This work was supported by a grant from the British Empire Cancer Campaign for Research.

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BIOLOGY

Diagrams of Changes in the Distribution of Plant Dry Weight or Other Variables

IN investigations of plant development it is helpful to be able to represent diagrammatically the changes which occur in the distribution of dry weight, total nitrogen or some other variable as the plant grows. It is usually desirable to distinguish at least four components of the plants of different physiological function, namely, leaf laminae, stems plus petioles, flowers plus fruits and roots, though data for the last-mentioned are often lacking. The values of the variable for each of these components should be plotted against a suitable independent variate which may be, for example, age, node number, leaf area or total dry weight. If the variable for the four components is plotted as four ordinary two-dimensional graphs, whether independently from the same base line or superimposed to build up the total, it is not easy to see whether the ratios of the values for the different components are constant or changing with growth of the plant. This can be seen by plotting logarithms of the values of the variable, but then their absolute magnitudes are obscured.

These difficulties have been partly circumvented by developing a substitute for a five-dimensional diagram. An example is shown in Fig. 1, which represents the distribution of dry weight in the barley plant during the second half of the growth cycle when ear development takes place (data for season 1938 from ref. 1). To plot such a diagram triangular graph paper ('isometric grid') is used and one of the three axes is selected for the independent variate (marked 'days from sowing' in Fig. 1). At any point on this axis a vertical line downwards gives the value of the variable for roots (R), a vertical line upwards for flowers plus fruits (F), a line to the right for leaves (L) and one to the left for stems plus petioles and peduncles (S). In the example chosen for Fig. 1 there are, of course, no petioles and the leaf sheaths have been included with 'stems'.

The ends of the lines for roots, leaves, flowers and stems may be joined to give four triangles. If the partition of dry weight has not changed with growth of the plant, the corresponding triangles will be similar and the corresponding lines all parallel. Changes in ratio of dry weights for $L:R$, $S:R$, $L:F$ and $S:F$ can be readily seen from the changes in shape of the appropriate triangles. It is a weakness of the diagram that this type of comparison is only available for four of the six possible ratios, which depend on the directions chosen for plotting the variable for the four components, and in Fig. 1 the changes in ratio of dry weight for $L:S$ and $F:R$ are not so easily seen. To assist in these last comparisons the L dry weight may be marked off on the S line and the F dry weight on the R line by short strokes (Fig. 1).

As an alternative to drawing the triangles the parallelograms may be completed, as has been done for one occasion (81 days) in Fig. 1. The changes in their shapes then indicate the changes in ratios. This method has the

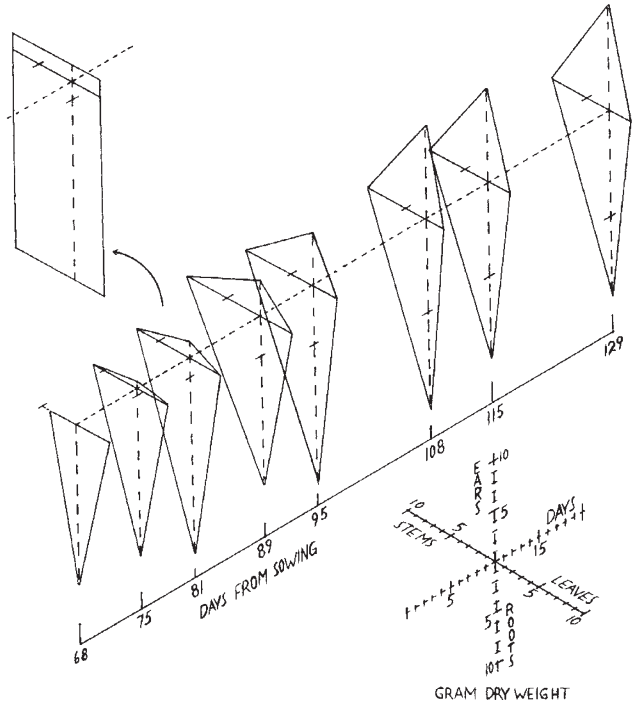

Fig. 1

advantage that it also indicates changes in $R:(L+S)$, $F:(L+S)$, $L:(F+R)$, $S:(F+R)$ and $(F+R):(L+S)$.

If desired the successive values of each component may be joined to emphasize the relations with the independent variate, and an example of this may be seen in ref. 2.

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Ion Uptake and Protein Synthesis in Enzymatically Isolated Plant Cells

THE D-threo isomer of chloramphenicol is an antibiotic and a specific inhibitor of protein synthesis in bacteria[1]. It also inhibits protein synthesis (net synthesis or turnover) in higher plants[2–6], including cell-free systems[7,8]. Suppression of the induced increase in oxygen uptake in potato disks by D-chloramphenicol[9] has been considered as indirect evidence of an inhibition of protein (possibly cytochrome oxidase) synthesis. Enzyme development during germination was also inhibited by D-chloramphenicol[10,11]. Recently, this chemical has also been used in several systems to relate ion uptake to protein synthesis in higher plants[2,3,6,12–16]. Others oppose this interpretation[17–20]. Meanwhile, the extrapolation of information on chloramphenicol from bacteria to higher plant systems has been criticized[4,18]. Ellis[18], for example, observed that D-chloramphenicol did not affect incorporation of amino-acids into protein (trichloroacetic acid (TCA)-insoluble fraction) and yet it reduced ion uptake in higher plants. In contrast, the L-threo-isomer of chloramphenicol, which is neither an antibiotic nor an inhibitor of protein synthesis in bacterial systems, does inhibit ion uptake[18] and root growth[21] in higher plants. Thus, further elucidation was necessary as to the action of chloramphenicol as an inhibitor of ion uptake via an effect on protein synthesis.

The comparative effects of the D- and L-threo isomers of chloramphenicol on rubidium uptake and protein synthesis were determined on a mixture of palisade and