factured and quantity production in the near future is assured.

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CORNING GLASS WORKS

NITRATE UTILIZATION BY ASPARAGUS IN THE ABSENCE OF LIGHT[1]

DURING the winter and spring of 1926 asparagus plants were grown in the greenhouse in quartz sand culture and in solution culture. Part of the plants were subjected to continuous darkness and others to the seasonal light conditions as they occurred in the greenhouse. The plants in the light and some of them in the dark were given a complete nutrient solution containing nitrates, while others grown in the dark were given a nutrient solution containing no nitrogen.

It has been found by several careful trials that an aliquot portion of an asparagus root crown of about 10 per cent. may be removed for analysis, while the remaining 90 per cent. may be used for experimental purposes. Quantitative analyses have also shown that the 90 per cent. and the 10 per cent. fractions are practically identical with respect to their percentage composition. Accordingly, the composition of asparagus crowns at the beginning of an experiment may be computed.

On an absolute amount basis, quantitative data have been secured which would indicate that asparagus may not only take in nitrates in the dark, but so long as there is a carbohydrate supply present plants seem able to build up nitrates to higher forms of nitrogen. This assimilation of nitrates seemed to occur as rapidly in the dark as in the light. Microchemical tests of plus nitrate series have consistently shown an abundance of nitrates in the fibrous absorbing roots, with none at all, or extremely small amounts of nitrates, in the storage roots. The rapidly growing spears in the dark contained no nitrates, except occasional traces in the lower parts of the spears. There were no nitrates in the spears which were grown in the light, except when the rate of vegetative extension was decreased by approaching maturity or as in the field by cold weather, at which times there was a large accumulation of nitrates in the tips and butts. At no time were nitrates found in any part of the minus nitrogen series.

As would be expected, the growth of the minus nitrogen series was associated with a decrease of protein and an increase of the nitrate free soluble nitrogen fraction, while in the plus nitrate series the growth was associated not only with a decrease of protein but as well with synthesis of nitrates to higher forms of nitrogen.

[1] Paper No. 296 of the Journal Series, New Jersey Agricultural Experiment Stations, Department of Horticulture.

In the dissection of the nitrate free soluble nitrogen fraction there was determined proteose, polypeptide, amide, amino and humin nitrogen fractions. The carbohydrate fractions determined include total sugars, reducing sugars, sucrose, polysaccharides,[2] hemicellulose and fat. These data and further details concerning them will be given at another time.

Analysis of the roots of the several series show, as would be expected, that there was a considerable loss of carbohydrates associated with growth of spears. It would seem particularly significant that there was a much larger loss of carbohydrates in the plus nitrogen dark series than in the minus nitrogen dark series. Presumably, the larger loss of carbohydrates in the plus nitrogen dark series was due to the fact that the carbohydrates were used in assimilation of nitrates.

The experimental conditions obtaining would seem to minimize the possibility of bacterial action affecting the results secured and the work of Liman[3] and others would also tend to make such seem unlikely. In addition, the following observations would seem significant. Root crowns in plus nitrate solution culture grown in the dark and with tops removed daily had an abundance of nitrates in the fibrous absorbing roots and none in the storage roots. These crowns, after thorough washing, were placed in distilled water, and frequent observations of all parts of many crowns showed that nitrates disappeared in about two hours at 20° C. Like roots at a temperature of 10° C. still contained traces of nitrates in the fibrous roots after a period of about twelve hours. That there was no loss of nitrogen from the roots was indicated by macrochemical analysis of the residual distilled water for total nitrogen, ammonia and nitrate nitrogen.

Further data are being secured from field and controlled experiments. A study is also to be made of extracts of plant tissue and their effect upon nitrate solutions under varying conditions, in order to determine if the apparent utilization of nitrates by asparagus is in part enzymatic in nature.

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[2] Tanret, Georges, Compt. rend. 149: pp. 48–51 (1909). The asparagus plant contains no starch but contains an inulin-like polysaccharide, "asparagose," which upon hydrolysis yields 93 per cent. levulose and 7 per cent. glucose.

[3] Lipman, C. B., and Taylor, J. K. "Do Green Plants have the Power of fixing Elementary Nitrogen from the Atmosphere?" *Jour.* Franklin Institute, Vol. 198, No. 4, pp. 475–507 (1924).