

EXPERIMENTS WITH CLEAN SEED POTATOES ON NEW LAND IN SOUTHERN IDAHO

[PRELIMINARY PAPER]

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It has generally been assumed by plant pathologists that if disease-free potatoes (*Solanum tuberosum*) were planted on new land the resulting product would be free from disease. For the past three years the writer has been engaged in investigations of potato diseases in southern Idaho, where this crop is grown under irrigation. As these irrigated tracts have but recently been opened up, there are many acres of land which may be classed as new in every sense of the word, since no agricultural crops have ever been grown upon them. Pathologists and potato growers alike believed that in these new lands just reclaimed from the desert lay a wonderful opportunity for the production of disease-free potatoes. However, from the beginning of the potato-growing industry in the irrigated portion of southern Idaho potato diseases have appeared each year. It is known that the first seed planted by the potato growers of these irrigated tracts was far from being free from disease, and it was naturally assumed that the diseases which appeared in the product had been introduced with the seed planted. The diseases most prevalent are wilt (*Fusarium oxysporum* Schlecht.), blackrot (*F. radicicola* Wollenw.), jelly-end rot (*Fusarium* sp.), Rhizoctonia or russet scab, powdery dryrot (*F. trichothecioides* Wollenw.), and common scab.¹

During the first two years of the author's investigations of potato diseases in southern Idaho, he observed that when potatoes were planted on virgin land just reclaimed from the desert many diseases usually appeared. Often the product from potatoes planted on such land appeared to be more diseased than that from potatoes planted on land which had been reclaimed from the desert for several years and which had been planted with other crops, such as alfalfa or grain. Frequently when such a diseased crop was observed, the grower would insist that the seed potatoes he had planted had been practically free from disease. Since certain of the diseases found, such as common scab and blackrot, are easily detected on the seed, the writer was forced to admit that in many such cases the grower might be right. Therefore,

¹ No attempt has been made to isolate an organism from the common scab found in this region, but since its appearance is identical with that found in the East it is assumed that the causal organism is the same—namely, *Actinomyces chromogenus* Gasparini.

in the spring of 1915, experiments were set up to determine whether a clean product could be obtained by planting disease-free seed on new land. While these experiments are to be continued another year, the results of the first year's trials were so conclusive and of such importance to the potato-growing industry that it appears desirable to record them at the present time.

In the spring of 1915 arrangements were made with several farmers to plant clean seed on lands which had never before been planted to potatoes. The plots planted ranged from one-twentieth of an acre to 1 acre in size. Six of the plots were planted on virgin soil reclaimed from the desert for the express purpose of planting with disease-free seed potatoes. Fourteen of the plots were planted on land which had for several years been in alfalfa or grain. On the grounds of the experiment station at Jerome, Idaho, other plots were planted with disease-free seed.

The land at the experiment station was reclaimed from the desert in 1910, planted to barley, and thereafter to alfalfa.

The varieties planted in the test plots were as follows: Idaho Rural, Netted Gem, Rural New Yorker, Pearl, Peoples, Red Peachblow, Burbank, Carmen No. 3, and Early Six Weeks. The disease-free seed was selected in the same manner for each plot as follows: Each tuber was first carefully examined for all external evidence of disease, such as common scab and the sclerotia of *Rhizoctonia* sp. All tubers showing evidence of either of these diseases were rejected. No tubers showing any large amount of infection with powdery dryrot were used. If there was only a small pocket of dryrot present, the infected portion was cut out until the tissues appeared white and clean. The externally clean tubers were then cut, the first cut being made across the stem end. The stem end portion was invariably discarded. If there was no evidence of vascular or other discoloration, the balance of the tuber was considered free from disease and was cut into pieces averaging about 2 ounces each. After cutting, the tubers were disinfected for 1½ hours in a solution of mercury bichlorid (1:1,000).

Throughout the season each plot was carefully watched, cultures being made from time to time as evidence of disease appeared in the plants. Wilt was found in every plot and *Fusarium oxysporum* was obtained in artificial cultures from stems showing vascular discoloration. Stem lesions and footrots were especially severe in all of the desert (or virgin) land plots. In all of the desert-land plots the plants presented a sickly appearance as compared with the plants in the alfalfa and grain land plots. There were indications in each of the desert-land plots of light yields and of a diseased product.

At harvest time the following methods were employed to determine the diseased condition of the tubers: In each of the smaller plots 100 hills were dug and the product of each hill examined separately. The

tubers were first examined for the presence of external diseases, such as Rhizoctonia or russet scab, common scab, blackrot, and jelly-end rot, after which each tuber was cut to determine the presence or absence of infection in the vascular tissue. The method employed in each of the larger plots was the same as in the smaller ones, except that several lots of 100 hills each were dug in different parts of each plot. All tubers showing pronounced vascular discoloration were considered as infected with wilt caused by *Fusarium* spp. Tubers showing such discoloration were taken to the experiment station laboratory and cultures were made from the discolored vascular tissue. Eighty per cent of all such cultures showed the presence of either *F. oxysporum* or *F. radicicola*. The percentage of vascular infection present in the harvested product was estimated on this basis.

The average percentage of disease present in the alfalfa-grain land plots, planted with disease-free seed, including the plots at the Jerome experiment station, was as follows: Common scab, 4.7 per cent; Rhizoctonia or russet scab, less than 2.8 per cent; vascular infection, 26 per cent; and fieldrots caused by *Fusarium* spp., less than $\frac{1}{2}$ of 1 per cent. In the desert-land plots the averages were as follows: Common scab, 9.3 per cent; Rhizoctonia or russet scab, 11.6 per cent; vascular infection, 29.3 per cent; and fieldrots caused by *Fusarium* spp., 5.6 per cent. The fieldrots caused by species of *Fusarium* are blackrot (*F. radicicola*) and jelly-end rot, the causal organism of which has not been definitely determined, but with it are associated *F. radicicola* and *F. oxysporum*, as well as other species of *Fusarium*. Of these two fieldrots, blackrot was the one principally found. Jelly-end rot was confined to the Netted Gems and rarely occurred.

It will be seen that the percentage of disease was much higher in the plots planted on virgin soil than in the plots planted on land which had previously been cropped with alfalfa or grain. When the fact is taken into consideration that the yield in each of the desert-land plots was light and the tubers small and of poor quality, it must be admitted that raw desert lands are not well adapted to the production of high-grade seed stock.

From the results so far obtained from the experiments the following conclusions are drawn:

- (1) Planting clean seed potatoes on new land does not guarantee a disease-free product.
- (2) A smaller percentage of disease may appear in the product when clean seed is planted on alfalfa or grain land than when similar seed is planted on virgin or raw desert land.

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