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Wm. A. Schoenfeld, Director
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TREATMENT OF PEA SEED IN RELATION TO GERMINATION AND PLANT GROWTH

By A. G. B. Bouquet

Seeds of early garden peas are usually planted in the spring just as soon as soil and weather conditions permit. Pea seeds frequently show a poor germination from these early plantings due to cool air temperatures and cold wet soils. As a result of low germination the stand of plants is often meager and the yield of pods considerably reduced.

This circular discusses the results obtained in the treatment of seed, previous to planting, with Semesan, an organic mercury compound.

Use of Semesan for Seed Treatment

Semesan, an organic mercury compound, was used in these tests by first placing the seed in a tin can with a tight cover or in a tight paper sack and adding Semesan at the rate of one ounce to 20-25 pounds of seed. General recommendations are made that three ounces of Semesan shall be used to a bushel of seed. In small quantities an amount of Semesan equal to seven times the size of a pin head should be used for an ordinary 10¢ packet of pea seed. The seed and powder should be shaken together for several minutes so that the seed is uniformly covered. The cost of using Semesan is approximately 1¢ per pound of seed treated. A 2-ounce can of this material costs approximately 50¢. A 1-pound can, $2.75.

Trials with Treated and Untreated Pea Seed

In the fall of 1932 certain lots of Idaho and Montana grown Alderman pea seed were treated with Semesan and planted under varying conditions in the College greenhouses. The treated seeds were planted in large pots and covered in a manner similar to that of the growing of a crop outdoors. Likewise a similar number of untreated seeds were planted. In so far as possible the conditions favoring each lot of seed were identical both as regards air temperature, soil temperature, moisture and aeration.

The greenhouse conditions consisted of one warm greenhouse and one cool greenhouse. The average air temperature of the warm greenhouse was approximately 72 degrees F. with variations from 64 to 80 degrees F. The soil temperature followed the air temperature quite closely, varying from 62 to 72 degrees F., or an average of 67 degrees F. The cool greenhouse air temperatures varied from 40 to 78 degrees F., averaging about 60 degrees. The soil temperature, in this greenhouse, averaged 54 degrees, varying from 38 to 68 degrees F. In general the soil temperatures averaged about 6 to 8 degrees cooler than the air temperatures. In some instances the temperatures of both air and soil were approximately equal, especially during the earlier parts of the day.

The following data are presented to show the relation between soil and air temperatures as affecting the germination of pea seed. The figures listed are taken at random from many readings of soil and air temperatures observed at a similar time.

Relation of Air and Soil Temperatures of Greenhouse in which Treated and Untreated Pea Seeds were Grown

Cool greenhouse		Warm greenhouse	
Air temperature Degrees F.	Soil temperature Degrees F.	Air temperature Degrees F.	Soil temperature Degrees F.
50	49	80	70
64	56	80	66
60	49	72	72
62	57	75	68
68	60	76	72
50	48	80	76
68	56	68	62
78	68	67	60
70	59	61	59
70	62	62	57
56	50	70	66
62	58	72.0 ± 1.47	66.2 ± 1.21
68	63		
62	50		
57	51		
70	58		
50	44		
56	53		
53	53		
58	57		
60	54		
40	38		
50	46		
60.0 ± 1.24	54 ± .30		

In the cool greenhouse the air temperature was approximately 6 to 7 degrees warmer than the soil temperature. In the warm greenhouse the soil temperature was slightly closer to the air temperature.

Pea growers may therefore figure that while there may be as much variation as ten to twelve degrees between soil and air temperatures, the average variation will be about six to seven degrees.

Effect of Seed Treatment on Germination

The germination of treated seed was markedly higher in every instance than that of the untreated or control seed as shown in the following table:

Strain of seed		Number seeds planted	Per cent germination	% increase or decrease from seed treatment
Lot 1	Idaho Alderman			
	Treated	36	94	+ 33
	Control	36	61	
Lot 2	Montana Alderman			
	Treated	36	91	+ 38
	Control	36	53	
Lot 3	Montana Alderman			
	Treated	36	94	+ 33
	Control	36	61	
Lot 4	Montana Alderman			
	Treated	36	98	+ 54
	Control	36	44	
Lot 5	Montana Alderman			
	Treated	36	100	+ 45
	Control	36	55	

The results show a definite superiority of germination in the treated seed. The average germination of the treated lots was 95 per cent, of the untreated lots 55 per cent.

