

## Pesticidal seed treatment to prolong the storability of fodder pearl millet cv. Co 8.

R. SUDHA, P. SRIMATHI AND J. RENUGADEVI

*Department of Seed Science and Technology Tamil Nadu Agricultural University, Coimbatore-3*

**Abstract:** Seeds of fodder pearl millet cv. CO 8 were treated individually and in - combination with insecticides *viz.* Diflubenzuron and Deltamethrin and Carbendazim, a fungicide and stored in gunny bags under ambient conditions of Coimbatore for a period of 12 months. The results revealed that after 12 months of storage, the seeds treated with Diflubenzuron @ 4mg kg<sup>-1</sup> + Carbendazim @ 2.5 g kg<sup>-1</sup> of seed recorded the highest germination of 84 per cent and this was followed by the seeds treated individually with Carbendazim (2.5 g kg<sup>-1</sup>) or Deltamethrin (40 mg kg<sup>-1</sup>) recording 82 per cent germination, which were higher than the minimum seed certification standard (MSCS) for pearl millet seeds. Storage fungi and the stored grain pest of pearl millet were also controlled by these treatments.

**Key words:** *Seed treatments, seed storage, pearl millet.*

### Introduction

Seeds deteriorate and loose their viability during prolonged storage and become unfit for further production. Though the deterioration cannot be prevented in seeds, the rate of deterioration can be minimized by application of pre-storage management practices (Srimathi 2001) Seed treatment with insecticides and fungicides is one such management practice, which preserves the planting value of seed by protecting seed from harmful biotic and abiotic factors. Fodder pearl millet is one of the economic crops of India where the seed storage is problematic due to insect infestation that occurs both as primary and secondary. Hence, an attempt was made to prolong the shelf life of the seeds through pesticidal seed management practices at ambient storage conditions of Coimbatore (33±20°, 55% RH).

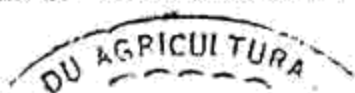
### Materials and Methods

Bulk seeds of fodder pearl millet cv. CO 8 were obtained from the Department of forage crops, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India and the lab experiments were conducted in the Department

of Seed Science and Technology Tamil Nadu Agricultural University, Coimbatore during 2001. The seeds were cleaned and graded using 4/ 64" round perforated (1.6 mm) metal sieve to homogenize the sample based on size. The seeds dried to 9 per cent moisture were imposed with the following seed treatments in three replicates.

- T<sub>1</sub> - Diflubenzuron @ 4 mg kg<sup>-1</sup> of seed
- T<sub>2</sub> - Diflubenzuron @ 8 mg kg<sup>-1</sup> of seed
- T<sub>3</sub> - Diflubenzuron @ 16 mg kg<sup>-1</sup> of seed
- T<sub>4</sub> - Carbendazim @ 2.5 mg kg<sup>-1</sup> of seed
- T<sub>5</sub> - T<sub>1</sub> + T<sub>4</sub>
- T<sub>6</sub> - T<sub>2</sub> + T<sub>4</sub>
- T<sub>7</sub> - T<sub>3</sub> + T<sub>4</sub>
- T<sub>8</sub> - Deltamethrin 2.8 E.C @ 40 mg kg<sup>-1</sup> of seed
- T<sub>9</sub> - Untreated Control

The treatment was imposed as slurry treatment using 5 ml of water kg<sup>-1</sup> seeds for uniform coating of the chemical with seed. Diflubenzuron is an insect growth regulant that control the emergence and growth of insects. The treated seeds were shade dried and packed in gunny bags and stored under ambient conditions of



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**Table 1.** Effect of seed treatments and period of storage on moisture content (%) of fodder pearl millet cv. CO 8.

