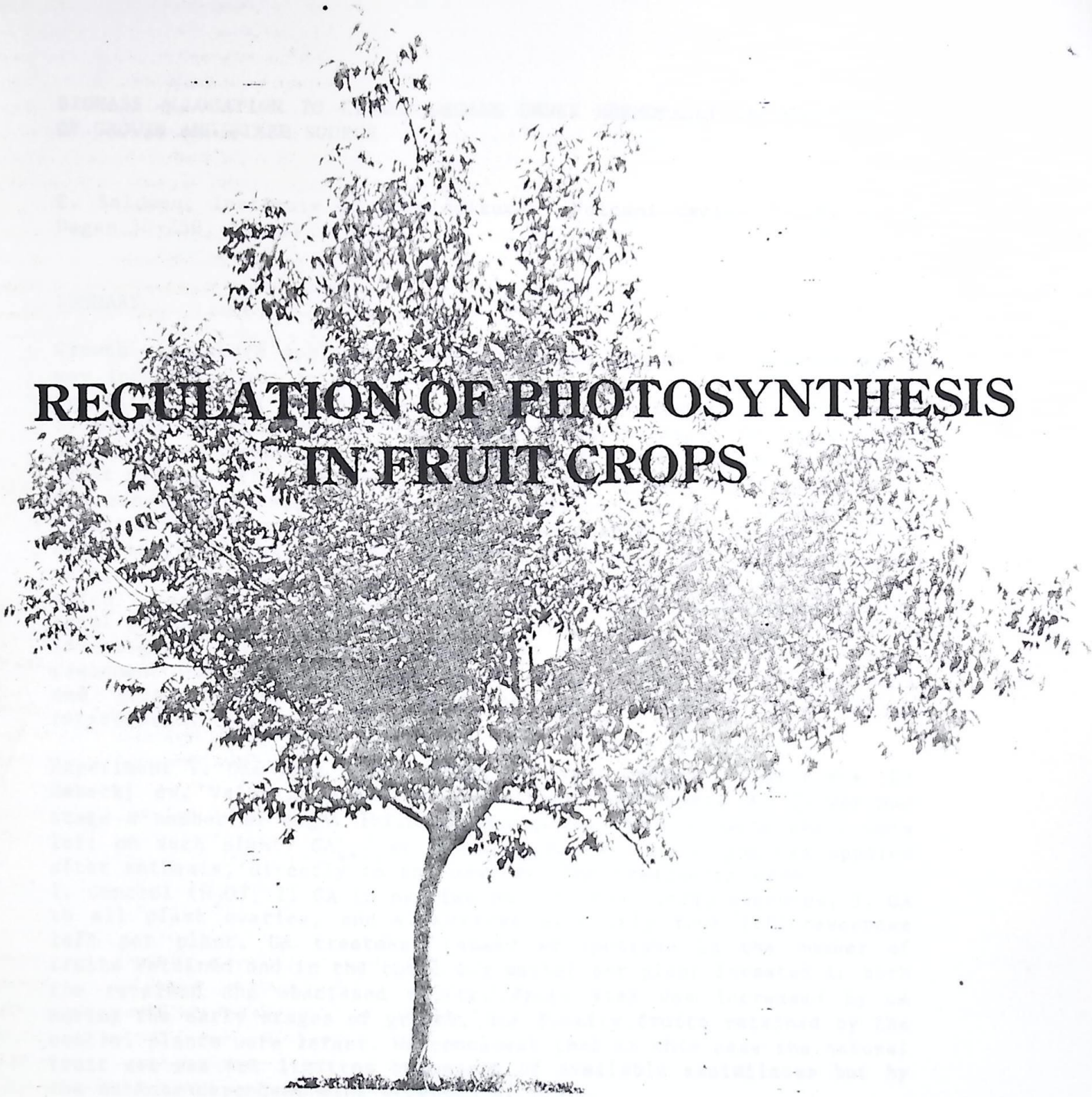

REGULATION OF PHOTOSYNTHESIS IN FRUIT CROPS

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BIOMASS ALLOCATION TO CITRUS ORGANS UNDER HORMONALLY INDUCED CHANGES OF GROWTH AND FIXED SOURCE

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SUMMARY

Growth regulators applied to specific plant organs or to whole plant may induce changes in growth balance according to their promotive or inhibitory effect on different tissues. These changes are paralleled by shifts in allocation of resources of assimilates. In fruit trees our interest concentrates on promotion of allocation of biomass to fruit without affecting, or even increasing, total biomass production. The conventional approach considers fruit setting as a process being limitted by the amount of assimilates available. The question is how much more biomass can be mobilized following hormonally improved setting of fruit. On a broader view, the question is on the extent to which hormonally induced shifts in growth affect reallocation and/or total production of assimilates. In the following three experiments we investigated: 1. Biomass allocation to fruits, following ovary treatment with GA, 2. Biomass partitioning between all plant organs and between root parts, following root treatment with growth retardants or GA.

Experiment 1. One-year old cuttings of sweet orange [C. sinensis (L) Osbeck] cv. Valencia grown in containers were used. At flower-bud stage a number of eight inflorescences, with four flowers each, were left on each plant. GA_{4+7} at a concentration of 200 ppm was applied after anthesis, directly to the ovaries. The treatments were: 1. Control (H_2O), 2. GA to ovaries on only four inflorescences, 3. GA to all plant ovaries, and 4. Control with only four inflorescences left per plant. GA treatment caused an increase in the number of fruits retained and in the total dry matter per plant invested in both the retained and abscissed fruits. Fruit size was increased by GA during the early stages of growth, but finally fruits retained by the control plants were larger. We concluded that in this case the natural fruit set was not limitted by amount of available assimilates but by the hormone-dependent sink strength of fruit.

Experiment 2. Cuttings of lemon [C. lemon (L) Osbeck] cv. Villafranca were grown in containers under either full sun light or 50% of this light intensity (by net shading). The growth retardant CCC was supplied at 1500 or 3000 ppm (a.i.) at weekly intervals. At the end of experiment dry weight accumulated in the vegetative parts and fruits was determined. Under full light intensity, in control plants the proportion of dry mass in fruits was 26% from total plant weight. CCC raised this proportion to 42% without affecting total plant weight. At

3000 ppm CCC plant dry weight decreased while proportion of dry mass in fruit raised to 47%. Plant dry weight was decreased by 15 - 18% by shading. Under shade the proportion of dry weight in fruits was about 14% of total plant mass, and CCC at 1500 ppm raised this proportion to 24% and only slightly decreased total plant mass.

Experiment 3. Rooted leaves of C. macrophylla Wester were grown in nutrient solution to which the following growth regulators were added: 1. None (C), 2. Paclobutrazol (Paclo) at 2 ppm (P-2), 3. Paclo at 10 ppm (P-10), 4. GA_3 at 10 ppm (G-10) and 5. P-10 + G-10. Root growth patterns and partitioning of dry matter between tap root and lateral roots were affected by the treatments, but total dry weight of whole plant was not significantly altered. Total dry matter of roots was positively correlated with dry weight (area) of leaf lamina.

The general conclusion is that hormonally induced shifts in growth of citrus plants cause mainly reallocation of existing resources.