

AN INVERSE RELATION BETWEEN THE MULTIPLICATION RATE AND THE STARCH CONTENT OF THE FRONDS OF *SPIRODELA POLYRHIZA* (L.) SCHLEIDEN CULTIVATED IN THE PRESENCE OR ABSENCE OF BRANCHED-CHAIN AMINO ACIDS

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L-leucine, L-valine and L-isoleucine have been shown to inhibit frond multiplication of *Spirodela polyrhiza* (L.) Schleiden, if present in axenic cultures of this duckweed in concentrations of approximately 10^{-5} - 10^{-4} M (BORSTLAP 1970). Growth experiments with this species, cultivated in a medium according to LACOR (1968) plus 1% sucrose, using various concentrations of the inhibitory amino acids, showed that the inhibition of frond multiplication was accompanied by an increase of the dry weights of the fronds (multiplication rate

defined as $\log \frac{N_{t_2}}{N_{t_1}} / t_2 - t_1$; N_{t_1} and N_{t_2} are number of fronds at time t_1 and t_2 respectively).

By plotting the frond multiplication rates against the frond dry weights, an inverse relation was found between these two parameters (*fig. 1*). The increase in dry weight of the inhibited plants appeared to be time dependent and largely due to an increase in the carbohydrate content (up till 80% of the dry weight).

Similar results have been obtained in our laboratory with L-leucine and L-isoleucine not only for *Spirodela polyrhiza* but also for the floating fern *Salvinia natans* (L.) All.

The increase in carbohydrate content of the duckweed fronds (determined according to HEWITT 1958) was mainly caused by accumulation of starch (*fig. 2*).

The protein content of the fronds (determined according to LOWRY et al. 1951) did not show a significant change during at least a two weeks period in the presence of L-valine (10^{-4} M). The inhibitory action of the branched-chain amino acids apparently stops net-protein synthesis, and with it frond multiplication, while carbohydrate metabolism (photosynthesis and polysaccharide synthesis from externally supplied sucrose) is hardly or not affected.

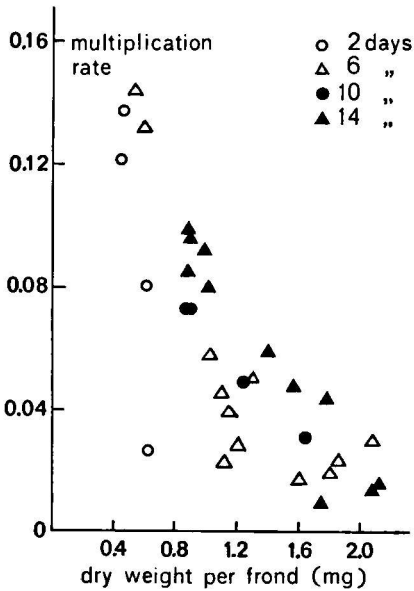


Fig. 1. Multiplication rates against frond dry weights (mg dry weight per frond) of *Spirodela polyrhiza*. Experiments were performed in the absence or presence of L-valine (10^{-5} – 10^{-4} M) over periods of 2 to 14 days.

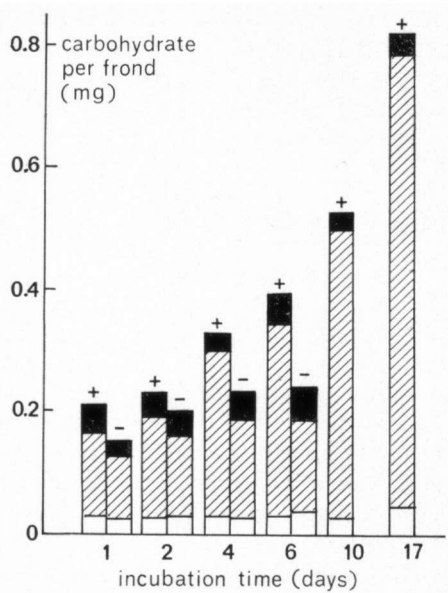


Fig. 2. The carbohydrate content of *Spirodela polyrhiza* during a 17 days period of inhibition of frond multiplication by L-valine 10^{-4} M (+); comparable data from normally multiplying cultures are drawn at 1 to 6 days (-). The dry matter was subjected to three successive extractions, viz. with (1) 80% ethanol (white column), (2) 30% perchloric acid (starch, hatched column) and (3) 72% sulphuric acid (cellulose, black column).

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