THE EFFECT OF CERTAIN METHODS OF POTATO CULTIVATION ON GROWTH AND YIELD AND ACCOMPANYING SOIL CONDITIONS

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The general subject of cultivation has been given much attention by investigators as evidenced by the vast amount of literature on the subject. Most of the research has been carried on with crops other than potatoes and any differences in yield were assumed to be due mostly to moisture, but few actual measurements were made. The knowledge of the effect of cultivation on root growth is very limited, particularly with potatoes—a crop produced with all degrees of ridging, from none to extremely high ones. Certainly this should be expected to exert an influence on yield since differences in behavior of plants are manifested directly or indirectly through the roots.

Thompson (4) and many others have indicated the apparent fallacy of some of the supposed benefits of frequent tillage. Little evidence has been presented to support the moisture conservation theory. The studies do not seem to confirm the theories of the benefits derived from soil aeration and of increasing the availability of plant food content of the soil. Based upon this experimental evidence, it would seem that potato cultivation, particularly of the ridge type, when continued beyond the point of weed control on a field well prepared prior to planting, would be detrimental to the growth and yield of the crop.

The experiment upon which this paper is based was planned to test the comparative merits of a number of methods of planting and subsequent cultivation of potatoes. Root growth, soil temperature, moisture

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and nitrates (indicative of aeration) were measured in order to determine their relative influence on any yield differences which might occur. Smooth Rural potatoes were grown at Ithaca, New York, on silty clay loam for three years, 1932 to 1934 inclusive, and on gravelly loam with irrigation facilities in 1934 only.

The three principal cultural treatments studied were:

1. Deep planting (4 inches below initial soil surface) and level culture.
2. Shallow planting (1 to 2 inches below initial soil surface) and moderate ridge culture (4 inches above seed piece).
3. Shallow planting (1 to 2 inches below initial soil surface) and extreme ridge culture (7 to 8 inches above seed piece).

Treatment 2, shallow covering (1 to 2 inches), was compared with treatment 1, deep or full covering (4 inches) to determine the influence on the rate of emergence.

Horse cultivation was given every two weeks until tuber-setting, the implement used depending upon the type of culture. A shovel-plow was used for the extreme ridging, whereas a one-horse cultivator with wings sufficed for the moderate ridges. No cultivation was given in 1932 and at all times weeds were kept removed by shallow hand hoeing or scraping. In 1933 scraping with no cultivation to control weeds was compared with the horse cultivation.

Spraying in 1932 and 1934 and dusting in 1933 with Bordeaux, including calcium arsenate when necessary, every two weeks controlled all late blight and potato beetles.

Fertilization consisted of home-mixed 5-10-5 at the rate of 1000 pounds to the acre broadcast prior to planting. This followed a cover crop of rye plowed under when 8-10 inches tall.

**EFFECT OF DEPTH OF PLANTING ON RATE OF EMERGENCE**

When conditions of temperature, rainfall, and soil moisture are favorable, the differences in effect of depth of planting and covering are at a minimum. These conditions were more nearly ideal in 1932 and 1933 than in 1934 when only 0.53 inches of rain fell in the month of May when the potatoes were planted. This is very deficient when compared with the normal of 3.4 inches for the month. Figure 1 shows the rate of emergence for 1934. Deep planting, with shallow covering, was most favorable for rapid germination in this as well as the two previous years, with shallow planting and deep covering at the other extreme. This latter type is the treatment usually followed by growers who practice ridge culture.