

Effect of Insecticidal Seed Treatment on Storability of Pearl millet Seed

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ABSTRACT: A study was conducted to assess the effect of new insecticides on lesser grain borer, *Rhyzopertha dominica* infesting stored pearl millet seed at MPKV, Rahuri, Maharashtra during 2013-14. The results revealed that the seed treatment of deltamethrin 2.8 EC @ 1ppm (0.04 ml/kg seed) or spinosad 45 SC @ 2ppm (4.4mg/kg seed) or emamectin benzoate 5SG @ 2ppm (40 mg/kg seed) were equally effective for control of storage insect, *R. dominica* and for maintaining the pearl millet seed germination above minimum seed certification standard (75%) up to 9 months of storage.

Key words: Pearl millet, *Rhyzopertha dominica*

Pearl millet is a dependable nutritious source of food for millions in marginal agricultural areas. It is the world's hardiest warm-season cereal crop. It can survive and produce grain even on the least fertile soils in the driest regions, on highly acidic and saline soils and in the hottest climates. India is the largest single producer of the crop, both in terms of area and production (9.3 million hectares and 8.3 million tons) [1]. It is well established fact that lot of efforts should be put for the production of "every single grain" but this is of no use if the produced seeds are not saved, which recalls the proverb "a grain saved is a grain equally produced". This proverb depends mainly on how best we protect the quality of grains during storage.

Use of quality seed is the most essential basic input in crop protection as this helps in maintaining required plant population per unit area. After harvest, the seeds are stored for different periods for sowing in next season. Besides production constraints, the insect pest problem, improper sanitation and storing methods causes both qualitative and quantitative losses in pearl millet. In storage, the losses are mainly due to insects, mites and pathogens. The presence of

insects in stored products has always posed unique problems. Nearly 10 per cent of the grain stored after each harvest is believed to be lost due to ravages of rats, insects, mites and microbial agents [2].

The average loss of food grains in storage due to biotic and abiotic factors accounts for 10 per cent per year, out of which insects are contributing about 2.5 to 5.0 per cent. Survey conducted by Food and Agriculture Organization revealed that, *R. dominica* is the major pest of wheat, rice and millets in India [3].

The attack of *R. dominica* normally gets noticed when considerable damage is already done. To avoid such losses, periodic surveillance of godowns with monitoring devices is required for taking timely control measures. Under our condition it is not feasible for farmers to provide ideal condition of seed storage, when seeds 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. With a view to evaluate new insecticides against *Rhyzopertha dominica* the present studies were undertaken.

Received : September 2016

Revised : October 2016

Accepted : October 2016

MATERIAL AND METHODS

A laboratory experiment was conducted at Seed Technology Research Unit, MPKV, Rahuri during 2013-2014, in completely randomized design having nine treatments and three replications. The different treatments viz, emamectin benzoate 5SG @ 2ppm (40.0mg/kg seed), spinosad 45 SC @ 2 ppm (4.4 mg/kg seed), indoxacarb 14.5 SC @ 2 ppm (13.8mg/kg seed), rynaxypyr 20 SC @ 2 ppm (9.9 mg/kg seed), chlorfenapyr 10 SC @ 2 ppm (20 mg/kg seed), profenofos 50 EC @ 2 ppm (0.004ml/kg seed), novaluron 10 EC @ 2 ppm (0.05ml/kg seed) and deltamethrin 2.8 EC @ 1.0 ppm (0.04ml/kg seed) were compared with untreated control. Freshly harvested 1 Kg certified pearl millet seed (Variety: Dhanshakti) with very high germination percentage and low moisture content was taken for study. 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 bags and kept for storage under ambient conditions.

Germination was tested as per ISTA rules [4]. Insect infestation was observed by counting damaged seed. The data were analyzed using CRD design. Samples of treated seed were drawn and observation of per cent germination, per cent infestation and moisture content percentage were recorded at three months interval i.e., 3, 6 and 9 months of storage period.

