THE EFFECT OF SOIL MOISTURE, PLANT FOOD, AND AGE ON THE RATIO OF TOPS TO ROOTS IN PLANTS.

FRANK S. HARRIS,

DEPARTMENT OF AGRONOMY, UTAH AGRICULTURAL COLLEGE, LOGAN, UTAH.

The root growth of plants without doubt has a very important bearing on agriculture and yet but little work has been done on the subject in comparison with the great investigations that have been conducted regarding the parts of plants growing above ground. This is probably due to the many difficulties encountered in the study of roots.

I. LITERATURE.

A number of the earlier workers on physiology and agriculture made studies of root growth as affected by various factors.

Sachs\(^1\) showed that the more concentrated the nutrient solution the shorter the roots, and Liebig said: "Plants search for food as if they had eyes."

Nobbe,\(^2\) raising clover and maize in a soil which consisted throughout of the same basal material but with alternate layers saturated with nutrient solution, showed that the roots branch much more freely in soils which contain abundant food materials than in those which are poor in them.

Volkens\(^3\) in 1887 described the great root growth of plants in arid regions. In the Egyptian desert he observed roots that were twenty times as long as the part above ground.

Fruwirth\(^4\) and Kraus\(^5\) have given some valuable data regarding the growth of roots, especially at different periods in the life of the plants. The legumes were given particular attention.

Müller-Turgau\(^6\) has done considerable work on the effect of nitrogen and of mixed salts on the growth of roots. The presence of nitrogen in a nutrient solution caused a much more vigorous growth.

\(^{1}\) Sachs, J. von, Handbuch der Experimental Physiologie der Pflanzen, p. 177, 1865.
\(^{3}\) Volkens, Die Flora der Ägyptisch-Arabischen Wüste, Berlin, 1887.