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Effect of various indigenous botanical seed protectants on seed quality parameters of chickpea seed during ambient storage

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Abstract

The seed quality of chickpea is deteriorated during ambient storage by various factors viz.; abiotic (Temperature, moisture and humidity) and biotic (insects and fungi etc.). Use of seed protectants is rapid and effective method for destroying life of insects during seed storage as well as reducing seed damage. In view of above facts in present investigation bio-efficacy (Seed moisture content, seed germination and vigour index) of botanicals were tested in seed entomology laboratory under ambient storage condition. In present investigation germination percent was found significantly above the IMSCS (Indian Minimum Seed certification Standard) level up to 6 months of storage when seed was treated with Deltamethrin 2.8 EC @ 0.04 ml kg⁻¹ seed followed by Nimbecidine @ 5 ml kg⁻¹ seed and Karanj oil @ 5 ml kg⁻¹ whereas percent seed moisture was depends on nature of seed protectants. Seed vigour index was found significantly higher up to 6 months of storage when seed was treated with Deltamethrin 2.8 EC @ 0.04 ml kg⁻¹ followed by Nimbecidine @ 5 ml kg⁻¹ and Karanj oil @ 5 ml kg⁻¹. The present investigation advocated that botanicals, Nimbecidine @ 5 ml kg⁻¹ and Karanj oil @ 5 ml kg⁻¹ may be utilized as suitable and safe seed protectants to maintain the seed quality above IMSCS level for a long period of 6 months.

Keywords: Chickpea (*Cicer arietinum* L.), botanical seed protectants and bio-efficacy.

Introduction

Pulses are the cheap and best source of protein. Pulses are third important group of crop in Indian agriculture after cereals and oilseed. Various constraints are responsible for deteriorate the quality of chickpea seed during ambient storage. Even after several technological advancements of seed, we feel difficult to lower down such losses due to abiotic (Temperature, moisture and humidity) and biotic (insects, and fungi etc.) factors during storage. In India due to lack of scientific storage facilities and incompatible insect control operation leads to colossal loss (Quality and quantity) of seed during storage.

Use of seed protectants is not only rapid and effective method for destroying life of insects during ambient seed storage but also able to maintain seed quality parameters above IMSCS level. The synthetics seed protectants are able to minimize the storage losses in some extents. But due to various hazardous effects of synthetic seed protectants these are not suitable for eco-friendly management and there is need to discard such pesticides and concentrate toward the ecofriendly. In these respect there is need to test the various traditional seed protectants and plants originated seed protectants which possess the effective and acceptable active ecofriendly ingredient against stored insects, (Grainge and Ahmed, 1988) [5]. Botanicals seed protectants are known to suppress the feeding and breeding of insects in various ways in addition to causing direct mortality. Keeping in view aforesaid facts and knowing the seriousness of problem, the present investigation.

Material and Methods

1) Seed moisture content

Seed moisture content of chickpea seed was recorded with the help of Electronic Moisture Meter at 0, 3, & 6 months das after storage.

2) Seed germination

To know the germination of chickpea seed the towel paper (germination paper) method (ISTA, 1976) was used. One hundred randomly selected seed from each replication of each treatment placed on already water soaked towel paper, which were rolled after covering them with another water soaked towel paper. The rolled towel papers were covered with butter paper and kept in seed germinator at 25 °C and 75% RH for 7 day. The germination percent were

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recorded on the basis of normal seedling. The germination was recorded at 0, 3, & 6 months after storage.

$$\text{Per cent Seed Germination} = \frac{\text{No. of Seed that germinated}}{\text{Total number of seed on the tray}} \times 100$$

3. Seed vigour index

Seedling vigour index was computed by adopting the following formula as suggested by Abdul-Baki and Anderson (1973) and was expressed in number.

$$\text{Vigour index} = \text{germination (\%)} \times \text{Seed ling length (cm)}$$

Result and Discussion

The results (Table-1, Fig.-1, Table-2, Fig.-2 & Table-3, Fig.-3) showed variation in seed moisture content, germination and seed vigour index in chickpea up to experimental storage periods. All the Seed protectants at 3 and 6 month were given significantly superior results over.

The results pertaining to moisture content of seed influenced by seed treatment, storage period and metrological condition, presented in the table-1. and figure-1. Effect of seed treatments regarding to the seed moisture content was found significant according to nature of seed protectants and the time of storage period.

