

## IRISH POTATO SCAB (*OOSPORA SCABIES*) AS AFFECTED BY FERTILIZERS CONTAINING SULPHATES AND CHLORIDES.

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In the spring of 1911 a pot experiment with Irish potatoes was started at the Purdue Experiment Station by the author. It was the intention to investigate the composition and quality of potatoes grown in several types of soil with different fertilizers, the ordinary silt loam of the station farm being the principal soil used. Peat and sandy soils were also used, as well as eight pots containing pure silica sand. The principal fertilizers studied were sulphate of potash and chloride of potash. Two varieties of potatoes were used, Early Ohio, one of the best early varieties, and Carmen No. 3, a good late variety.

The experiment was not planned to cover an investigation of potato scab, although this development of the research may be one of the most significant features noted. The seed potatoes planted the first year did not show any scabbiness and no attempt was made to prevent it. When the potatoes were harvested, however, it was seen that formalin should have been used, as the crop was badly affected by the scab fungus *Oospora scabies*. The scab was very much worse in the brown peat than in the other soils, as will be seen from Fig I. There was also a slightly greater amount of scab in the pots where chloride of potash was used than there was where sulphate was used, the unfertilized pots being affected the worst of all. In 1912, to prevent scab the seed potatoes were all treated with formalin and one-half the pots, which are in duplicate, were given an application of flowers of sulphur, which is a treatment that has been reported as a success by certain investigators.\* No great differences as to scabbiness were seen in the crop of 1912, and photographs were not taken.

In 1913 the seed potatoes were again treated with formalin, but no sulphur was added. When the potatoes were harvested this year a sur-

\* B. D. Halsted, Bul. 112, N. J. Agr. Exp. Sta.; also Bul. 120 N. J. Exp. Sta.

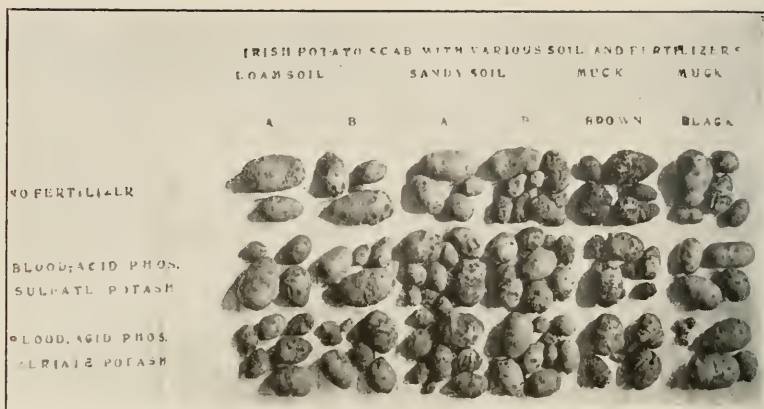


Fig. I. Potatoes Grown in Pots, 1911. Various Soils and Fertilizers Affecting Scab.

