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RESEARCH ARTICLE

Effect of newer insecticidal seed treatment on viability of chickpea seed during storage

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SUMMARY

The experiment was conducted at Seed Technology Research Unit, Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra during 2009 to 2012 on chickpea with an objective to ascertain new insecticidal chemical against *Callosobruchus chinensis*, a major pests of stored chickpea seed. The observation on germination and insect infestation were recorded at interval of three months of storage period. Among different insecticides, deltamethrin 2.8 EC @ 0.04 ml/kg or lufenuron 5 EC @ 0.1 ml/kg or emamectin benzoate 5SG @ 40 mg/kg of seed were found equally effective for control of stored grain pest of chickpea and maintained the chickpea seed germination above minimum seed certification standard (85%) upto 9 months of storage.

Key Words : Storage, Chickpea, *Callosobruchus chinensis*

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Chickpea (*Cicer arietinum* L.) is a important pulse crop in India and is the main source of protein for vegetarian. India is the largest producer of this pulse contributing to around 63 per cent of the world's total production (Anonymous, 2007). However, nearly 8.5 per cent of total annual production is lost during post harvest handling and storage (Agrawal *et al*., 1988). The pulse seed suffer a great damage during storage due to insect attack (Sherma, 1989). Among the insect pest attacking stored product the pulse beetle *Callosobruchus chinensis* L (Coleoptera : Bruchidae) is serious one causing weight loss, lower germination potential and quality deterioration (Mukherjee *et al*., 1970 ; Singal and Singh, 1985). Both qualitative as well as quantitative losses occur due to *C. chinensis* infestation. Singh and Sharma (1982) estimated 47.53-79.60 per cent losss of germination due to damaged grains by the beetle. This insect has been reported from the Philippines, Japan, Indonesia, Sri Lanka, Burma and India. It is a notorious pest of chickpea, mung, cowpea, lentil and pigeon pea (Aslam *et al*., 2002).

Its attack is normally noticed when considerable damage is already done. To avoid such losses, periodic surveillance of godawons with monitoring devices is required for taking timely control measures. Under our condition it is not feasible for farmer to provide ideal condition of seed storage,when seed are to be stored under ambient conditions. Some pre storage seed treatment is needed to take care of insect pests during storage with the aim of improving the shelf life of seed. Keeping the above facts in view, investigations were carried out on efficacy of newer insecticides for control of storage insects and viability of chickpea seed during storage under ambient conditions.

MATERIALS AND METHODS

A laboratory experiment conducted at Seed Technology Research Unit. Mahatma Phule Krishi Vidyapeeth, Rahuri for three consecutive years from 2009-2010, 2010-2011 and 2011-2012. The different insecticides *viz.*, flubendiamide 480 SC @ 4.2 mg/kg (2ppm), emamectin benzoate 5 SG @ 40.00 mg/kg (2ppm), spinosad 45 SC @ 4.4 mg/kg(2ppm), thiodicarb 75

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WP @ 2.7 mg/kg (2ppm), indoxacarb 14.5 SC @ 13.8 mg/kg (2ppm) and lufenuron 5 EC @ 0.1 ml/kg (5ppm) seed were compared with deltamethrin 2.8 EC @ 0.04 ml/kg (1ppm) seed and untreated control. Freshly harvested 1 kg certified chickpea seed (Digvijay) with very high germination percentage and low moisture content was taken for each treatment. Required quantity of insecticide was diluted in 5 milliliter of water to treat 1 kg of seed for proper coating. After drying in shade, seeds were packed in 2 kg capacity gunny bag lets and kept in storage under ambient conditions.

Germination was determined as per ISTA rules (Anonymous, 1985). Insect infestation was carried out by counting damaged seed. The data were analyzed using CRD design with three replications. Samples of treated seed were drawn and observation of per cent germination and per cent infestation was recorded at three months interval *i.e.* 0, 3, 6 and 9 months of storage period.

RESULTS AND DISCUSSION

The average germination percentage ranged from 93.00 to 93.89, 86.33 to 91.00 and 81.33 to 88.67 per cent, respectively in different seed treatment at 0, 3 and 6 month after treatments (Table 1). The average germination percentage at 9 month after treatment ranged from 77.33 to 87.78 per cent in different treatments. The significantly higher (87.78 %) germination was recorded in deltamethrin 2.8 EC @ 0.04 ml/kg seed and was at par with treatment of lufenuron 5 EC @ 0.1 ml/kg seed (86.78 %). The next best treatment was emamectin benzoate 5 SG @ 40mg/kg seed (86.33 %). The seed treatment of deltamethrin, lufenuron and emamectin benzoate maintained the seed germination above seed certification standard (85%) up to nine months of storage.

Seed germination declined significantly in all the treatments from the time of commencement to 9 months of storage. This decline in germination is a natural phenomenon and could also be attributed due to insect infestation caused by *C.chinensis* with the increase in storage period.

The data pertaining to seed infestation percentage due to different treatment during 9 months of storage period are presented in Table 2. The initiation of seed infestation was observed from 3 month onward irrespective of seed treatment. At three month of storage significant difference was observed for seed infestation due to seed treatment. The significantly higher infestation was recorded in untreated control (9.33 %).