Treatments	Months of storage (P)					Mean
	1	2	3	4	5	
Diﬂubenzuron @ 4 mg kg <sup>-1</sup> of seed	8.06	8.60	9.30	9.56	10.60	9.22
Diﬂubenzuron @ 8 mg kg <sup>-1</sup> of seed	8.20	8.60	9.23	9.36	10.80	9.24
Diﬂubenzuron @ 16 mg kg <sup>-1</sup> of seed	8.00	8.60	9.23	9.50	10.50	9.20
Carbendazim @ 2.5 mg kg <sup>-1</sup> of seed	8.10	8.86	9.30	9.60	10.33	9.20
Diﬂubenzuron @ 4 mg kg <sup>-1</sup> of seed + Carbendazim @ 2.5 mg kg <sup>-1</sup> of seed	8.00	8.63	9.33	9.53	10.16	9.13
Diﬂubenzuron @ 8 mg kg <sup>-1</sup> of seed + Carbendazim @ 2.5 mg kg <sup>-1</sup> of seed	8.23	8.70	9.20	9.50	10.66	9.26
Diﬂubenzuron @ 16 mg kg <sup>-1</sup> of seed + Carbendazim @ 2.5 mg kg <sup>-1</sup> of seed	8.06	8.66	9.10	9.50	10.90	9.24
Deltamethrin 2.8 E.C @ 40 mg kg <sup>-1</sup> of seed	8.00	8.83	9.16	9.56	10.46	9.20
Untreated Control	8.00	8.36	9.43	9.73	11.10	9.32
Mean	8.07	8.65	9.25	9.54	10.61	9.22

CD= (P= 0.05)

P=0.094 T=0.126 PxT =0.282

Coimbatore (25 - 350-55 % RH) for a period of 12 months. At trimonthly interval, the seed samples were drawn and evaluated for moisture content and germination (ISTA, 1999). Seeds were also observed for the insect infestation in percentage based on visual damage and pathogenic infection as per ISTA (1999) adopting blotter technique. The data collected were statistically scrutinized as per Panse and Sukhatme (1995) for understanding the level of significance.

### Results and Discussion

Highly significant results were obtained for all the parameters evaluated to trace the efficacy of pre-storage seed treatment. The moisture content of the seed was in increasing order from initial evaluation upto 12 months of storage (Table 1) which might be due to atmospheric alteration of relative humidity and temperature and the activation of biotic factor (Justice and Bass, 1978). The seed germination was in decreasing order with increase in the storage period ((Vijayakumar *et al.* 1991). due to the phenomenon of aging that occurs in any biological organism (Abdul-Baki and Anderson, 1973).

Among the pre-storage seed treatments the efficacy in extension of storage life of pearl millet seeds varied with the treatments as reported by Bass, 1976.. In the present study, the seeds which received the combined treatment of Diﬂubenzuron @ 4 mg kg<sup>-1</sup> and Carbendazim @ 2.5 g kg<sup>-1</sup> (T<sub>5</sub>) preserved the shelf-life of the seed upto 12 months recording 84% germination (Table 2), which was above certification standards for pearl millet seeds. The percentage increase over control was 16. It was followed by the efficacy of individual seed treatment with deltamethrin (40 mg kg<sup>-1</sup>) and Carbendazim (2.5 g kg<sup>-1</sup>) which maintained 82 per cent germination after 12 months of storage. Reshma (2001) also reported that seed treatment with Diﬂubenzuron preserved the viability of seeds for longer period under ambient storage in *desmanthus* seeds.

The observation of insect infestation revealed that the seeds were infested by *Tribolium castaneum* and *Sitophilus oryzae* during the storage period. They were found to be in the increasing order with storage period, starting from 3<sup>rd</sup> month of storage indicating the possibility of primary

