SOURCE-SINK RELATIONSHIPS IN THE CUCUMBER PLANT (*Cucumis sativus* L.)

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ABSTRACT

In an attempt to increase the sink strength of the fruit, two auxin transport inhibitors were sprayed on to the whole plant or applied to the fruit, four days after first anthesis. Application to the plant increased fruit set, reduced the dry weight of all the component organs, but had little effect on the partitioning of the dry weight. With application to the fruit chlorflurenol had little effect, but TIBA at 200 ppm reduced fruit set on the lower nodes where it was applied. This reduction in fruit set reduced fruit dry weight and partitioning to the fruit.

As neither of these growth substances increased sink strength it was decided to investigate source sink relationships by altering the source strength. With increasing degree of leaf removal total plant dry weight was reduced but the partitioning was little affected. However with the severest leaf removal treatment a greater proportion was partitioned into the stem and less into the fruit, but the proportion partitioned into the leaves was not altered.

Deleafing as a method of reducing source strength has been criticised due to its effect on the distribution of hormones. For this reason the effect of shading was investigated. The partitioning of the absolute growth on plants that had developed medium

sized fruit was not affected by up to 58% shading. However with an increase in shading from 58% to 70% the partitioning to the fruit was reduced. Below a critical level of assimilate supply the competitive ability of the vegetative organs seemed to be higher than the fruit.

As deleafing and shading reduced source strength the effect of increasing source strength by carbon dioxide enrichment was investigated. Enrichment was applied from first anthesis and increased the growth rate of the plant in the following five weeks. The partitioning was not different to the control plants in the first week following anthesis. However in week two the partitioning to the fruit was less with enrichment. There appeared to be an accumulation of assimilates in the leaves due to the mobilising ability of the growing regions being insufficient for the higher rate of assimilation. In week three and four the mobilising ability of the growing regions increased and there appeared to be a redistribution of stored assimilates as there was a loss of leaf and petiole dry weight. The accumulation of assimilates inhibited the NAR but following the redistribution of stored assimilates the NAR recovered. In the fifth week the partitioning was very similar with or without enrichment, and these partitioning figures were very similar to that obtained with the various shading treatments in the previous

experiment. It appears that once the plant develops several medium sized fruit it partitions about 70% of the absolute growth into the fruit, 23% into the leaves, 6% into the stem, and 1% into the roots, over a wide range of assimilation rates.

With higher rates of assimilation fruit set and fruit size increased. This cultivar has many potential fruit sites as it produces few male flowers and often several flowers per node. With greater rates of assimilation fruit set will increase and should be capable of utilising the greater supply. Therefore the plant appears to be source limited.

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