RESULTS AND DISCUSSION

The per cent seed damage of pearl millet seed treated with different insecticides were observed at 3, 6 and 9 months after storage and the data on per cent seed damage are presented in Table 1. The initiation of seed infestation was noticed from 3 month onward irrespective of seed treatments. The per cent seed damage in pearl millet seed was noticed to be significantly lower in all insecticidal treatment as compared to untreated control. The seed treated with emamectin benzoate 5SG @ 2 ppm, spinosad 45 SC @ 2 ppm, profenofos 50 EC @ 2 ppm and deltamethrin 2.8 EC @ 1.0 ppm were found free

Table 1. Effect of new insecticides on pearl millet seed damage during storage under ambient conditions

Tr. No.	Treatments (Quantity per kg seed)	Seed damage (storage period-months)		
		3	6	9
1	Emamectin benzoate 5SG@2ppm (40 mg)	0.00 (4.05)*	0.00 (4.05)	0.33 (4.62)
2	Spinosad 45 SC@2ppm (4.4 mg)	0.00 (4.05)	0.00 (4.05)	0.33 (4.62)
3	Indoxacarb 14.5SC@2ppm (13.8 mg)	0.00 (4.05)	0.33 (4.62)	1.33 (6.53)
4	Rynaxypyr 20SC@2ppm (9.9mg)	0.00 (4.05)	1.00 (5.74)	3.00 (9.88)
5	Chlorfenapyr 10SC@2ppm (20 mg)	0.00 (4.05)	0.33 (4.62)	1.33 (6.54)
6	Profenofos 50EC@2 ppm(0.004 ml)	0.00 (4.05)	0.00 (4.05)	0.67 (5.18)
7	Novaluron 10EC@5ppm (0.05ml)	0.00 (4.05)	1.00 (5.74)	2.00 (8.13)
8	Deltamethrin 2.8EC@1ppm (0.04 ml)	0.00 (4.05)	0.00 (4.05)	0.00 (4.05)
9	Untreated control	3.00 (9.88)	5.00 (12.88)	7.33 (15.66)
S.Em. ± 0.33		0.37	0.68	
CD at 5 %		0.98	1.09	2.00

*Figures in parenthesis are arcsine transformed values

from insect damage at 6 month of storage period. Further at 9 month storage, seed treated with deltamethrin 2.8 EC @ 1 ppm was free from insect infestation. However, seed treated with emamectin benzoate 5SG @ 2ppm (0.33%) and spinosad 45 SC @ 2ppm (0.33%) had the seed infestation below Indian minimum seed certification standards (0.5%). The remaining treatments i.e indoxacarb 14.5 SC @ 2 ppm (1.33%), rynaxypyr 20 SC @ 2 ppm (3.00%), chlorfenapyr 10 SC @ 2 ppm (1.33%), profenofos 50 EC @ 2 ppm (0.67%) and novaluron 10 EC @ 2 ppm (2.00%) recorded significantly minimum infestation compared to control (7.33%).

The effectiveness of deltamethrin and emamectin benzoate has been reported by [5] against stored grain pest of pearl millet. The study conducted on various seeds showed that deltamethrin, emamectin benzoate and spinosad were found equally effective and provide protection against storage insects infesting wheat, pearl millet and paddy seeds under different agro-climatic conditions, for nine months [6].

The germination percentage was the highest at 3 month, then afterwards the germination percentage decreased at 6, and 9 months of storage period (Table 2). At 3 months of storage, the pearl millet seed treated with deltamethrin 2.8 EC @ 1 ppm recorded the highest germination (93.00%) and was at par with remaining treatments except control. Further, data revealed that all the insecticidal seed treatments maintained the pearl millet seed germination above minimum seed certification standards (75%) up to 6 month of storage without any adverse effect on seed germination. At 9 month of storage, seed treatment with deltamethrin 2.8 EC @ 1 ppm recorded germination (84.00%) above MSCS level (75 %) and was at par with emamectin benzoate 5SG @ 2 ppm (81.00). The remaining treatments, except spinosad 45 SC @ 2 ppm (79.00%) recorded germination below MSCS level (75.00%).

