periodicity and rhythm in activity in various species of fishes. This work will be reported fully at a later time.

It is with the hope that the apparatus may be found useful to students of animal behavior that it has been described.

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SPECIAL ARTICLES

POTASSIUM IN RELATION TO THE SHAPE OF THE SWEET POTATO[1]

FERTILIZER experiments in the field by Schermerhorn[2] have shown that good yields of Yellow Jersey sweet potatoes of desirable chunky shape can not be consistently secured unless a fertilizer is used containing considerable potassium in relation to nitrogen.

During the past three years sweet potatoes of the same variety were grown under controlled nutrient conditions in sand culture in the greenhouse. The triangle system was employed and the growth responses and chemical composition of the plants were recorded. Many of these solutions produced excellent growth of tops and roots. The entire vine growth of one of the largest plants was nearly 150 meters in total length, and the yield of potatoes of another was over one kilogram.

It was found as a result of this work that those plants supplied with ample nitrate nitrogen in the nutrient solution produced potatoes which were comparatively high in organic nitrogen and relatively low in carbohydrates. These potatoes were distinctly chunky, whereas other plants supplied with a smaller proportion of nitrates produced potatoes with a low percentage of organic nitrogen and higher percentage of carbohydrates. These potatoes were distinctly long.

An experiment was devised to determine the effect of limiting the supply of potassium on growth of the sweet potato. One of the nutrient solutions of the triangle was selected which had been found to support good top growth but did not produce the maximum yield of potatoes. This solution contained abundant nitrate nitrogen. Plants were grown a month or longer with this nutrient solution after which some of them received the same solution lacking potassium but otherwise complete. Sodium was substituted for potassium.

Leaves, petioles and stems of plants which received no further supply of potassium after the first month grew more slowly than others receiving potassium continuously. The low potassium plants were apparently healthy in every respect, although the foliage was not quite so dark green as that of the high potassium plants and exhibited a condition like that of others grown with a slightly limited nitrogen supply. The sweet potato plants which received no external supply of potassium after the first month formed potatoes relatively early as the result of carbohydrate accumulation in the roots, whereas the plants grown continuously with abundant potassium in the nutrient solution formed potatoes later and there were fewer of them.

It appears probable that potassium may be necessary at some stage for the change of nitrates and carbohydrates to proteins which can be used for the production of embryonic tissue. If this process is checked by limiting the potassium supply available to the plant, carbohydrates must necessarily accumulate provided photosynthesis is not greatly checked. As already noted, the low potassium plants of this experiment were not chlorotic.

In addition, study of the structure of chunky sweet potatoes[3] shows that these low carbohydrate and high protein roots have a larger and more active cambium than long thin potatoes, which are relatively low in protein and high in carbohydrates. The cambium of the sweet potato gives rise to cells which are later used for starch storage. If the major amount of cell division is principally at or near the tip of the root, as when potassium is low, there will result a greater increase in length than in diameter, and the potatoes will, therefore, be long and thin. But, if the increase in diameter takes place nearly as rapidly as increase in length the potato will be chunky. Cell division can take place only if there is an ample supply of organic nitrogen. If potassium is necessary for the formation of organic nitrogen and the potassium supply is limited, cell division in the direction of the diameter of the potato will be retarded and the potatoes will be long even though there may be an abundance of nitrate nitrogen and carbohydrates in the plant tissue and nitrates in the nutrient solution.

An adequate supply of potassium, therefore, appears to be essential for the production of chunky potatoes in order that there may be formed proteins of quality and quantity necessary for the rapid development of cambium, the tissue of the sweet potato root chiefly responsible for increasing the number of cells and therefore the thickness or chunkiness.

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[1] Paper of the Journal Series, New Jersey Agricultural Experiment Station, Division of Horticulture.

[2] "Sweet Potato Studies in New Jersey," Bulletin 398, N. J. Agri. Exp. Sta.

[3] "How Potassium Affects Sweet Potatoes," N. J. Agriculture, Vol. 11, No. 6, June, 1929.