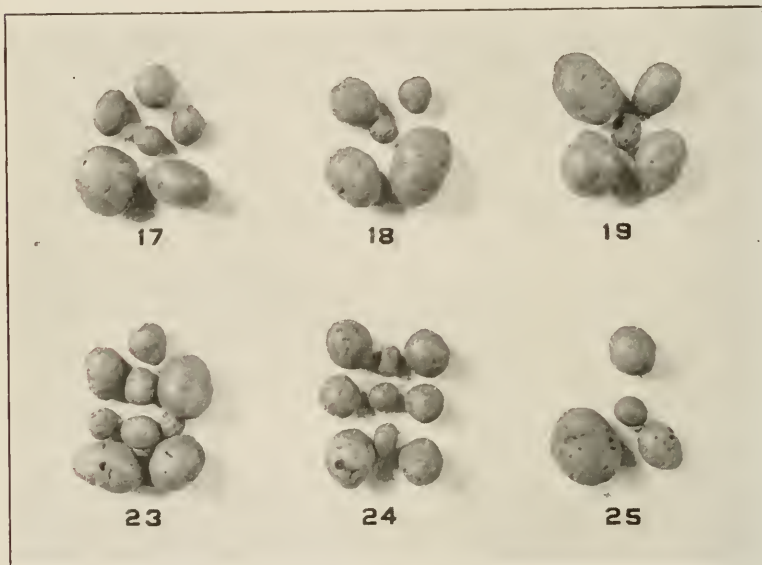


Fig. II. Potatoes Grown in Pots, 1913. Loam Soil. Very Little Scab. See Table I, for Treatment.



Fig. III. Potatoes Grown in Pots, 1913. Peat Soil. See Table I, for Treatment Affecting Scab.



Fig. IV. Potatoes Grown in Pots, 1913. Sandy Soil. See Table I, for Treatment Affecting Scab.

prisingly large amount of scab was noted. The soil, the treatment, and the approximate percentage of scabiness are given in Table I and photographs of the early potatoes are shown in Figs. II, III, and IV.

As the seed potatoes had been treated it is evident that the scab spores had lived over the winter in the pots which were left out in the ground. It appears that very little scab had survived the climate and soil conditions in the loam soil, while in the soils of more open texture such as peat and sand, the spores had been able to survive.

The unfertilized soils in most cases are affected to the greatest extent. In every case flowers of sulphur, which had been applied in 1912, has had a deterrent effect in the development of scab. In the fertilizer treatment sulphates have kept the scab down while the chloride has apparently encouraged it.

The variations noted in the amount of scab on the potatoes grown in silica sand merit special attention, as in these pots all factors except soil treatment have been eliminated and there are four pots which have not had chloride in any form either in the original sand (the soils all have more or less chlorine naturally) or in any treatment. The sulphur factor was more nearly controlled in these pots than in the soil pots as di-calcic phosphate was used in 1913 in place of acid phosphate. Acid phosphate which contains more or less calcium sulphate was used in all soil pots that were fertilized; it was also used the first season in the silica sand pots, and it was necessary that some sulphate should be added as a plant food. The treatment of each pot and the amount of scab on the potatoes grown in silica are shown in Table II. Fig. V is a photographic reproduction of all the potatoes grown in the silica pots in 1913. It will be noted from the accompanying table and illustrations that sulphur has had a marked influence in reducing scab, but that sulphates have not. On the other hand, wherever chloride has been added either with or without sulphates very much scab was always present. This seems to indicate that chlorides are needed in the development of the scab fungus. The fact that chlorides are present in quite large amounts in soils, especially those near the sea coast, may account for the fact that chlorides have not been found to increase scab in experiments where such effects were noted.\*

\* H. J. Wheeler and G. M. Tucker, Bul. 40, R. I. Exp. Sta.; also G. E. Stone, 20th Ann. Rep. Mass. Agr. Exp. Sta., 1908.

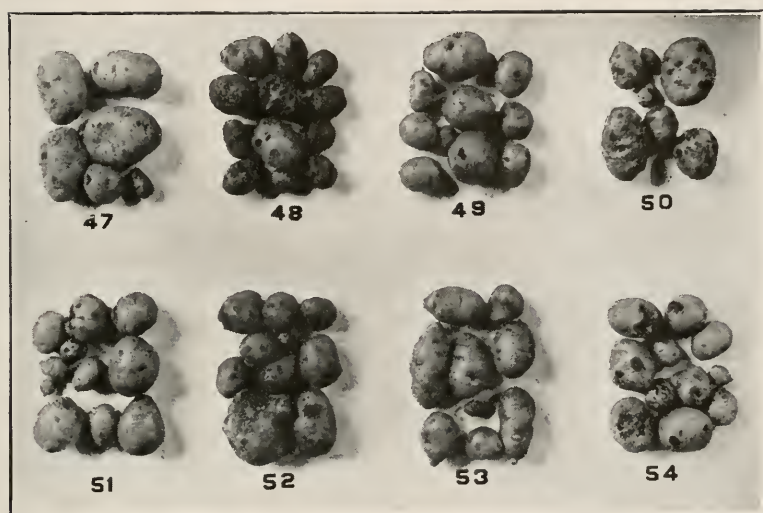


Fig. V. Potatoes Grown in Pots, 1913. Silica Sand. See Table II, or Treatments Affecting Scab.

