



## **Assessment of residual toxicity of seed protectants (botanicals) in stored chickpea pea seed**

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### **ABSTRACT**

*Seed protectants have an important role in enhancing the storability of the legume seed by protecting the legume seeds for long time against pulse beetle, *Callosobruchus chinensis* during storage. But some seed protectants fail to protect seed due to short residual effect. Due to short persistency on seed, the bruchids can survive and breed easily and maintain their population even on stored treated legumes, later on seed damage badly. Considering above points in view the residual toxicity of eight seed protectants (botanicals) were assessed in stored seed of chickpea at different storage periods under ambient condition at N.D. University of Agriculture and Technology, Kumarganj, Faizabad. Although, chemical seed protectant viz.; Deltamethrin 2.8 EC @ (0.04 ml kg<sup>-1</sup>) had maximum residual effect among tested protectants but, Gorakmundi powder @ 5g kg<sup>-1</sup> seed had longer persistency with maximum toxicity against bruchids among tested botanicals on stored chickpea seed followed by Nimbecidine @ 5 ml kg<sup>-1</sup> seed, Neem leaf powder @ 5g kg<sup>-1</sup> seed, Karanj oil @ 5 ml kg<sup>-1</sup> seed, Custard apple leaf powder @ 5g kg<sup>-1</sup> seed, castor oil @ 5 ml kg<sup>-1</sup> seed and Eucalyptus oil @ 5ml kg<sup>-1</sup> seed at six month of storage. Due to longer persistency on seed of Gorakmundi powder @ 5g kg<sup>-1</sup> seed and Nimbecidine @ 5 ml kg<sup>-1</sup> seed botanicals may be used to save the seed for longer period with less hazardous effect as compared to chemical seed protectants.*

*Key word: Chickpea Storage, Botanical seed protectants, residual toxicity.*

Received 10.07.2017

Revised 09.08.2017

Accepted 23.08.2017

### **INTRODUCTION**

The pulse beetle *Callosobruchus chinensis* is one of the most important pest of stored legumes which causing considerable damage to seeds and grains during storage as well as in field. The first recorded sighting and description of *C. chinensis* was in China in 1758 where, the beetle gets its species name (Thembhare, 2007). The beetle's natural distribution is in the tropics and subtropics of Asia and their population extensively dependents on the cultivation and distribution of legumes. The bruchids breed exclusively on pulses, having very short life span with high degree of reproductive potential. The pest developed during storage within the grains and detected only when adult beetles comes out. Its infestation is maximum from July to August which causes up to 50 per cent losses. The good storability period (Sown up to two planting seasons or more) provides much more time for pulse beetle infestation in godown. To protect the seed from pulse beetle for longer period it is need to search such seed protectants, having longer persistence period with minimum hazardous effect on seed. Therefore, a study was undertaken to assess the residual toxicity of different seed protectants at different storage period in seed entomology laboratory of N.D.U.A. and T., Kumarganj, Faizabad.

### **MATERIALS AND METHODS**

Eight seed protectants viz. ; Neem leaf powder @ 5g kg<sup>-1</sup> seed, Nimbecidine @ 5 ml kg<sup>-1</sup> seed, Karanj oil @ 5 ml kg<sup>-1</sup> seed, Custard apple leaf powder @ 5g kg<sup>-1</sup> seed, Castor oil @ 5ml kg<sup>-1</sup> seed, Eucalyptus oil @ 5ml kg<sup>-1</sup> seed, Gorakmundi powder @ 5g kg<sup>-1</sup> seed and Deltamethrin 2.8 EC @ 0.04 ml kg<sup>-1</sup> seed with control (untreated) were assessed for their residual effect based on corrected mortality per cent during 2016-17. The experiment was carried out under CRD in 3 replications with chickpea variety, PG-186. Seed obtained from seed processing unit of N.D.U.A. & T., Kumarganj, Faizabad was disinfested seed with Aluminium phosphid @ 3 tab/3q seed and packed half Kg such disinfested seed in 1kg jute bag after

proper coating with above mentioned seed protectants as per their respective doses and placed them in racks in laboratory under ambient condition up to six months of storage. After 3 and 6 month of storage 10 gm of treated seed was taken from each replication of each treatment and put them in Petri dishes to test the residual effect mortality per cent. Five pairs of same aged adults of pulse beetles (reared in laboratory) were released in each replication of each treatment. After 1, 3, 7 and 15 days of release of bruchids in Petri dishes, the number of dead bruchids were recorded. On the basis of such observed data the Corrected per cent mortality (Abbott, 1925) and mortality per cent (Kumar, 2008) were calculated by following formulas:

$$\text{Correct per cent mortality} = \frac{T - C}{100 - C} \times 100$$

Where,

T= mortality per cent in treatment  
C= mortality per cent in control and,

$$\text{Mortality per cent} = \frac{\text{Number of dead beetles}}{\text{Number of total released beetle}} \times 100$$

### RESULTS AND DISCUSSION

The results (Table 1 & 2) revealed that all the seed protectants were superior over control at different storage periods. However, the effectiveness of different seed protectants was decreased with increased in storage period.

