

pretilachlor (4 DAR) on growth and yield of rice was due to its phytotoxic nature on the emerging rice seedlings. Though the phytotoxic effect vanished at the time of thinning, gap filling, the initial set back reflected on the plant growth and yield parameters. This corroborates with results of Porpavai (1990). Such phytotoxic effect was not noticed when pretilachlor was applied along with safener on 4 DAR.

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## Influence of fungicides and insecticides on storability of pearl millet seeds

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**Abstract :** Storage experiment was conducted to trace the effect of joint action of insecticides and fungicides with pearl millet cv. Co 7. The result revealed that besides exerting individual effect, Malathion 0.06 ml kg<sup>-1</sup>, Decis 0.04 ml kg<sup>-1</sup> and Thiram 2.5 g kg<sup>-1</sup> of seed also had additive effect on storability when combining insecticide + fungicide the seeds received Decis + Thiram treatment preserved the pearl millet germination above the certification standard upto 18 months (90%) when stored in 700 gauge polyethylene bag than in gunny bag. In addition, the insecticide and fungicide combination also protected the paddy from storage fungi and insects. (*Key words : Fungicide, Joint action, Insecticide*)

Seed enter into senescence immediately after its physiological maturation. On account of the diverse biological activities taking place during storage the seed deteriorates progressively in physical, physiological and biochemical attributes finally resulting in complete death. The irreversible phenomenon of deterioration though not be prevented, can be extended by pre-storage seed management practices (Roberts, 1972). This seed management includes insecticidal and fungicidal seed treatment (Srimathi, 1997) and packing containers (Agrawal, 1996). Pearlmillet is the common cultivated crop of India. Hence an attempt was made to prolong the shelf life of the seeds through seed management practices for ambient storage at Coimbatore.

## Materials and Methods

Bulk seeds of pearl millet cv. Co 7 were obtained from the Central Farm of Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India. The seeds were cleaned and graded using 4/6" round perforated (1.6mm) metal sieve to homogenize the sample based on size. The seeds dried to 8 per cent moisture were imposed with the following seed treatments in three replicates. For slurry treatment 5 ml of water kg<sup>-1</sup> seed was added.

- T<sub>0</sub> - Untreated control  
 T<sub>1</sub> - Malathion @ 0.06 ml kg<sup>-1</sup>  
 T - Decis @ 0.04 ml kg<sup>-1</sup>

Table 1. Influence of insecticides, fungicides and containers on moisture content (%) of seeds during storage in pearl millet cv. CO 7

Treat- ments (T)	Gunny bag (C)									700 gauge polyethylene bag (C)								
	Months of storage (P)									Months of storage (P)								
	0	3	6	9	12	15	18	Mean	18	3	6	9	12	15	18	Mean		
T <sub>0</sub>	8.1	10.2	11.6	12.1	12.3	12.5	12.8	11.3	12.8	8.5	8.4	8.4	8.6	8.8	9.3	8.5		
T <sub>1</sub>	8.1	10.7	11.1	11.7	11.9	12.2	12.5	11.1	12.5	8.3	8.3	8.4	8.5	8.7	9.0	8.5		
T <sub>2</sub>	8.2	11.0	11.4	12.7	12.1	12.4	12.7	11.5	12.7	8.3	8.4	8.8	8.6	8.9	9.2	8.6		
T <sub>3</sub>	8.1	10.2	11.1	10.9	11.9	12.7	13.0	11.1	13.0	8.3	8.2	8.5	8.4	8.8	9.1	8.5		
T <sub>4</sub>	8.0	10.9	11.7	11.7	11.9	12.1	12.3	11.2	12.3	8.3	8.4	8.4	8.5	8.9	9.2	8.5		
T <sub>5</sub>	8.1	10.3	12.1	12.2	11.9	12.3	12.7	11.4	12.7	8.4	8.1	8.5	8.6	8.9	9.3	8.5		
Mean	8.1	10.6	11.5	11.8	12.0	12.4	12.6	11.3	12.6	8.4	8.3	8.5	8.5	8.8	9.2	8.5		
CD (P=0.05)	T	C	P	TC	TP	CP												
	0.51	0.26	0.48	0.73	1.36	0.68												

T<sub>3</sub> - Thiram @ 2.5 g kg<sup>-1</sup>

T<sub>4</sub> - T<sub>1</sub> + T<sub>3</sub>

T<sub>5</sub> - T<sub>2</sub> + T<sub>3</sub>

The seeds were dried and packed both in gunny bags and 700 gauge polyethylene bags and stored under the ambient conditions of Coimbatore (25 - 35°C) for a period of 18 months. At trimonthly intervals the seed quality parameters viz. moisture content and germinability were evaluated as per ISTA (1999). Seeds were also observed for the insect infestation and seed mycoflora infection based on visual damage and blotter technique respectively, (ISTA, 1999) and were recorded in percentage. The data collected were scrutinized as per Panse and Sukhatme (1967) for understanding the level of significance.

