March, 201718. Geographically, Kanpur, Uttar Pradesh, India. It is situated in a sub-tropical zone at 25°26' and 26°58' N latitude and 79°32' and 80°34' E longitude with an altitude of 125.90 m above mean sea level. Chickpea variety KWR-108 seed were treated with following treatments *viz.* carbendazim @ 0.1% (T_1), imidacloprid @ 0.1% (T_2), rhizobium + PSB @ 2.5 g each /100g seed (T_3), *Trichoderma harzianum* @ 0.2% (T_4), $T_1 + T_2 = (T_5)$, $T_3 + T_4 = (T_6)$, $T_1 + T_2 + T_3 = (T_7)$, $T_1 + T_2 + T_3 + T_4 = (T_8)$ and untreated (T_0). The seed treatment was done by water soaking of 100g seeds of chickpea in various chemicals and biological inoculant concentration for 12 hours, for integreted treatment FIRT (fungicide – insectcide – rhizobium – trichoderma) order followed. Then the seeds were shade dried to contain the seed moisture content of 11-13%. The treated seeds along with control (untreated) were sown in three replications in a plot of 4 x 2.5 m^2 size at Oil Seed Farm, Kalyanpur, Kanpur. The crop was grown by using all required agronomical practices. Mature crops were harvested. Processed seeds were examined first and then stored in a poly bag for eight months at the end of storage seed samples were again examined on seed quality parameters *viz.*

Seed Germination (%)

Three replications with 100 seeds $replication^{-1}$ from each variety were placed in between germination papers (B.P.). then kept in the germinator at 20±10°C. The counting of normal seedlings was made on the final count on the 10th day (International Seed Testing Association, 1985) and normal seedlings were expressed as % germination.

Seedling Length (cm)

Seedling length was measured on the 10th day at fi-

nal count. Ten seedlings were randomly selected from each replication; seedling length was immediately measured in cm and averaged.

Seedling dry weight (g)

Ten normal seedlings were selected for seedling length measurement and were dried for 24 hours in a hot air oven maintained at 100 ^{0}C temperature. These dried seedlings were cooled for 30 minutes in a dessicator. The weight of dried seedlings was recorded in grams.

Seedling Vigour Index-I

Seed vigour index-I was calculated by formula of (Abdul Baki and Anderson, 1973).

Seedling Vigour Index-II

Seed vigour index-II was calculated by formula of (Abdul Baki and Anderson, 1973)

The recorded data were analyzed statistically in Completely Randomized Design.

Results and Discussion

Chickpea seeds having satisfactory germination under laboratory conditions most often fail to maintain germination when planted in the field, because laboratories provide very favorable environmental conditions which seldom prevail in the field. A field has many adverse conditions. Variety of chickpea cv. KWR-108 was treated with fungicide carbendazim, insecticide imidacloprid, Rhizobium + PSB and Trichoderma individually and in various combinations. It was recorded that all treatment used in this study differed significantly from control for most of the characters.

Germination percent just after harvest and after eight months of storage was significantly improved

Table 1. Seed quality just after harvest

Treatment	Germination %	Seedling length (cm)	Seedling dry wt. (g)	SVI-I	SVI-II
T_0	94.6	15.20	0.47	1435.7	45.1
T_1	97.3	19.20	0.52	1876.1	50.6
T_2	98.0	18.60	0.51	1826.2	50.6
T_3	96.0	16.90	0.50	1622.6	48.6
T_4	95.0	16.70	0.50	1593.2	47.8
T_5	98.3	20.20	0.55	1995.4	54.7
T_6	96.6	17.40	0.54	1681.5	52.8
T_7	98.6	20.90	0.55	2062.4	54.6
T_8	99.6	22.10	0.61	2199.4	62.1
Mean	97.1	18.6	0.53	1810.3	51.9
SE (diff)	1.054	0.455	0.010	54.417	0.919
CD at 5%	2.232	0.964	0.021	115.212	1.946

