

EFFECT OF SEED TREATING CHEMICALS ON THE MICROFLORA AND GERMINATION OF SOYBEAN SEEDS

BY

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The effect of seed treating chemicals on the microflora and germination of soybean seeds was studied. Seed deterioration started at RH 70% and was maximum at RH 90%. Of the different seed treating chemicals, Cerasan Dry was most effective for best germinations followed by Captan and Difolatan. The germination of seeds was higher in sterilized sand than in blotter. Soaking of seeds in water for different periods revealed that it had always retarding effect on germination. On the basis of available data it is presumed that soybean seed deterioration is due to the microbial activities.

INTRODUCTION

The rapid loss of germination of soybean seeds is a serious problem in India (Singh, 1976) particularly in West Bengal, where high relative humidity greatly accelerates loss of viability of the seeds. Loss of germination in case of *rabi* soybean is relatively more than in *kharif* crop as the *rabi* crop passes through hot and humid monsoon season in eastern India, resulting in significant loss of viability.

In the present investigation, the effect of seed treating chemicals was studied on the microflora and germination of soybean seeds in order to select a suitable chemical which will ensure improved plant stand.

MATERIALS AND METHODS

Seeds of soybean (*Glycine max* L. cv. Bragg) of 1977-78 harvest after 4 months storage were used in this study. One lot of the seeds were stored at room temperature and the other lot at low temperature (1°C).

The different chemicals used for seed treatment and their dosages used are as follows :-

Terramycin (Oxytetracycline)—200 ppm ; Agrimycin (Streptomycin, 15% + Terramycin, 1.5%)—200 ppm ; Cerasan Dry (Phenyl mercury acetate)—0.25% ; Captan (N—(Trichloromethyl) Thio)—4—cyclonxene—1, 2—dicarboximide)—0.25% ; Defolatan (Cis—N—/(1, 1, 2, 2—Tetrachlorethyl) thio/—4—cyclohexene—1, 2—dicarboxiride)—0.25% ; Thiram (Tetyamethyl thiram disulphide)—0.25% ;

Benlate (methyl 1, 2—benzimidazole carbamate)—0.1% ; Bavistin (2—(methyl—carbamoyl)—benzimidazole)—0.1% and Brassicol (Penta chloronitro benzene)—0.25%.

RESULTS AND DISCUSSION

Effect of storage temperature on soybean seed germination

Soybean seeds after harvest were kept in cloth-bags. One lot of seeds were stored at room temperature and the other lot at 10°C. Samples from the seed lots were tested for germination at monthly intervals. The data are presented in Table 1.

Table 1. *Effect of storage temperature on soybean seed germination (p.c.)*

Period	Storage Condition	
	Room	Cold storage
April	83	84
May	79	82
June	71	80
July	59	80
August	46	80

The data in Table 1 show that in the months of May—June, when the R. H. was beyond 70 percent, seed deterioration starts, and the maximum deterioration occurred during the month of August, September and October, when the R. H. was about 90 percent.

According to Christensen and Kaufmann (1969), favourable lower limit of seed moisture necessary for the development of storage fungi like *Aspergillus restrictus*, *A. flavus*, *A. candidus* etc. is about 13-15 percent on starchy cereal grains and in case of grains like soybean, the limit is around 11.5 percent seed moisture. So soybeans are more preferred substratum for the development of storage fungi than cereals. According to Agarwal (1976), for attaining 11.5 percent equilibrium seed moisture in soybean, the percent relative humidity necessary is around 70 percent. In the results presented in Table 1 also, it is apparent that when the seed moisture is beyond 70 percent in the months of May-June, the storage fungi were active and seed deterioration started.