### Results and Discussion

The moisture content of the seeds in both the containers were in increasing order from initial evaluation upto 18 months of storage. In the cloth bag it was higher than in 700 gauge polyethylene bag (Table 1) due to the attainment of moisture equilibrium status with the atmospheric alteration of relative humidity and temperature (Justice and Bass, 1978). Irrespective of the containers the seed germination was in decreasing order with increase in the storage period (Gopal, 1997) due to the entrance of the seed into irreversible ageing phenomenon of any biological organism (Abdul-Baki and Anderson, 1973). But it was lower in 700 gauge polyethylene bags than in gunny bags due to their vapour proofness to moisture and alternation of the relative humidity of the surrounding atmosphere (Tompsett, 1986, Agrawal, 1996)

Among the pre-storage seed treatment the efficacy in extension of storage life varied with the treatments as reported by many scientists (Bass, 1976, Srimathi, 1982). In the present study the seeds which received the combinational treatment with insecticide and fungicide of Decis and Thiram (T<sub>3</sub>) prolonged the shelf-life of the seed preservation. This treatment preserved the viability (Table 2) above the certification standards for 12 months (72%) in pearl millet while storing at 700 gauge polyethylene bag. But in gunny bag the germination was above the seed certification standards only upto 9 months (72%).

The observation on insect infestation revealed that the seeds were infested by *Tribolium castaneum* and *Sitophilus oryzae* during the storage period. In both the containers they were found to be in the increasing order, which might be due to primary infestation of insect from the field (Table 3).

Table 2. Influence of insecticides, fungicides and containers on germination (%) of seeds during storage in pearl millet cv. CO 7

Treatments (T)	700 gauge polyethylene bag (C)																	
	Gunny bag (C)									Months of storage (P)								
	0	3	6	9	12	15	18	Mean	3	6	9	12	15	18	Mean			
T <sub>0</sub>	90	71	43	28	24	21	22	43	78	74	70	62	51	49	68			
	(71.56)	(57.41)	(40.97)	(31.94)	(29.33)	(27.27)	(27.17)	(40.80)	(62.02)	(59.34)	(56.78)	(51.94)	(45.57)	(44.42)	(55.94)			
T <sub>1</sub>	91	73	54	53	36	41	38	55	82	76	73	70	56	51	71			
	(72.54)	(58.69)	(47.29)	(46.71)	(36.86)	(39.81)	(30.05)	(47.42)	(64.89)	(60.66)	(58.69)	(56.78)	(58.44)	(45.57)	(72.24)			
T <sub>2</sub>	88	72	58	61	53	51	47	61	78	81	70	68	56	53	71			
	(69.73)	(58.05)	(49.60)	(51.35)	(46.71)	(45.57)	(43.28)	(52.04)	(62.02)	(64.15)	(56.78)	(55.55)	(58.44)	(46.71)	(59.05)			
T <sub>3</sub>	90	69	72	53	42	40	37	58	81	78	75	61	49	46	69			
	(71.56)	(56.16)	(58.05)	(46.71)	(40.39)	(39.23)	(37.46)	(49.93)	(64.15)	(62.02)	(60.00)	(51.55)	(44.42)	(42.70)	(56.62)			
T <sub>4</sub>	91	82	76	76	58	53	43	68	90	81	80	77	56	52	75			
	(72.54)	(54.89)	(60.66)	(60.66)	(49.60)	(46.71)	(40.97)	(55.13)	(71.56)	(64.15)	(63.43)	(61.34)	(58.44)	(46.14)	(62.51)			
T <sub>5</sub>	87	44	36	48	34	30	27	44	74	70	68	61	50	43	65			
	(68.86)	(41.55)	(36.86)	(43.85)	(35.66)	(33.21)	(31.30)	(41.61)	(39.34)	(56.89)	(55.55)	(51.35)	(45.00)	(40.97)	(53.97)			
Mean	90	69	57	53	41	39	36		81	77	73	67	53	49				
	(71.13)	(54.45)	(48.91)	(46.77)	(39.75)	(38.63)	(35.03)		(63.99)	(61.18)	(58.53)	(54.75)	(51.71)	(44.41)				
CD	T	C	P	TC	TP	CP												
(P=0.05)	3.2	1.5	2.1	4.6	8.4	4.2												