Table 1: Performance of newer insecticides on chickpea seed germination during storage (Pooled data 2009-10 to 2011-2012)

Sr. No.	Treatments	0 Month	3 Month	6 Month	9 Month
1.	Flubendiamide480SC@ 2ppm (4.2mg/kg seed)	93.89 (75.90)*	89.67 (71.30)	85.67 (67.82)	82.11 (64.99)*
2.	Emamectin benzoate 5SG@ 2ppm (40.0mg/kg seed)	93.56 (75.86)	90.67 (72.30)	88.33 (70.08)	86.33 (68.18)
3.	Spinosad 45 SC @ 2ppm (4.4 mg/kg seed)	93.67 (75.88)	90.00 (71.63)	86.33 (68.33)	82.67 (65.15)
4.	Thiodicarb 75WP@ 2ppm (2.7mg/kg seed)	93.89 (75.95)	89.67 (71.30)	85.67 (67.78)	82.67 (65.18)
5.	Indoxacarb14.5 SC@ 2ppm (13.8mg/kg seed)	93.89 (75.95)	90.22 (71.83)	86.33 (68.35)	83.67 (66.33)
6.	Lufenuron 5 EC @ 5 ppm (0.1ml/kg seed)	93.22 (75.71)	91.00 (72.65)	88.67 (70.40)	86.78 (68.96)
7.	Deltamethrin 2.8 EC @ 1.0 ppm (0.04ml/kg seed)	93.00 (75.17)	91.00 (72.60)	88.67 (70.40)	87.78 (69.54)
8.	Untreated control	93.22 (75.46)	86.33 (68.34)	81.33 (64.43)	77.33 (61.87)
	S.E. ±	0.84	1.05	1.04	0.47
	C.D. at 5 %	2.48	NS	2.96	1.37

Figures in parenthesis are arcsine transformed values * Wt.mean NS= Non-significante

Table 2: Performance of newer insecticides on chickpea seed infestation during storage (Pooled data 2009-10 to 2011-2012)

Sr. No.	Treatments	0 Month	3 Month	6 Month	9 Month
1.	Flubendiamide 480SC@ 2ppm (4.2mg/kg seed)	0	0.33(2.30)	1.00 (5.12)	2.42 (8.73)*
2.	Emamectin benzoate 5SG@ 2ppm (40.0mg/kg seed)	0	0.00 (0.57)	0.00 (0.57)	0.17 (0.98)
3.	Spinosad 45 SC @ 2ppm (4.4 mg/kg seed)	0	0.78 (3.67)	2.11(8.18)	4.26 (11.62)
4.	Thiodicarb 75 WP@ 2ppm (2.7mg/kg seed)	0	0.11(1.15)	0.89 (4.55)	1.52 (7.19)
5.	Indoxacarb14.5 SC@ 2ppm (13.8mg/kg seed)	0	0.00 (0.57)	0.89 (4.55)	3.58 (10.96)
6.	Lufenuron 5 EC @ 5 ppm (0.1ml/kg seed)	0	0.00 (0.57)	0.11 (1.15)	0.23(0.98)
7.	Deltamethrin 2.8 EC @ 1.0 ppm (0.04ml/kg seed)	0	0.00 (0.57)	0.00 (0.57)	0.14 (0.92)
8.	Untreated control	0	9.33 (17.69)	16.67 (24.01)	23.81(29.45)
	S.E. ±	-	1.15	1.23	0.48
	C.D. at 5 %	-	3.28	3.49	1.43

Figures in parenthesis are arcsine transformed values * Wt.mean

The treatment of deltamethrin 2.8 EC @ 0.04ml/kg, lufenuron 5 EC @ 0.1 ml/kg seed, emamectin benzoate 5 SG @ 40mg/kg seed and indoxacarb 14.5 SC @ 13.8 mg/kg were found free from the infestation and were statistically at par with rest of insecticidal seed treatment. At 6 month storage all the treatments recorded significantly less infestation compared to control (16.67 %). The treatment of deltamethrin 2.8 EC@ 0.04ml/kg seed and emamectin benzoate 5 SG @ 40mg/kg seed was found free from infestation and was at par with lufenuron 5 EC @ 0.1ml/kg seed . At 9 month storage significantly less infestation was recorded in deltamethrin 2.8 EC@ 0.04ml/kg seed (0.14%) and was at par with emamectin benzoate 5 SG @ 40mg/kg seed (0.17%) and lufenuron 5 EC @ 0.1 ml/kg seed (0.23 %) which was below ETL as per MSCS. The significantly maximum infestation was recorded in untreated control (23.81). The effectiveness of deltamethrin has been reported in literature (Bareh and Gupta, 1989). Study conducted at various centre of National Seed project showed that emamectin benzoate and lufenuron were found equally effective as deltamethrin and provided appreciable control of storage insect infesting chickpea, mung under different agro climatic conditions for 9 months (Anonymous, 2012).

Thus, the study brought out the significance of storing chickpea seed with minimum seed certification standards of 85 per cent up to 9 months in gunny bag under ambient storage condition after seed treatment either with deltamethrin 2.8 Ec @ 0.04 ml/kg, emamectin benzoate 5SG @ @40mg/kg or lufenuron 5EC @ 0.1ml/kg seed by protecting them from infestation caused by *C.chinensis.*

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