Table 2. *Effect of different seed treating chemicals on the germination and microflora on soybean seeds*

Chemicals	Substrates						Unsterilized soil in pot
	Blotter			Sterilized sand			
	Germi- nation (p.c)	Fungi (p.c)	Bacte- ria (p.c)	Germi- nation (p.c)	Fungi (p.c)	Bacte- ria (p.c)	
Terramycin (dip)	26	84	7	29	86	13	36
Agrimycin (dip)	22	92	7	31	100	3	38
Ceresan Dry	74	7	10	76	0	40	82
Captan	61	11	61	63	0	33	68
Difolatan	58	8	70	61	0	83	61
Thiram	47	3	90	60	0	87	58
Benlate	45	7	85	43	8	93	51
Bavistin	38	17	83	43	13	93	49
Brassicol	36	9	100	39	9	84	48
Control	34	13	97	36	7	66	46

Effect of different seed treating chemicals on the germination and microflora of soybean seeds

Soybean seeds after 4 months storage were treated with different chemicals at their recommended dosages. The seeds were tested for germination and the nature of microflora on different substrate. The results are presented in Table 2. The data show that in case of antibiotic treatments, the bacterial growth was inhibited and fungal growth was enhanced, and the germination was less than control. In case of fungicidal treatments, fungal growth was reduced and bacterial growth was highly enhanced, but there was general improvement in germination over control, the maximum improvement being recorded in case of Ceresan Dry, followed by Captan and Difolatan.

About the different substrate used in germination and microflora assay, it was found that the germination was higher in sterilized sand than in blotter. As it was found that the treatment with fungicides has improved germination of soybean seed, it was apparent that the fungi were the chief cause for the loss of germination. As there was relatively more inhibition of fungi in sterilized sand, there was corresponding improvement in germination. In natural unsterilized

soil, the activity of the fungi associated with seed was perhaps retarded because of the activity of soil microflora. Perhaps because of this reason, seed germination was better in unsterilized garden soil than in sterilized sand.

Table 3. *Effect of mode of application of some seed treating chemicals on the germination and microflora of soybean seeds*

Chemicals	Mode of application	Substrates						
		Blotter			Sterilized sand			Unsterilized soil in pot
		Germination (p.c)	Fungi (p.c)	Bacteria (p.c)	Germination (p.c)	Fungi (p.c)	Bacteria (p.c)	Germination (p.c)
Terramycin	Dip	28	71	9	31	92	15	33
	Dry	33	76	6	34	87	16	36
Agrimycin	Dip	21	98	8	30	96	5	39
	Dry	27	94	10	36	100	7	49
Ceresan	Dip	64	8	79	66	3	45	77
	Dry	70	6	85	73	3	51	83
Control	Water soaked (5 min)	32	6	100	35	17	85	43
	Dry	37	12	94	40	8	71	48

Effect of mode of application of seed treating chemicals on germination and microflora of soybean seeds

In the previous experiment it was found that when the antibiotics were used by dip method, there was considerable reduction in germination over control. So it was thought necessary to study the effect of methods of treatment of antibiotics, i. e. dip/slurry method and dry method on the germination of seeds. For reference one fungicide cerasan was also used by slurry and dry method. The results are presented in Table 3.

The results show that in dip or slurry methods, there was general retardation in germination. Fungi were more active in dip and slurry method of treatment. Basu and coworkers (1974, 1976) reported that the loss of viability of seeds of wheat, rice, jute, sunflower, pulses and vegetables could be significantly slowed down by soaking the seeds half way during storage with water or dilute solutions of chemicals for 2-6 hours, followed by drying back to original weight. In our investigation, we found that the seed treating chemicals when used in aqueous phase produced negative effect on germination.

Table 4. *Effect of different period of water soaking on the germination and microflora of soybean seeds*

Duration of water soaking (min)	Germination (p. c)	Fungi (p. c.)	Bacteria (p. c)
15	10	13	17
30	13	17	100
60	20	27	100
120	3	7	100
180	0	3	100
240	0	3	100
300	0	3	100
360	0	3	100
720	0	0	103
Control (Dry)	41	13	10

Effect of different periods of water soaking on the germination and microflora of soybean

From the results of previous experiment it was thought necessary to find out the effect of soaking the seed for different durations on the germination and microflora of soybean seeds. The results are presented in Table 4. The results show that soaking always had retarding effect on germination.

Effect of soaking followed by drying to original weight on the germination of soybean seeds

When the soybean seeds were soaked in water for 60 minutes and then dried to original weight at 35°C, the germination of the seeds was found to be less than control. So it is apparent that the physiological phenomenon associated with water soaking treatment, as recorded by Basu and coworkers (1976) might not be active in the case of soybean.

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