**Table 2.** Effect of seed treatments and period of storage on germination (%) of fodder pearl millet cv. CO 8.

Treatments	Months of storage (P)					
	0	3	6	9	12	Mean
Diifubenzuron @ 4 mg kg <sup>-1</sup> of seed	96 (78.72)	93 (74.53)	84 (66.45)	81 (64.45)	78 (62.04)	86 (69.24)
Diifubenzuron @ 8 mg kg <sup>-1</sup> of seed	94 (75.56)	90 (71.95)	85 (67.49)	78 (62.04)	72 (58.27)	84 (67.06)
Diifubenzuron @ 16 mg kg <sup>-1</sup> of seed	93 (74.53)	89 (71.0)	85 (67.49)	83 (65.43)	82 (65.18)	87 (69.47)
Carbendazim @ 2.5 mg kg <sup>-1</sup> of seed	96 (78.72)	89 (71.05)	85 (67.49)	83 (65.43)	82 (65.18)	87 (69.47)
Diifubenzuron @ 4 mg kg <sup>-1</sup> of seed + Carbendazim @ 2.5 mg kg <sup>-1</sup> of seed	95 (77.08)	90 (71.62)	88 (69.77)	87 (68.62)	84 (66.45)	89 (70.71)
Diifubenzuron @ 8 mg kg <sup>-1</sup> of seed + Carbendazim @ 2.5 mg kg <sup>-1</sup> of seed	94 (77.08)	90 (71.62)	85 (69.77)	80 (68.62)	76 (66.45)	85 (70.71)
Diifubenzuron @ 16 mg kg <sup>-1</sup> of seed + Carbendazim @ 2.5 mg kg <sup>-1</sup> of seed	96 (78.72)	90 (71.62)	86 (68.06)	81 (63.96)	76 (64.91)	86 (69.10)
Deltamethrin 2.8 E.C @ 40 mg kg <sup>-1</sup> of seed	93 (74.53)	88 (69.77)	87 (68.73)	78 (67.55)	82 (64.91)	87 (69.10)
Untreated Control	93 (74.53)	86 (68.06)	75 (60.25)	73 (58.50)	68 (58.55)	79 (63.38)
Mean	94 (75.2)	89 (71.11)	85 (67.49)	81 (64.32)	77 (61.76)	85 (68.14)
CD= (P= 0.05),	1.206	T=1.619	PxT =3.620			

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Figures in parenthesis are arcsine transformed values

infestation of insects from the field (Table 3). The untreated control seeds registered the highest infestation of 68% after 12 months of storage. Though the insect infestation was lesser in higher dose of Diifubenzuron (16 mg kg<sup>-1</sup>) in combination with Carbendazim, this higher dose was found to have deleterious effect on germination of seeds (Table 2). However,

the insect infestation was in lower order in best treatment of Diifubenzuron + Carbendazim @ 8.0 mg kg<sup>-1</sup> and 2.5 mg kg<sup>-1</sup> of seed respectively. This effect might be due to the influence of dosages of Diifubenzuron which is an insect growth regulant and controlled the growth of insects very effectively at higher doses than at lower doses (Gupta, 2001).

Table 3. Effect of seed treatments and period of storage on insect infestation (%) of fodder pearl millet cv. CO 8.

Treatments	Months of storage (P)					Mean
	0	3	6	9	12	
Diflubenzuron @ 4 mg kg <sup>-1</sup> of seed	0.00	3.67	7.00	10.33	15.33	7.27
Diflubenzuron @ 8 mg kg <sup>-1</sup> of seed	0.00	1.67	3.67	9.33	13.00	5.53
Diflubenzuron @ 16 mg kg <sup>-1</sup> of seed	0.00	6.00	9.67	11.00	14.00	8.13
Carbendazim @ 2.5 mg kg <sup>-1</sup> of seed	0.00	4.67	7.00	9.67	12.67	6.80
Diflubenzuron @ 4 mg kg <sup>-1</sup> of seed + Carbendazim @ 2.5 mg kg <sup>-1</sup> of seed	0.00	5.33	6.00	6.67	7.00	5.00
Diflubenzuron @ 8 mg kg <sup>-1</sup> of seed + Carbendazim @ 2.5 mg kg <sup>-1</sup> of seed	0.00	1.00	1.00	3.33	3.33	1.73
Diflubenzuron @ 16 mg kg <sup>-1</sup> of seed + Carbendazim @ 2.5 mg kg <sup>-1</sup> of seed	0.00	0.00	1.00	1.00	2.00	0.80
Deltamethrin 2.8 E.C @ 40 mg kg <sup>-1</sup> of seed	0.00	4.33	7.00	10.67	12.67	6.93
Untreated Control	0.00	5.33	10.00	14.00	25.00	10.87
Mean	0.00	3.56	5.81	8.44	11.67	5.90
CD= (P= 0.05)		P=0.760 T=1.020 PxT = 2.281				