1) Per cent seed moisture content

At 3 month of storage minimum seed moisture per cent was recorded in Nimbecidine @ 5 ml kg⁻¹ and Neem leaf powder @ 5g kg⁻¹ with 11.7 per cent and both are statistically at per followed by Eucalyptus oil @ 5ml kg⁻¹ and Gorakhmundi @ 5g kg⁻¹ with 11.9 percent and both are statistically at per moisture that was significantly lower than the control.

At 6 month of storage, the minimum seed moisture was recorded in Custard apple leaf powder @ 5g kg⁻¹ with 13.0 per cent followed by Neem leaf powder @ 5g kg⁻¹ with 13.06 per cent, more or less similar work has also been reported by Doharey *et al.* (1988) [4], Babu *et al.* (2008) [2] Pal and Katiyar (2013) [7] and, Patole and Mahajan (2008) [8].

2) Per cent seed germination of chickpea seed at different storage intervals

The result indicated that all the seed protectant showed better performance in respect to germination with significant level

over control at different storage periods. The germination level decreased simultaneously as storage period increased in all treatments.

At 3 month of storage the maximum germination was recorded in Deltamethrin 2.8 EC @ 0.04 ml kg⁻¹ with 91.33 per cent followed by Nimbecidine @ 5 ml kg⁻¹ with 88.33 per cent, Karanj oil @ 5 ml kg⁻¹ and Custard apple leaf powder @ 5g kg⁻¹ with 87.66 per cent germination which was statistically at per for each other. At 6 month of storage the germination percentage were again observed higher in above 3 treatment namely, deltamethrin 2.8 EC @ 0.04 ml kg⁻¹, Nimbecidine @ 5 ml kg⁻¹ and Karanj oil @ 5 ml kg⁻¹. The minimum germination was observed in Eucalyptus oil @ 5ml kg⁻¹ with followed by Neem leaf powder @ 5g kg⁻¹ up to 6 month of storage.

The germination percentage was decreased in all treatments as increased in storage period of seed. These results were also supported by Raghvani and Kapadia (2003) [9], Lal and Raj (2012) [6] and Singh *et al.* (2014) [10] in Pigeon pea, Babu *et al.* (2008) [2] in Soyabean.

3) Effect of seed protectant on seed vigour index

The vigour was found significant over control up to 6 month of storage in all the seed protectants. At 3 month of storage the highest vigour was recorded in Deltamethrin 2.8 EC @ 0.04 ml kg⁻¹ with 1617.85 followed Nimbecidine @ 5 ml kg⁻¹ with 1587.03 karanj oil @ 5 ml kg⁻¹ with 1543.6 and Custard apple leaf powder @ 5g kg⁻¹ with 1534.9. At 6 month of storage deltamethrin 2.8 EC @ 0.04 ml kg⁻¹ with 1508 followed by Nimbecidine @ 5 ml kg⁻¹ and Karanj oil @ 5 ml kg⁻¹ with 1422.83 & 1422.36 respectively and Custard apple leaf powder @ 5g kg⁻¹ with 1402 vigour index. All the botanicals seed protectants were also significantly superior over control.

These results were also supported by Bajpai *et al.* (2002) in Urdbean, and Singh *et al.* (2014) [10] in Pigeonpea, Babu *et al.* (2008) [2] in Soyabean.

On the basis of above findings we can say that Deltamethrin 2.8 EC @ 0.04 ml kg⁻¹, Nimbecidine @ 5 ml kg⁻¹ and Karanj oil @ 5 ml kg⁻¹ may be used as suitable seed protectants in ambient storage of chickpea above IMSCS level for upto 6 months of storage period.

Table 1: Effect of treatments (seed protectants) on seed moisture content (%) of chickpea at different storage period

Treatment	Seed protectants	Dose (kg ⁻¹ Seed)	Storage Month After Treatment (Mean Seed Moisture Content %)	
			3 Month	6 Month
T ₁	Neem leaf powder	5 g	11.7 (20.06)	13.06 (21.19)
T ₂	Nimbecidine	5 ml	11.7 (20.03)	13.36 (21.44)
T ₃	Karanj oil	5 ml	12.2 (20.44)	13.46 (21.52)
T ₄	Custard apple leaves powder	5g	12.03 (20.29)	13.0 (21.13)
T ₅	Castor oil	5ml	12.06 (20.32)	13.4 (21.47)
T ₆	Eucalyptus oil	5ml	11.9(20.23)	13.73 (21.75)
T ₇	Gorakhmundi	5g	11.9 (20.47)	13.46 (21.52)
T ₈	Deltamethrin (2.8EC)	0.04ml	12.1 (20.38)	13.56 (21.60)
T ₉	Control	Untreated	12.36 (20.58)	14.2 (22.13)
S.E±			0.087	0.107
C.D. (5%)			0.259	0.321

Initial mean seed moisture content: 14.1%

The figures given in parenthesis angular transformed value.