TABLE I.

POTATO SCAB (*OOSPORA SCABIES*) POT CULTURES, 1913.

Kind of Soil.	Treatment of Soil.	Early Ohio Variety.		Carmen No. 3 Variety.	
		Pot No.	Per Cent. of Scab.	Pot No.	Per Cent. of Scab.
Silt Loam.	None.....	17	1	20	0
	N P K <sub>2</sub> SO <sub>4</sub> .....	18	1	21	0
	N P KCl.....	19	1	22	2
	None.....sulfur	23	3	26	1
	N P K <sub>2</sub> SO <sub>4</sub> .....sulfur	24	1	27	0
	N P KCl.....sulfur	25	1	28	1
Brown Peat.	None.....sulfur	29	60	32	5
	N P K <sub>2</sub> SO <sub>4</sub> .....sulfur	30	15	33	10
	N P KCl.....sulfur	31	25	34	15
Black Peat.	None.....sulfur	55	50	58	1
	N P K <sub>2</sub> SO <sub>4</sub> .....sulfur	56	3	59	3
	N P KCl.....sulfur	57	15	60	5
Sandy Soil.	None.....	35	80	38	30
	N P K <sub>2</sub> SO <sub>4</sub> .....	36	65	39	50
	N P KCl.....	37	75	40	50
	None.....sulfur	41	28	44	3
	N P K <sub>2</sub> SO <sub>4</sub> .....sulfur	42	20	45	3
	N P KCl.....sulfur	43	24	46	5

N = 7 gr. dried blood + 6.7 gr. nitrat soda per pot.

P = 12.8 gr. acid phosphate per pot.

K<sub>2</sub>SO<sub>4</sub> = 3.6 gr. sulphate of potash per pot.

K Cl = 3.6 gr. chloride of potash per pot.

Sulfur = 8 gr. sulfur per pot.

Per cent. of scab is an approximation of the surface of the tubers affected.

TABLE II.

POTATO SCAB (*OOSPORA SCABIES*) IN SILICA SAND POT CULTURES.

Treatment of Soil	Pot No.	Per Cent. of Scab.
N P K <sub>2</sub> SO <sub>4</sub> .....	47	4
N P KCl.....	48	75
N P K <sub>2</sub> SO <sub>4</sub> + Na <sub>2</sub> SO <sub>4</sub> .....	49	4
N P K <sub>2</sub> SO <sub>4</sub> + NaCl.....	50	75
N P K <sub>2</sub> SO <sub>4</sub> + sulfur.....	51	8
N P KCl + sulfur.....	52	25
N P K <sub>2</sub> SO <sub>4</sub> + Na <sub>2</sub> SO <sub>4</sub> + sulfur.....	53	2
N P K <sub>2</sub> SO <sub>4</sub> + NaCl + sulfur.....	54	20

N = 7 gr. dried blood plus 6.7 gr. nitrate soda per pot.

P = 5.1 gr. di-calcic phosphate per pot.

K<sub>2</sub>SO<sub>4</sub> = 3.6 gr. sulfate of potash per pot.

KCl = 3.6 gr. chloride of potash per pot.

Na<sub>2</sub>SO<sub>4</sub> = 3.4 gr. sulfate of soda per pot.

NaCl = 2.8 gr. chloride of soda per pot.

Sulfur = 8 gr. per pot or approximately 360 lbs. per acre.

All pots had a treatment of 100 gr. calcium carbonate per pot.

Early Ohio potatoes treated with formalin were planted.