(Figures in parenthesis indicates arcsin values)

Table 3. Influence of insecticide, fungicides and containers on insect infestation (%) of seeds during storage.

Container	Gunny bag (C)									700 gauge polyethylene bag								
	0	3	6	9	12	15	18	Mean	3	6	9	12	15	18	Mean			
T <sub>0</sub>	0	19	32	46	50	60	60	38	3	11	18	19	25	29	5			
T <sub>1</sub>	0	29	37	46	49	53	57	38	5	10	16	18	22	24	14			
T <sub>2</sub>	0	14	34	36	38	42	53	31	4	5	10	10	15	17	9			
T <sub>3</sub>	0	18	28	30	36	40	42	28	4	87	10	11	19	22	22			
T <sub>4</sub>	0	22	40	35	41	46	50	33	9	7	10	9	10	13	8			
T <sub>5</sub>	0	9	18	17	29	34	37	21	2	6	8	8	11	14	7			
Mean	0	19	32	35	41	46	50	33	5	21	12	13	17	20				

Seed mycoflora infection percentage expressed that the seeds were infected with storage and field fungi viz. *Helminthosporium* spp., *Curvularia lenata*, *Curvularia palescence*, *Chaladosporium herbatum*, *Aspergillus tenuis*, *Aspergillus flavus* and *Aspergillus niger* in pearl millet. Among them the field fungi *Helminthosporium* spp., *Chaladosporium herbatum* in pearl millet were found to decrease with increase in age of the seed while the storage fungi (*Aspergillus flavus*, *Aspergillus tenuis* and *Aspergillus niger*) were found to increase with increase in storage period. These fungal infection and insect infestation were found to be more in control than in treated seeds. Joint action of insecticide and fungicide (Decis + Thiram and Malathion + Thiram) were found to be more effective in controlling the multiplication of insects and fungi than the individuals. The higher germination per cent recorded by these treatments as discussed earlier also might be due to their efficacy in controlling these external biotic organisms that affect the storability of any seed (Justice and Bass, 1978). Raja (2000) also reported similar efficacy of fungicides and insecticides in controlling the biotic organisms and prolonging the shelf-life of seed with good germination in storage of seeds. Thus the study expressed that the storability of pearl millet seed could be prolonged by imposing prestorage seed treatment with insecticide (Decis @ 0.04 ml kg<sup>-1</sup> of seed) and fungicide (Thiram @ 2.5 g kg<sup>-1</sup> of seed) upto 9 months with minimum seed certification standards in gunny bags and upto 12 months in 700 gauge polyethylene bags with minimum seed certification standards.

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Table 4. Influence of insecticides, fungicides and containers on seed mycoflora infection (%) in pearl millet cv. Co 7 during storage

