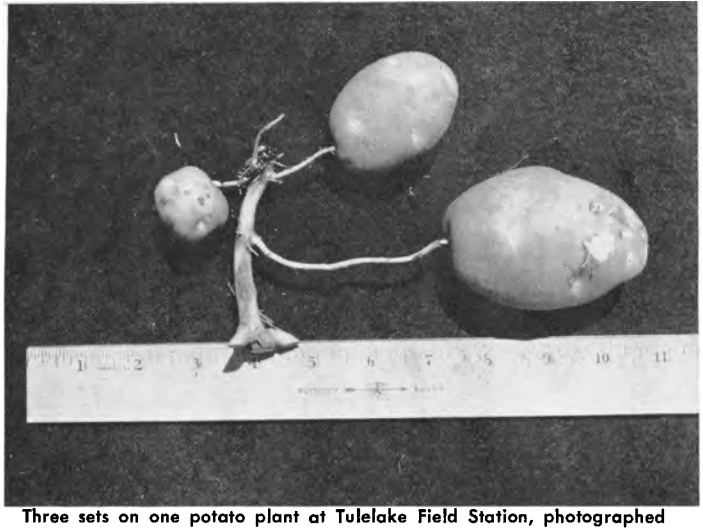
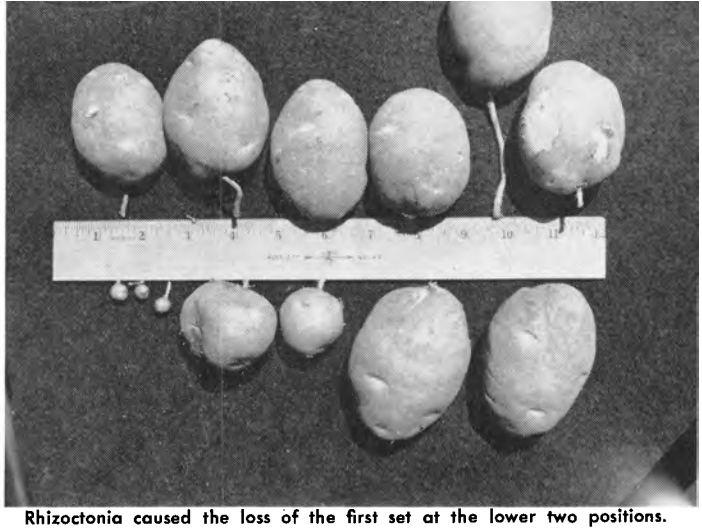


Three sets on one potato plant at Tulelake Field Station, photographed August 19, are shown in photo above. The largest tuber is the first set with the longest stolon, the mid-size tuber is the second set with mid-length stolon, and the smallest tuber is the third set with the shortest stolon.



Rhizoctonia caused the loss of the first set at the lower two positions. Photo above of entire crop from one plant shows short length of nodes in all but one case. Although these tubers are relatively smooth in photo (August 20), by the time they size-up, crowding deformities will show.

STRESS AND CROWDING As Causes of Potato Defects

B. J. HOYLE

RESEARCH AT TULELAKE Field Station has shown that although two potatoes may start out well shaped while small, as one gains in size, it may push the other causing changes in shape. Under certain conditions, hills have been observed where the developing tubers are pushing, pulling and squeezing each other so that few marketable tubers result. The production of high-quality potatoes depends on understanding the causes of these underground pressures and the means of correction.

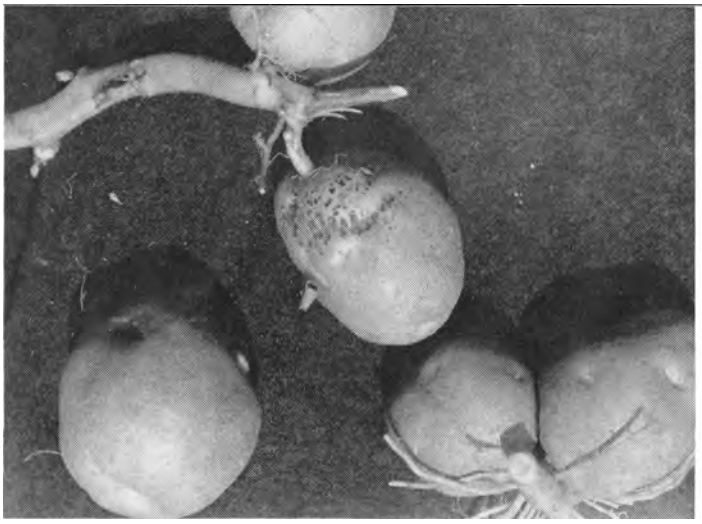
Growing space for potatoes can be provided only if the stolons attaching the tubers to the stem are long enough to allow development. The stolon is as important to the potato as the umbilical cord is to the unborn baby, because it channels all water, food and other elements necessary for growth. When this cord is twisted, diseased, under stress, or too small in diameter, food supplies are restricted and the tuber shape is affected.