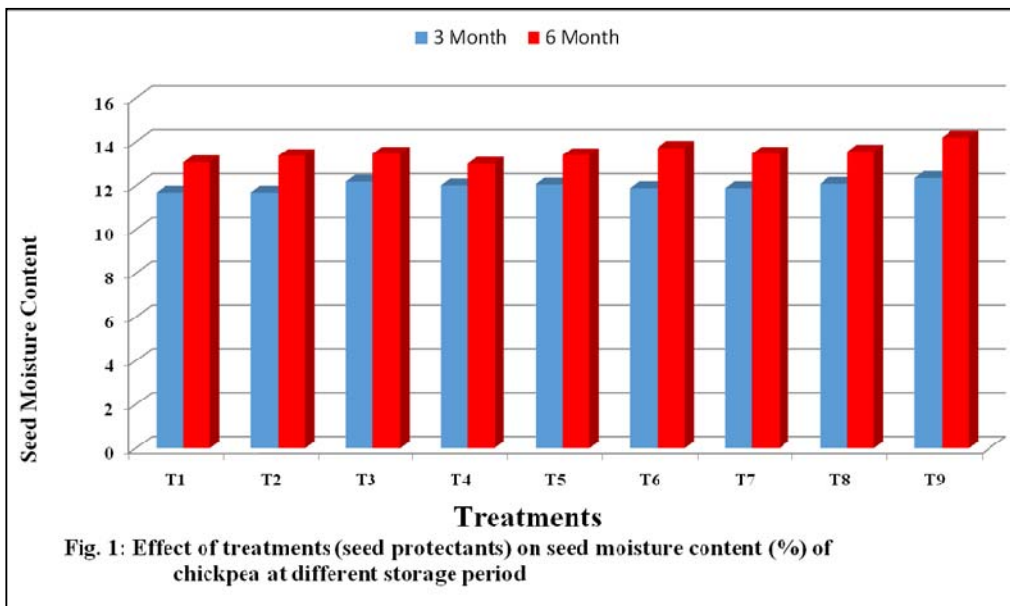


Table 2: Effect of treatments (seed protectants) on seed germination (%) of chickpea at different storage period

Treatment	Seed protectant	Dose (kg ⁻¹ Seed)	Storage Month After Treatment (Mean Germination %)	
			3 Month	6 Month
T ₁	Neem leaf powder	5 g	85.33 (67.22)	81.66 (64.65)
T ₂	Nimbecidine	5 ml	88.33 (70.05)	83.66 (66.16)
T ₃	Karanj oil	5 ml	87.66 (69.46)	83.33 (65.91)
T ₄	Custard apple leaves powder	5g	87.66 (69.45)	82.33 (65.15)
T ₅	Castor oil	5ml	85.66 (67.77)	80.33 (63.68)
T ₆	Eucalyptus oil	5ml	83.66 (66.16)	77.33 (61.57)
T ₇	Gorakmundi	5g	87.33 (69.17)	82.00 (64.90)
T ₈	Deltamethrin (2.8EC)	0.04ml	91.33 (72.88)	85.33 (67.22)
T ₉	Control	Untreated	77.33 (61.57)	70.66 (57.21)
S.E±			0.61	0.64
C.D. (5%)			1.83	1.378

Initial mean seed germination: 94%
 The figures given in parenthesis angular transformed value