At 3 month the correct mortality of pulse beetle ranged from 11.11-25.01 per cent at 15 DAR. The maximum correct mortality of pulse beetle was recorded in Deltamethrin 2.8 EC @ 0.04 ml kg<sup>-1</sup> seed with 25.01 per cent followed by Karanj oil @ 5 ml kg<sup>-1</sup> seed with 14.52 per cent and Custard apple leaf powder and Nimbecidine @ 5 ml kg<sup>-1</sup> seed with 13.73 per cent and. However, Karanj oil, Nimbecidine, Custard apple leaf powder and Neam leaf powder were statistically at par with each other upto 3 month of storage.

At 6 month the correct mortality of pulse beetle ranged from 7.07-18.39 per cent. The maximum correct mortality percent was recorded in Deltamethrin 2.8 EC @ 0.04 ml kg<sup>-1</sup> seed with 18.39 per cent followed by Gorakmundi powder @ 5g kg<sup>-1</sup> seed with 13.19 per cent and Nimbecidine @ 5 ml kg<sup>-1</sup> with 11.49 per cent. The minimum correct mortality was recorded in Eucalyptus oil @ 5ml kg<sup>-1</sup> seed with 7.07 per cent followed by Custard apple leaf powder @ 5g kg<sup>-1</sup> seed and Castor oil @ 5ml kg<sup>-1</sup> with 8.72 percent and these botanicals were statistically at par with each other. Thus Due to longer persistency on seed of Gorakmundi powder @ 5g kg<sup>-1</sup> seed and Nimbecidine and Karanj oil @ 5 ml kg<sup>-1</sup> seed among botanicals can be utilized to save the seed for longer period without creating any type of hazardous effect. This results supported by Lal and Dikshit (2001), Rahman *et al.* (2008), Chander *et al.* (2010), and Singh *et al.* (2014).

**Table 1: Mortality per cent of pulse beetle, *Callosobruchus chinensis* L. during storage period.**

Treatment	Seed Protectant	Dose (kg-Seed)	Mean mortality percentage of pulse beetle at different storage periods							
			3 Month				6 Month			
			Days After Release (DAR)				Days After Release (DAR)			
			1 day	3 day	7 day	15 day	1 day	3 day	7 day	15 day
T <sub>1</sub>	Neemleaf powder	5 g	10.52	13.44	16.78	22.29	10.52	11.71	15.59	20.79
T <sub>2</sub>	Nimbecidine	5 ml	10.52	13.44	17.74	22.36	10.52	13.44	16.78	21.57
T <sub>3</sub>	Karanj oil	5 ml	10.52	12.25	15.81	23.07	10.52	12.25	16.78	19.89
T <sub>4</sub>	Custard apple leaves powder	5g	10.52	13.44	14.62	23.36	8.8	12.25	14.62	19.11
T <sub>5</sub>	Castor oil	5ml	10.52	12.25	13.44	20.79	8.8	10.52	14.62	19.11
T <sub>6</sub>	Eucalyptus oil	5ml	8.8	13.44	15.81	21.57	8.8	10.52	12.25	18.21
T <sub>7</sub>	Gorakmundi powder	5g	10.52	14.62	17.74	20.0	8.8	12.25	13.44	23.01
T <sub>8</sub>	Deltamethrin (2.8EC)	0.04ml	12.25	19.54	23.51	32.57	12.25	14.62	16.78	27.68
T <sub>9</sub>	Control	Untreated	7.07	8.8	8.8	10.0	7.07	8.8	10.52	11.38

**Table 2:Residual toxicity of seed protectants (botanicals) based on corrected mortality per cent in stored seed of chickpea at different storage periods**

Treatment	Seed Protectant	Dose (kg <sup>-1</sup> Seed)	Mean Correct Mortality number of pulse beetle at different storage periods							
			3 Month				6 Month			
			Days After Release				Days After Release			
			1 day	3 day	7day	15 day	1 day	3 day	7 day	15 day
T <sub>1</sub>	Neemleaf powder	5 g	3.712	5.08	8.75	13.65	3.71	3.19	5.66	10.61
T <sub>2</sub>	Nimbecidine	5 ml	3.712	5.08	9.47	13.73	3.71	5.08	6.99	11.49
T <sub>3</sub>	Karanj oil	5 ml	3.712	3.78	7.68	14.52	3.71	3.78	6.99	9.60
T <sub>4</sub>	Custard apple leaves powder	5g	3.712	5.08	6.38	13.73	1.86	3.78	4.58	8.72
T <sub>5</sub>	Castor oil	5ml	3.712	3.78	5.08	11.98	1.86	1.88	4.58	8.72
T <sub>6</sub>	Eucalyptus oil	5ml	1.861	5.08	7.68	12.85	1.86	1.88	1.93	7.07
T <sub>7</sub>	Gorakmundi powder	5g	3.712	6.38	9.47	11.11	1.86	3.78	3.26	13.19
T <sub>8</sub>	Deltamethrin (2.8EC )	0.04ml	5.574	11.77	16.12	25.01	5.57	6.38	6.99	18.39
T <sub>9</sub>	Control	Untreated	----	----	----	----	----	----	----	----

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**CITATION OF THIS ARTICLE**

R. N. Nishad and R. B. Singh . Assessment of residual toxicity of seed protectants (botanicals) in stored chickpea pea seed. *Bull. Env. Pharmacol. Life Sci.*, Vol 6 Special issue 1, 2017: 316-318