

### Effect of Carbon/Nitrogen Ratio upon the Formation of Nitrate and Ammonia from Amino-acids in Soil

In the course of an investigation into the decomposition of nitrogenous materials in the soil, we have in one experiment found a highly significant correlation between carbon/nitrogen ratio and the formation of both ammonia and nitrate from a series of amino-acids added to the soil.

The importance of the carbon/nitrogen ratio in relation to biological processes in the soil has long been recognized<sup>1,2</sup>. Working with amino-acids, Batham<sup>3</sup> reported that nitrification appeared to be independent of carbon/nitrogen ratio, but later<sup>4</sup> observed a fairly close relationship for nitrogenous compounds more complex than the monoamino-monocarboxylic acids. More recently, Quastel<sup>5</sup> reported that for glycine, alanine and sodium glutamate, recovery of added nitrogen as nitrate was inversely related to carbon/nitrogen ratio.

In the present experiment the following sixteen amino-acids were used: L-arginine hydrochloride, L-histidine hydrochloride, L-glutamic acid, L-tyrosine, L-lysine hydrochloride, L-proline, DL-alanine, DL-tryptophane, DL-serine, DL-valine, DL-leucine, DL-nor-leucine, DL-threonine, DL-aspartic acid,  $\alpha$ -amino-isobutyric acid and glycine. Each amino-acid was mixed with market-garden soil in quantities calculated to supply 300 p.p.m. nitrogen, except for histidine, lysine and arginine, which were at concentrations of 275, 273 and 248 p.p.m. respectively. The soil was kept in an incubator at 23.5° C. and each batch sampled at least nine times over a period of twenty-five days, analyses being made for ammonia and nitrate. From the results, the maximum values for percentage conversion to ammonia and nitrate were obtained for each amino-acid and plotted against the carbon/nitrogen ratio, as in the accompanying graph.

Taking the carbon/nitrogen ratio as the independent variate ( $y$ ), the equation to the regression of ammonia ( $x$ ) on the carbon/nitrogen ratio is  $X = 86.0 - 9.36y$  and the correlation coefficient  $r$  is  $-0.91$ . Nitrate values ( $x_2$ ) for only fourteen amino-acids were available, as the quantities of threonine and proline proved

insufficient to allow completion of the experiment. The regression equation is  $X_2 = 91.9 - 4.45y$  and again  $r$  is  $-0.91$ , showing a highly significant correlation.

It is evident from these results that the effect of carbon/nitrogen ratio is more marked on accumulation of ammonia than of nitrate. If the occurrence of ammonia and afterwards of nitrate in the soil during decomposition of organic nitrogenous compounds be taken to signify that nitrogen is present in the added material in excess of the growth requirements of the organisms concerned, then the influence of the carbon/nitrogen ratio would, in fact, be expected to be more marked in the early stages of the transformation, when the supply of utilizable carbon compounds is greater, rather than at the end when nitrate values approach their maxima. Further experiments with amino-acids are in hand.

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<sup>1</sup> Waksman, S. A., *J. Agric. Sci.*, **14**, 555 (1924).

<sup>2</sup> Rubins, E. J., and Bear, F. E., *Soil Sci.*, **54**, 411 (1942).

<sup>3</sup> Batham, H. N., *Soil Sci.*, **20**, 337 (1925).

<sup>4</sup> Batham, H. N., *Soil Sci.*, **24**, 137 (1927).

<sup>5</sup> Quastel, J. H., and Scholefield, P. G., *Nature*, **164**, 1068 (1949).

### Photoperiodic Induction in Jute and a Great Acceleration of Vegetative Growth in *C. capsularis*

BOTH the species of jute, *Corchorus capsularis* L. (*D* 154) and *C. olitorius* L. (*C.G.*), have been found to behave as short-day plants<sup>1,2</sup>. In a further investigation on the photoperiodic effect in jute, the effect of a number of light periods continuous until flowering and for shorter periods has been studied. The mean flowering time of twelve plants per treatment grown in pots and the mean heights at flowering were noted. There were two sowings—on April 17, 1948, and on June 2, 1948. Plants of April sowing were subjected to 14 days, 21 days and continuous 8 hours, and to 14 days, 21 days and continuous 10 hours treatments, and those of June sowing to 7 days, 14 days and continuous 10 hours and to 7 days, 14 days, 30 days, 60 days and continuous 14 hours treatments.

In *C. olitorius* the shortest flowering time is seen in 10 hours continuous treatments of April sowing, flowering in 21 days and showing an earliness of 105 days from control which flowered in 126 days, and there was no significant difference between the continuous 14 days and 21 days treatments for 8 hours periods, the mean flowering time being about 25 days. The heights at flowering in all the short-day treatments were also very low, varying between 6 cm. and 11 cm., except in 10 hours 14 days treatment the height of which at flowering was 28 cm. with a flowering time of 32 days. In the long light period treatments of June sowing, the greatest lateness of flowering of 98 days flowering in 185 days against 87 days of control and a greater height of 76 cm. (275 cm. against 199 cm. of control) are seen in 14 hours continuous treatment, but in 7 days, 14 days and 30 days treatments flowering takes place practically at the same time as control; but 60 days treatment causes a significant lateness, flowering in 91 days.

In *C. capsularis* the shortest flowering time of 33 days is found in 10 hours continuous treatment,