In a second series of tests, 4 strains of Alderman seed, G2005, G2007, G2012, and G2123 were likewise treated as in the first series, the only difference being in the number of seeds planted -- 30 instead of 36 as in Series 1. The results with the various "G" strains were as follows:

Strain number		Number seeds planted	Per cent germination	Increase or decrease from seed treatment
G2005	Treated	30	78	62
	Control	30	16	
G2007	Treated	30	96	76
	Control	30	20	
G2012	Treated	30	96	56
	Control	30	40	
G2123	Treated	30	90	53
	Control	30	37	
Average germination treated lots			90	
Average germination control lots			28	62

Ten per cent of the treated seed, therefore, failed to germinate but of the untreated seed 72 per cent failed to produce viable plants. These seeds were planted under cool temperatures of both air and soil. Soil temperatures varied from 38 to 57 degrees F. Air temperatures in the greenhouses varied from

40 to 70 degrees F. Soil temperatures varied from 2 to 12 degrees lower than air temperatures with an average of 4 to 5 degrees. (See discussion on soil and air temperatures in other paragraphs).

Effect of Seed Treatment on Rapidity of Germination and Subsequent Growth

Plants from treated seed invariably appeared above the soil more rapidly than those from the untreated seed. There was a uniform vigor of the seedlings from the treated seed which was not to be found in the pots of plants from the control seedings. The seedlings of the treated seed showed a general consistency of growth and vigor throughout the entire time of the trials.

In the matter of growth subsequent to germination, measurements of plants from treated and untreated seed showed the following increases in growth in favor of the plants grown from treated seed.

Lot number and strain	Increase in growth of plants from treated seed over untreated seed Per cent
1 Idaho Alderman	133
2 Montana Alderman	100
3 Idaho Alderman	350
4 Montana Alderman	133
5 Montana Alderman	100

In some cases plants in pots of untreated seed were fully as large as those from treated seed but the increases in the table stated above represent the average of all of the plants in both the treated and control lots.

Germination Test in U. S. Seed Laboratory

In order to contrast the germination of treated and untreated seed not planted in soil but placed in the oven germinators, 30 seeds of each lot were placed in the oven and observed at the end of 10 days. There was considerable mold on the pea plants and blotters of the untreated lot while the plants and blotters of the treated seeds were perfectly clean, no mold showing in any case. There were 28 uniformly good sprouts from the 30 treated seeds planted while the untreated seed developed 24 sprouts of somewhat inconsistent size and vigor.

Conclusions

1. Seeds of garden peas, planted in cool wet soil of the spring when unfavorably cool air temperatures also prevail, are subject to rot through molds which destroy the viability of the seedling. Even if the young plant is not entirely destroyed in the embryo stage, results of tests of untreated pea seed planted in a moist cool soil indicate that the vigor of the plant may be seriously impaired and the subsequent growth and yield of the plant decreased.

2. Treating the seed with Semesan, an organic mercury compound, is a useful manner of protecting it from mold and rot and of increasing very markedly the chances for a good germination of seed and a uniform stand of plants in the row. The treatment is easily effected at a cost approximating 1¢ per pound of seed, depending upon the amount planted.

3. Soil temperatures follow very closely air temperatures as indicated by greenhouse tests. While variations of 10-12 degrees may exist, yet observations of temperatures show that the soil temperature is usually on an average of 6 to 7 degrees cooler than the temperature of the air at the same time.

4. In the present tests of treated and untreated seed there was consistent evidence of a much greater per cent of germination and subsequent growth of plant from the treated seed over the untreated seed. The average germination of treated seed lots was 90 per cent; that of the control lots 28 per cent. Subsequent growth records show increases from treated seed varying from 100 to 350 per cent.

5. Under unfavorable conditions for high seed germination, namely cool air temperatures and a cold, moderately wet soil, growers of peas can well afford to treat seed as a means of helping to prevent rot and a poor stand of plants. Seed treatment is easy, inexpensive and efficient.