Table 2. After eight month of storage

Treatment	Germination %	Seedling length (cm)	Seedling dry wt. (g)	SVI-I	SVI-II
T_0	84.3	14.80	0.46	1248.2	38.5
T_1	88.3	18.60	0.51	1649.3	45.6
T_2	88.0	19.00	0.51	1672.0	44.9
T_3	87.0	16.30	0.49	1421.3	43.2
T_4	86.6	16.10	0.49	1395.4	43.4
T_5	88.6	19.00	0.53	1683.6	47.5
T_6	87.3	16.70	0.52	1461.2	45.4
T_7	89.0	20.60	0.54	1839.3	48.1
T_8	**91.6**	**21.80**	**0.57**	**1997.8**	**52.2**
Mean	87.88	18.12	0.51	1596.47	45.4
SE (diff)	1.089	0.442	0.01	39.671	0.920
CD at 5%	2.305	0.937	0.022	83.991	1.947

by most of the treatments. Treatment T_8 showed significantly highest germination percent followed by Treatment T_7 while treatment T_4 did not show any significant effect. Seed viability up to 90 per cent can be maintained up to 10 months in cloth bag as well as polythene bag when the seeds were coated with polymer @ 3g, carbendazim @ 2 g and imidacloprid @1 ml per kg of seed Sherin and John, (2003), Praveena (2005) and Kumar *et al.* (2014).

The effect of seed treatments on other seed quality attributes like seedling length, seedling dry weight, SVI-I and SVI-II were significantly superior over control in all treatments at just after harvest as well as after eight months of storage. Treatment T_8 showed significantly superior results followed by Treatment T_7 over control on seed quality and storability attributes. Significant effect of seed treatments on seed quality was reprorted by Singh *et al.* (2007), Vegulla (2008) and Shahid *et al.* (2011) this may be due to the effect of seed treatment on pathogen and pest incidence.

Conclusion

Effect of different seed treatments on quality parameters of chickpea (just after harvest) viz. germination percent, seedling length, seedling dry weight, SVI-I and SVI-II were significantly superior over control. Treatment T_8 (Carbendazim + Imidacloprid + (*Rhizobium leguminosarum*+PSB) + *Trichoderma harzianum*) showed highest performance on above mentioned parameters and lowest in treatment T_4 (*Trichoderma*).

On storability (eight months of storage) different treatments were found significantly superior over control on different characters viz. germination percent, seedling length, seedling dry weight, seedling vigour index-I and seedling vigour index-II. Treatment T_8 (Carbendazim + Imidacloprid + (*Rhizobium leguminosarum*+PSB) + *Trichoderma harzianum*) was reported as maximum effective while, treatment T_4 (*Trichoderma*) as minimum with respect to storability. This treatment can be recomonded for enhancement of seed quality and sorabilty of chickpea.

References

Abdul Baki, A.A. and Anderson, J.D. 1973. Vigour determination in soybean seed by multiple criteria. *Crop Science*. 13(6): 630633.

Anitha, Mummigatti, U.V., Kumar, Madhusudhan and Punitha, C.H. 2013. Effect of organic and inorganic seed priming on soyabean germination and yield parameters. *Biolife.* 1(4): 223-230.

Channabasanagowda, N.K., Patil, B., Tinganur, B.T., Patil, B.N., Hunje, R. and Awaknavar, J.S. 2008. Effect of botanical seed treatments on storability of wheat. *Karnataka Journal of Agricultural Sciences* 21(3), 361365.

Ebrahim, M.F., El-Emam, A.A. and Selim, A.H. 2009. Effect of storage period, seed moisture content and insecticides treatments on wheat (*Triticum aestivum* L.) seed quality. *Annals of Agricultural Science.* 44(1): 111124.

Kumar, Vipul., Shahid, M., Srivastava M., Singh, Anuradha, Pandey Sonalika and Sharma, Antima, 2014. Enhancing seed germination and vigour of chickpea by using potential and effective strains of Trichoderma species. *Virology & Mycology*. 3(2): 1-3.

Plaxton, W.C. 2004. Plant response to stress: biochemical adaptations to phosphate deficiency. *In:* Goodman R (eds.) *Encyclopedia of Plant and Crop Science*. New York: Marcel Dekker. pp.976-980.