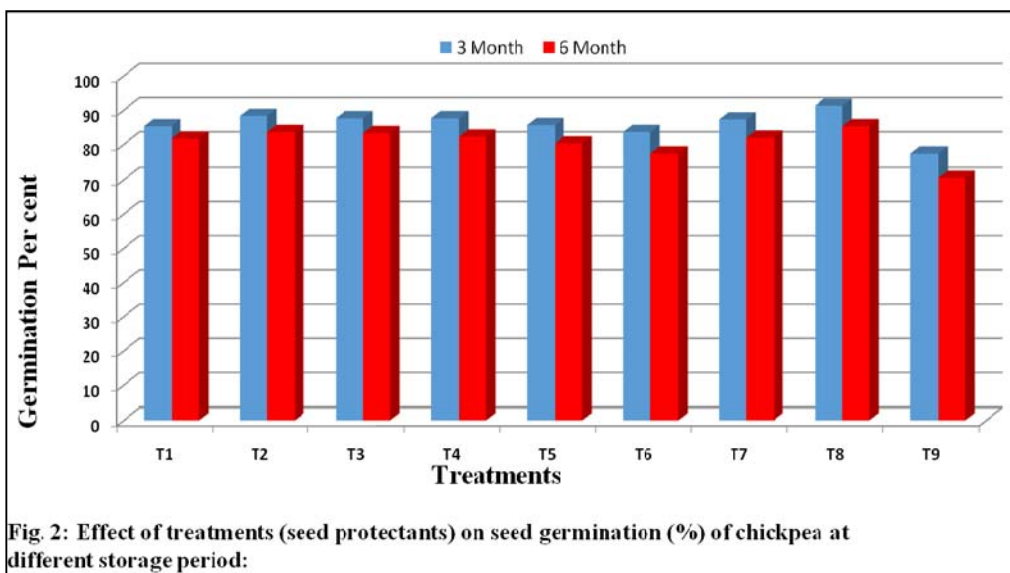
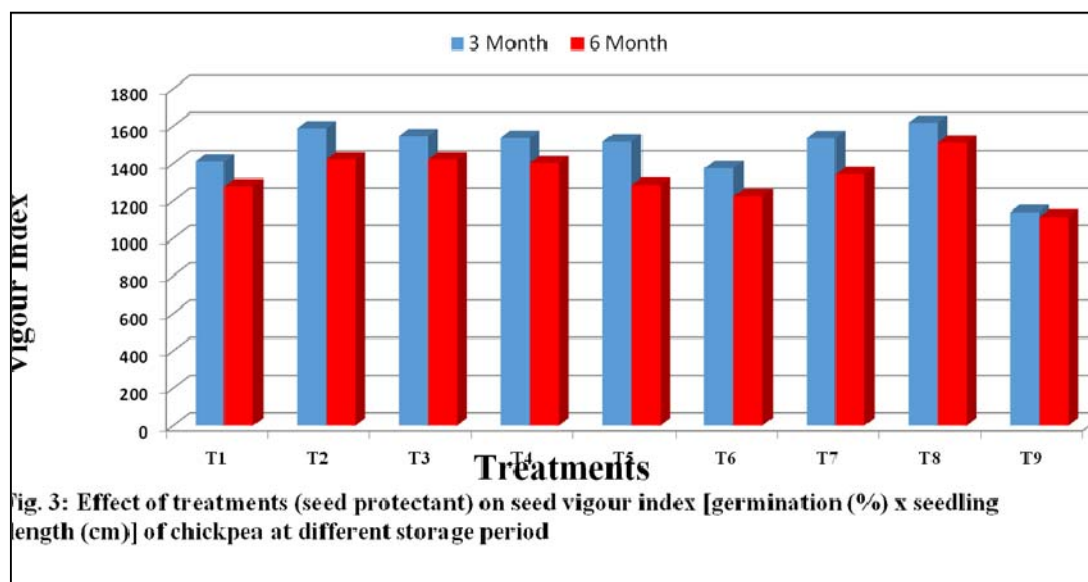


Table 3. Effect of treatments (seed protectant) on seed vigour index [germination (%) x seedling length (cm)] of chickpea at different storage period

Treatment	Seed protectant (Insecticide/Botanical)	Dose (kg ⁻¹ Seed)	Storage Month After Treatment (Mean Vigour)	
			3 Month	6 Month
T ₁	Neem leaf powder	5 g	1411.53	1279.46
T ₂	Nimbecidine	5 ml	1587.03	1422.83
T ₃	Karanj oil	5 ml	1543.6	1422.36
T ₄	Custard apple leaves powder	5g	1534.93	1402
T ₅	Castor oil	5ml	1514.63	1284.93
T ₆	Eucalyptus oil	5ml	1375.03	1225
T ₇	Gorakhmundi	5g	1533.13	1341.63
T ₈	Deltamethrin (2.8EC)	0.04ml	1617.85	1508.7
T ₉	Control	Untreated	1140.03	1114.2
S.E±			66.238	75.247
C.D. (5%)			198.327	225.302

Initial vigour index 1745.6

**Fig. 3:** Effect of treatments (seed protectant) on seed vigour index [germination (%) x seedling length (cm)] of chickpea at different storage period**References**

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