Months of storage	0					6					12					18									
	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	T <sub>5</sub>	T <sub>0</sub>	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	T <sub>5</sub>	T <sub>0</sub>	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	T <sub>5</sub>	T <sub>0</sub>	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	T <sub>5</sub>	T <sub>0</sub>	
Gunny bag																									
H	9	13	12	8	10	6	12	11	9	12	11	16	14	15	7	11	10	18	19	20	12	15	13	25	25
At	16	15	8	4	13	16	18	19	0	0	12	15	19	21	0	0	15	19	26	28	6	5	23	26	26
Cn	4	1	7	4	1	4	3	2	1	0	0	3	4	1	0	0	0	5	14	5	6	6	5	17	17
CI	1	4	0	0	0	2	1	0	0	0	0	2	1	0	0	0	0	3	10	5	3	6	7	11	11
CP	4	5	12	1	0	7	0	0	0	0	0	0	0	0	0	0	0	0	7	5	2	5	7	8	8
AF	0	0	0	0	0		13	21	19	21	26	33	19	29	25	31	31	38	28	34	31	36	41	50	50
An	0	0	0	0	0	0	30	22	18	32	19	34	35	33	25	33	26	33	41	44	30	31	34	41	41
Mean	5	5	6	2	3	5	11	11	7	9	10	13	25	14	8	11	12	17	21	20	13	15	18	25	25
700 gauge polyethylene bag																									
H	9	13	12	8	10	6	8	10	8	7	10	11	7	10	11	9	11	12	14	15	26	11	15	17	17
At	16	15	8	4	13	16	10	13	0	0	11	11	10	11	0	0	11	12	15	14	5	5	14	18	18
Cn	4	1	7	4	1	4	0	0	0	0	0	3	0	0	0	0	0	2	2	2	2	5	5	8	8
CI	1	4	0	0	0	2	0	0	0	0	0	2	0	0	0	0	0	0	3	4	1	4	3	4	4
CP	4	5	12	1	0	7	0	0	0	0	0	0	0	0	0	0	0	0	8	1	4	7	6	3	3
AF	0	0	0	0	0	0	9	12	16	15	12	21	11	11	20	22	15	25	18	21	28	30	28	31	31
An	0	0	0	0	0	0	20	21	17	13	10	23	23	23	24	21	14	33	31	26	31	32	28	39	39
Mean	5	5	6	2	3	5	7	8	6	5	6	10	7	7	8	7	7	12	13	12	14	13	14	17	17
H - <i>Helminthosporium</i> spp. CP - <i>Curvularia paleoscence</i> An - <i>Aspergillus niger</i> At - <i>Aspergillus tenuis</i> Cn - <i>Cladosporium herbatum</i> CI - <i>Curvularia imata</i> AF - <i>Aspergillus flavus</i>																									

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## Yield and physiological attributes of soybean as influenced by P mobilizers under varying irrigation regimes

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**Abstract :** A field experiment was carried out during Summer 1994 and 1995 at Vamban, Pudukkottai to study the yield and physiological attributes of soybean (*Glycine max* (L) Merrill) as influenced by P management using P mobilizers under varying irrigation regimes. Irrespective of season, irrigation at IW/CPE ratio of 0.8 were significantly increased the various growth analysis parameters viz. DMP, LAI, LAD, CGR and NAR of soybean. The grain yield was increased by irrigation at IW/CPE ratio of 0.8 in both the experiments. An appreciable increase in physiological attributes and grain yield were recorded at 80 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup>. (**Key words :** Soybean, Physiological attributes, Yield, P management, "P" mobilizers, Irrigation.)

Soybean is an important protein cum oil yielding leguminous crop. Water is a major limiting factor for successful production of soybean in Tamil Nadu and India. Achieving greater water use-efficiency is possible in irrigated soybean production through efficient and judicious application of irrigation water. Irrigation scheduling technique is one of the means of attaining this goal. Soybean requires adequate amount of phosphorus for better growth and yield. It is evident that application of P influences the physiological attributes positively in soybean as reported by Rajput *et al.* (1994). Therefore, the present experiment was conducted to evaluate the effect of different irrigation regimes and phosphorus management using P mobilizers on yield and physiological attributes of soybean.

### Materials and Methods

A field experiment was conducted for two years during summer season of 1994 and 1995 at National Pulses Research Centre, Vamban, Pudukkottai (Tamil Nadu). The experiment was conducted in split-split plot design with 2 irrigation regimes (0.8 and 0.6 IW/CPE) in main plots, 4 P mobilizers (pressmud, gypsum, enriched FYM and phosphobacteria) in sub plots and 3 phosphorus levels (40 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup>, 60 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> and 80 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup>) in sub-sub plots replicated 3 times. The soil was red soil with sandy clay loam texture. The fertility status of the soil was 220, 9.8 and 200 kg of available N, P and K ha<sup>-1</sup> respectively. The soil pH was 6.4 with the organic carbon content of 0.35 per cent.

The seeds of soybean var. Co 1 were sown on 1.1.1994 and 30.1.1995 adopting a inter-row spacing of 30 cm and inter-plant spacing of 10cm. Before sowing pressmud @ 2 t ha<sup>-1</sup>, gypsum @ 250 kg ha<sup>-1</sup>, enriched FYM @ 750 kg ha<sup>-1</sup> with treatmental