The moisture content of the seed was found to be non significant and within the safe limit throughout the storage period. The moisture content ranged from 7.63 to 11.00 per cent after

Table 2. Effect of new insecticides on pearl millet seed germination during storage under ambient conditions

Tr. No.	Treatments (Quantity per kg seed)	Seed damage (storage period-months)		
		3	6	9
1	Emamectin benzoate 5SG@2ppm (40 mg)	93 (75.10)*	88 (70.05)	81 (64.46)
2	Spinosad 45SC@2ppm (4.4 mg)	92 (73.23)	86 (68.02)	79 (62.76)
3	Indoxacarb 14.5SC@2ppm (13.8 mg)	92 (74.28)	85 (67.31)	72 (58.06)
4	Rynaxypyr 20SC@2ppm (9.9mg)	90 (71.61)	82 (64.92)	73 (58.71)
5	Chlorfenapyr 10SC@2ppm (20 mg)	92 (74.01)	81 (64.16)	70 (56.80)
6	Profenofos 50EC@2 ppm(0.004 ml)	93 (74.43)	85 (67.24)	73 (58.77)
7	Novaluron 10EC@5ppm (0.05ml)	90 (71.28)	81 (64.16)	70 (56.81)
8	Deltamethrin 2.8EC@1ppm (0.04 ml)	93 (75.04)	89 (70.64)	84 (66.47)
9	Untreated control	86 (68.20)	80 (63.70)	60 (50.97)
S.Em. ±	1.42	0.85	1.19	
CD at 5 %		4.23	2.53	3.53

*Figures in parenthesis are arcsine transformed values

Table 3. Effect of new insecticides on pearl millet moisture during storage under ambient conditions

Tr. No.	Treatments (Quantity per kg seed)	Seed damage (storage period-months)		
		3	6	9
1	Emamectin benzoate 5SG@2ppm (40 mg)	10.80 (19.19)*	10.23 (18.65)	8.15 (16.59)
2	Spinosad 45 SC@2ppm (4.4 mg)	10.73 (19.12)	9.90 (18.34)	8.00 (16.43)
3	Indoxacarb 14.5 SC@2ppm (13.8 mg)	10.90 (19.28)	9.90 (18.34)	7.93 (16.36)
4	Rynaxypyr 20SC@2ppm (9.9mg)	11.00 (19.37)	10.10 (18.53)	7.97 (16.39)
5	Chlorfenapyr 10SC@2ppm (20 mg)	10.93 (19.31)	10.03 (18.47)	8.03 (16.47)
6	Profenofos 50EC@2ppm (0.004 ml)	10.87 (19.25)	10.00 (18.43)	7.98 (16.41)
7	Novaluron 10EC@5ppm (0.05ml)	10.83 (19.21)	9.97 (18.40)	7.93 (16.36)
8	Deltamethrin 2.8EC@1ppm (0.04 ml)	10.70 (19.09)	10.07 (18.50)	7.97 (16.39)
9	Untreated control	10.83 (19.22)	10.00 (18.43)	7.63 (16.03)
S.Em. \pm 0.13		0.15	0.10	
CD at 5 %		NS	NS	NS

*Figures in parenthesis are arcsine transformed values

9 month of storage period (Table 3). This indicates that the insecticides had no effect on seed moisture percentage.

Thus the study brought out the significance of storing pearl millet seed having germination above minimum seed certification standard (75 per cent) up to 9 months in gunny bag after seed treatment either with deltamethrin 2.8 EC @1 ppm or emamectin benzoate 5SG @ 2 ppm or spinosad 45 SC @ 2 ppm by protecting them from infestation caused by *R. dominica*.

ACKNOWLEDGEMENT

The authors are thankful to the Project Director (NSP), Principal Investigator (Seed Entomology) and Director of Research, Mahatma Phule Krishi Vidyapeeth, Rahuri for providing necessary facility to conduct this investigation.

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