Pingoliya, K.K., Dotaniya, M.L. and Mathur, A.K. 2013. Role of Phosphorus and Iron in Chickpea (*Cicer arietinum* L.). Lap Lambert Academic Publisher, Germany.

Prasad, R.B. and Joshi, M. 2017. Impact of heat stress on seed quality and storability in wheat (*Triticum aestivum* L.). *Journal of Agricultural Engineering and Food Technology*. 4(4): 174177.

Praveena, K. 2005. *Seed quality enhancement techniques in cotton (Gossypium spp.).* M.Sc. (Agri.) Thesis, Tamil Nadu Agril. Univ., Coimbatore, Tamil Nadu (India).R.N. Pandey, N.M. Gohel and Pratik Jaisani.

Redden, B., furman, B, J., Upadhyaya, H, D., Pundir R,P,S., Gowda, C,L,L., Coyne, C. and Enne King, D. 2007. Biodiversity Management in Chickpea. In: Yadav, S,S., Redden R., Chen, W., Sharma, B., editors. *Chickpea Breeding & Mnagement*. CABI, Walling ford, UK. Pp355-368.

Schulze, J., Temple, G., Temple, S.J., Beschow, H. and Vance, C.P. 2006. Nitrogen fixation by white lupin under phosphorus deficiency. *Annals of Botany.* 98: 731-740.

Shahid, Mohd; singh, Anuradha; Srivastva, Mukesh; Sachan , C.P. and Biswas, S.K. 2011. Effect of Seed Treatment on Germination and Vigour in Chickpea. *Trends in Biosciences.* 4 (2): 205-207.

Sherin and John, Susan, 2003. *Seed film coating technology using polykote for maximising the planting value, growth and productivity of maize cv Co1*. M.Sc. (Agri.) Thesis, Tamil Nadu Agril. Univ., Coimbatore, Tamil Nadu.

Singh, D.K. and Sale, P.W.G. 2000. Growth and potentially conductivity of white clover roots in dry soil with increasing phosphorus supply and defoliation fre-

quency. *Agronomy Journal.* 92: 868-874.

Singh, Poonam; Tiwari, Nalini; Vaish, C.P. and Maurya, C .L. 2007. Effect of teatment, container and storage period on longevity of lenti (*Lens Culinar Medica)* seed. *Seed Research.* **35**(1): 53-57.8.

Singh, A., Jatav, A.L., Singh, Poonam, Singh, Bazil Avinash; Singh, Parikshit and Sagar Kumar, S. 2017. Effect of seed priming treatments on seed quality parameters and storability of field pea (*Pisum sativum* L.) *Journal of Pharmacognosy and Phytochemistry*. 6(5): 161-163.

Sonalika and Sharma, Antima, 2014. Enhancing seed germination and vigour of chickpea by using potential and effective strains of Trichoderma species. *Virology & Mycology.* **3**(2): 1-3.

Tambekar, D.H., Gulhane, S.R., Somkuwar, D.O., Ingle, K.B. and Kanchalwar, S.P., 2009. Potential *Rhizobium* and phosphate solubilizers as a biofertilizers from saline belt of Akola and Buldhana district, India. *Research Journal of Agriculture and Biological Sciences.* 5(4):578-582.

Tripathi, L. K., Thomas, T., Singh, V. J., Gampala, S. and Kumar, R. 2015. Effect of nitrogen and phosphorus application on soil nutrient balance in chickpea (*Cicer arietinum* L.) cultivation. *Green Farming*. 6(2): 319-322.

Vegulla, Suresh, 2008. *Standardization of Polymercoating technology for mechanization in maize hybrid COH (M) 5* M.Sc. (Agri.) Thesis, Tamil Nadu Agril. University Coimbatore, Tamil Nadu (India).

Yadav, J., Verma, J. P. and Twari, N. K. 2010. Effect of plant growth promoting Rhizobacteria on seed germination and plant growth chickpea (*Cicer arietnum* L.) under in vitro conditions. *Biol Furum Inter J.* **2**: 15-18.