

## ZINC FERTILIZATION OF RUSSET BURBANK POTATOES

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Russet Burbank potatoes grown in both the Yakima Valley and Columbia Basin irrigation projects sometimes develop a characteristic growth disorder which has been given the descriptive name "fern leaf". This name arises from the thickening, twisting, and cupping of developing leaves causing the terminal growth to resemble the unfolding fronds of certain ferns. Tests made during the mid-1950's indicated that "fern leaf" is associated with zinc nutrition and in 1958 zinc fertilization was recommended as a means of preventing "fern leaf" in this crop.

An experiment performed on the Columbia Basin Research Unit of the Irrigation Experiment Station during the summer of 1961 provided a vivid demonstration of how important zinc fertilization can be in the production of Russet Burbank potatoes. In this experiment the entire field was fertilized with adequate amounts of  $\text{NH}_4\text{NO}_3$  and  $\text{K}_2\text{SO}_4$  for high yields. Then Russet Burbank potatoes were grown on plots having four different treatments: (1) no treatment, (2) concentrated superphosphate at 100 pounds P per acre, (3) zinc sulfate at 10 pounds zinc per acre, and (4) 100 pounds P per acre plus 10 pounds zinc per acre.

Very soon after the potatoes came up drastic differences in growth were apparent on these four treatments. Where neither phosphorus nor zinc were applied the plants were stunted but had normal appearance and color. Likewise, where zinc was applied alone the plants were small but had normal development. Where phosphorus was applied alone, however, the plants showed extreme "fern leaf" symptoms. Finally, on the treatment receiving both phosphorus and zinc the plants showed vigorous, normal growth. It was obvious from these results that "fern leaf" developed only when phosphorus was applied and could be prevented by the application of zinc.

The potato yields from these plots further illustrate the importance of zinc fertilization for this potato variety. Where phosphorus was applied without zinc total yield of tubers was less than 1 ton per acre, none of which were of marketable size. In contrast, plots treated with both phosphorus and zinc yielded as high as 15 tons per acre. Plots which received neither phosphorus nor zinc, or zinc alone, were obviously phosphorus deficient and had a total yield of roughly 8 tons per acre. In other words, on this field a poor yield would have been obtained without phosphorus fertilization, but had phosphorus been applied without zinc the yield would have been even smaller because of the "fern leaf" disorder.

The results of the experiment just cited should not be interpreted to mean that zinc deficiency of Russet Burbank potatoes will occur only where phosphorus fertilizer is applied. It is reasonable to assume that low levels of zinc in the plant brought about by other factors will also cause "fern leaf" symptoms to develop.

It should be emphasized, that as a general problem, "fern leaf" disorder is commonly associated with only a small portion of any one field, occurring primarily on deeply cut areas. However, since numerous tests have shown that foliage sprays applied after symptoms appear are completely ineffective for correcting the disorder, the only safe procedure to insure against the loss of at least a portion of a Russet Burbank potato crop is to apply zinc fertilizer prior to planting. The "fern leaf" problem is associated primarily with development of new lands, and additional zinc fertilization is not recommended on fields which have already been fertilized with zinc for other crops.

No data are presently available to show if sidedressed applications of zinc are as effective as zinc broadcast and plowed down.

Unlike corn and beans, which may recover considerably from early season symptoms of zinc deficiency, Russet Burbank potato plants which develop "fern leaf" decline rapidly and eventually die.

"Fern leaf" has not been observed on any other potato variety growing in central Washington.