Tuber production

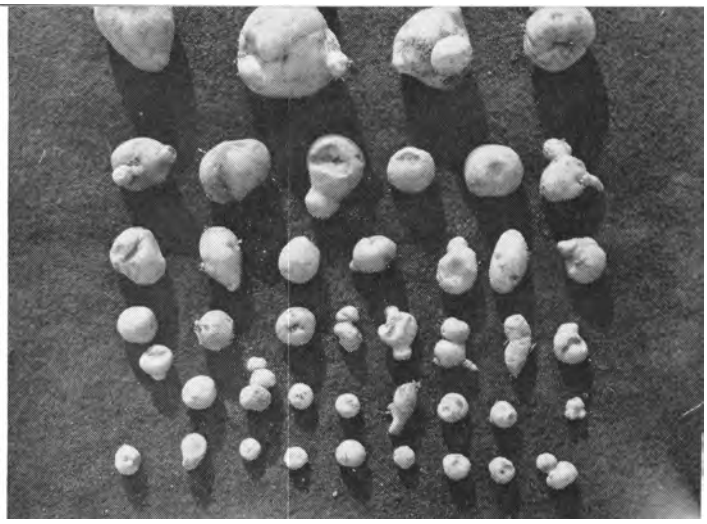
With normal development, a good potato plant should yield 8 to 12 tubers. Observations have shown that stolons 2 to 4 inches long and of large diameter are necessary to avoid deformities. As stolons get shorter, the stem ends of the potatoes come more readily in contact and deformities begin. These defects can be observed in their mildest form as shallow, concave pressure points about the size of a penny.

With very short stolons (⅛-inch or less) the stem end frequently presses severely against the main shoot, causing a "V"-shaped deformity in the potato. If there is another potato opposite the shoot, then the ends of both potatoes become flattened with a groove across them. In very loose soil, two potatoes bumping and pushing against each other will move enough in the soil to prevent serious deformities—but only if the stolons are

A well-distributed crop of potatoes is shown developing from plant shown in first photo to right. The soil has been removed by air blast and tubers left in natural position. Note that stolons are long enough to allow space for smooth development. Rhizoctonia often strikes late in the season, as shown in middle photo. These tubers reached about 3 oz in size by mid-August. At this time, rhizoctonia completely severed the stolons at the locations shown beneath the white pieces of paper. From August until harvest, tops remained green but tuber growth remained as seen. In third photo to right, a young plant shows well-developed stolons and a good first set of potato tubers. Few pressure defects will develop in such a hill.



Several types of tuber defects caused by pressures and stresses are shown in photo above. Black spots on the center tuber are caused by rhizoctonia.



Effect of hormones out of balance is indicated in photo above showing 45 tubers from one plant. A disease such as rhizoctonia often causes this.

Growing-space limitations and short stolon length are major causes of shape defects of potato tubers, according to this report of research from Tulelake Field Station. Diseases, particularly rhizoctonia, are the most common cause of the short stolon.

long enough to permit this movement. With short stolons, one end of the potato is anchored to the main stem and cannot move under any condition. Therefore, as growth continues, deformities of many kinds take place, including keel shapes, heart shapes and others. Where cloddy soil is a factor, sharp clods sometimes are trapped between two potatoes and cause irregular, rough surfaces. In all these cases, the shorter the stolon, the more likely it is that pressure-caused deformities will occur.

Diseases are the most common cause of the short stolon. Leaf-roll virus is one cause, but an infection of rhizoctonia is of much more importance. Rhizoctonia causes a loss of the first set of tubers, and as the second set develops, the stolons are shorter. Third and fourth sets are usually even more severely deformed, because of pressure defects.

Deformities

Many types of deformities including knobs, bottlenecks, cracks, and hollow hearts are caused by other factors. Current observations indicate that most shape defects and irregularities can be traced to underground pressures started by rhizoctonia which causes a second set of shorter stolons to develop. These shorter stolons compress the developing tubers into a smaller space where they push and pull each other out of shape in competing for space to grow.

Long stolons

Excessively long stolons sometimes occur and can also cause problems. This condition, caused by the natural hormones getting out of balance, results in the stolon "going wild" and growing as long as 2 ft. A "string of beads," usually develops with the one stolon supplying nutrients to seven or eight potatoes. These potatoes are usually not well shaped and are generally undesirable. Another abnormality caused by hormones getting out of balance results in a set of 30 or 40 tubers all developing at once. Very short to nondiscernible stolons develop and the resulting "marbles" are unuseable. Attempts to control the length of stolons with hormone applications have not been successful at the Station.

Burton J. Hoyle is Associate Specialist, University of California, Davis, and Superintendent, Tulelake Field Station.