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The Libriform Fibers in the Roots and Crown of *Medicago* and *Melilotus*

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no increase in acidity, and the alkaline population reaches a maximum and begins to decline, then a sudden increase in acidity occurs accompanied by the appearance of the rapid variant in large numbers. When such a culture is aerated, the total utilization of sucrose increases from thirty-five to sixty per cent during similar periods. The decrease in sugar content of the medium takes place largely during one twenty-four hour period following an initial period of twenty-four to forty-eight hours when there is little utilization.

When the fermentation is brought about by the rapid variant (inoculation from acid colonies), under aerobic conditions, there is again little utilization of sucrose, generally less than ten per cent. The increase in bacterial count and acidity as well as utilization of sugar is largely confined to the first day. When the same type of fermentation is aerated, the changes in sugar content, acidity and bacterial count occur largely during the first day as in the aerobic fermentation. The total sugar utilization is much greater, rising as high as sixty per cent in eight days.

In order to study the course of the fermentation of sucrose in more detail, and aerated fermentation was started in a six-liter flask. Samples were withdrawn daily for the differential count, determination of sugar and products, namely, succinic, formic, lactic and acetic acids, alcohol and carbon dioxide.

In this experiment the alkali count reached a maximum during the second twenty-four hour period and the acid count during the succeeding day. When the products as determined were plotted against the sugar utilized it was found that the transformation from the alkaline to the acid types was accompanied by a pronounced change in the rate of production of the chief products. This fact indicates that there is a difference in the physiology of the two forms of *Shigella paradysenteriae*.

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THE LIBRIFORM FIBERS IN THE ROOTS AND CROWNS OF MEDICAGO AND MELILOTUS

J. N. MARTIN AND AUSTIN O. SIMONDS

The libriform fibers, long known to be especially prominent in many of the Leguminosae, particularly the papilionaceae, constitute

a large part of the xylem and are present in the phloem of the roots and crowns of the alfalfas and sweet clovers. They deserve mentioning in these legumes because the modifications they undergo at different periods in the plant's growth cycle indicate that they function as storage structures, and have an importance relative to the nutrition of the plant.

The libriform fibers, as they occur in the roots and crowns of the alfalfas and sweet clovers, are long and slender, ranging from one half to two millimeters in length and from five to ten microns in width. They have three walls, primary, secondary, and tertiary. The primary and secondary walls are relatively thin, whereas the tertiary wall, which is the one involved in storage, attains a remarkable thickness when fully developed. The walls are crossed by simple pits.

In the alfalfas the tertiary layers are removed from the fibers in the locality of the cambium during the early spring growth and are restored as soon as an excess of food is provided. In the biennial sweet clovers the tertiary layer is removed from most of the fibers during the second season, chiefly during the formation of flowers and seeds, and there follows the thickening and lignification of the remaining portion of the libriform fibers which consequently become responsible for the woody texture of the main root at the end of the second season.

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CONTRACTION OF THE ROOTS AND CROWNS MEDICAGO AND MELILOTUS

AUSTIN O. SIMONDS AND J. N. MARTIN

The longitudinal contraction, a natural phenomenon of many plants, which results in lowering the basal portion of the plant deeper in the soil, is apparently accomplished in various ways.

In both alfalfa and sweet clover the crowns are pulled vertically downward two to four inches during the first season. This is accomplished chiefly by the contraction vertically and the expansion radially and tangentially of parenchymatous cells that are continuously being formed in isolated groups scattered among the vascular elements. The development and expansion of these intercalated masses of parenchyma separate the vascular elements into tortuous strands, the tortuosity of which results in the shortening