Evaluation of seed mycoflora infestation percentage expressed that the seeds were infested with storage and filed fungi viz., *Helminthosporium* spp., *Aspergillus flavus* and *Aspergillus niger*, which were found to be increasing with increase in storage period (Table 4). The fungal infection and insect infestation were found to be more in control than in treated seeds. However, the infestation level was less in seeds treated with Diflubenzuron @ 4 mg kg<sup>-1</sup> + Carbendazim @ 2.5 mg kg<sup>-1</sup> of seed. Thus the study highlighted that the joint action of insecticide and fungicide (Diflubenzuron + Carbendazim) were found to be more effective in controlling the multiplication of insects and fungi.

The study also expressed that for control of biotic infestation and deteriorative changes, individual chemical treatment with Deltamethrin (4pmg\_kg<sup>-1</sup>) or Carbendazim (2.5 mg

kg<sup>-1</sup>) can be followed which recorded 82% germination as against 84 per cent germination since the reduction of germination was only 2 per cent. Hence the study expressed that the storability of fodder pearl millet seed could be prolonged to 12 months with germination by imposing pre-storage seed treatment with combination of insecticide (Diflubenzuron @ 4 mg kg<sup>-1</sup> of seed) and fungicide (Carbendazim @ 2.5 mg kg<sup>-1</sup> of seed) which was higher than minimum seed certification standards. The cost involved for the treatment was also less which would be only one rupee per kilogram of seed. However, the individual seed treatment with Carbendazim @ 2.5 mg kg<sup>-1</sup> of seed or Deltamethrin @ 40 mg kg<sup>-1</sup> of seed could be also preserve the germinability of seed above MSCS level upto 12 months recording 82 per cent germination which was identified as next best treatment.

**Table 4.** Effect of seed treatments and period of storage on fungal infection (%) of fodder pearl millet cv. CO 8.

Treatments	Months of storage (P)					
	0	3	6	9	12	Mean
Diflubenzuron @ 4 mg kg <sup>-1</sup> of seed	0.00	1.00	2.00	4.00	7.00	2.80
Diflubenzuron @ 8 mg kg <sup>-1</sup> of seed	1.00	1.00	2.00	3.00	5.00	2.40
Diflubenzuron @ 16 mg kg <sup>-1</sup> of seed	2.00	4.00	4.00	5.00	5.00	4.00
Carbendazim @ 2.5 mg kg <sup>-1</sup> of seed	1.00	1.00	1.00	2.00	3.00	1.60
Diflubenzuron @ 4 mg kg <sup>-1</sup> of seed + Carbendazim @ 2.5 mg kg <sup>-1</sup> of seed	0.00	1.00	1.00	2.00	3.00	1.40
Diflubenzuron @ 8 mg kg <sup>-1</sup> of seed + Carbendazim @ 2.5 mg kg <sup>-1</sup> of seed	0.00	0.00	1.00	1.00	2.00	0.80
Diflubenzuron @ 16 mg kg <sup>-1</sup> of seed + Carbendazim @ 2.5 mg kg <sup>-1</sup> of seed	0.00	1.00	1.00	1.00	1.00	0.80
Deltamethrin 2.8 E.C @ 40 mg kg <sup>-1</sup> of seed	1.00	1.00	2.00	2.00	4.00	2.00
Untreated Control	1.00	3.00	5.00	7.00	12.00	5.60
Mean	0.66	1.44	2.11	3.00	4.67	2.38
CD= (P= 0.05)	P=0.477 1=0.640 PxT = 1.430					

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