

DEVELOPMENT OF NEW ALTERNATIVE METHODS FOR PLANT GROWTH REGULATION IN EUROPE

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ABSTRACT

In Europe the largest amount of pesticides used in horticulture is for chemical growth regulation in ornamental plant production. The intensive use of chemical growth retardants is of environmental concern. Restrictions on the use of chemical growth retardants have been introduced in the recent years, and reflect a need for developing efficient non-chemical methods for plant growth regulation. Experiments have shown that by using a low phosphorus (P) buffer technique as a single factor or combined with drought stress or reduced nitrogen (N) availability, chemical growth regulation can be significantly reduced. Using the low P buffer technique (Compalox®-P) as a method to reduce chemical growth regulation has been tested in genetically and ecologically widely differing plant species. In some plant species chemical growth regulation can be completely avoided by using the low P buffer technique, whereas in other species combinations with other alternative methods or reduced amounts of chemical growth regulators are needed to obtain sufficient growth regulation. Results from 94 tests using the Compalox®-P buffer technique are available in a low P database (<http://www.agrsci.org/ahp/cwh>).

In a study with *Hibiscus rosa-sinensis* drought stress was applied as cyclic drought, alternating between container capacity and drought to visible wilt (-650 to -800 hPa as measured with tensiometers placed in the growth substrate). Also in this study we used the Compalox®-P buffer technique to maintain a predetermined and stable P concentration in the growth substrate (Hansen & Nielsen, 2001). Reduced N was either provided as a constant low N fertigation or as a dynamic supply where N availability varied throughout production according to the plant demand. Drought stress as a single factor reduced plant height by 30%, and low P by 15% when compared with the control. Combining reduced P with drought resulted in an additive growth regulating effect (36% reduction). Continuous low N availability reduced plant height by 20%, but resulted in severe N deficiency symptoms. There was no clear growth regulating effect of dynamic N availability. The desired plant height was obtained by a combination of drought stress and reduced amounts (17%) and applications (3 compared with 7) of the chemical growth regulator Cycocel (Hansen & Petersen, 2004).

Post-production evaluations showed that chemically growth regulated plants had by far the highest percentage of damaged and wilted flower buds throughout the post-production evaluation compared with plants from all other treatments (Figure 1). Besides the growth regulation effects, reduced P in particular, but also reduced N availability during production also improved the post-production quality by significantly reducing the number of senescent flower buds compared with chemically growth-regulated plants (Figure 1). Several cycles of drought did not influence post-production stress tolerance. Improving plant tolerance to post-production stress by delaying floral senescence and reducing root dieback (Hansen & Nielsen, 2001; Hansen & Petersen, 2004) may have considerable importance to the horticultural industry and to the consumer, since most cultivated flowering plants have inadequate keeping quality when growth regulated chemically. This presentation will give you an update on promising

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alternative methods for plant growth regulation, the potential benefits of using these methods for growth regulation, and what attempts were made in Europe to implement the results to the horticultural industry.

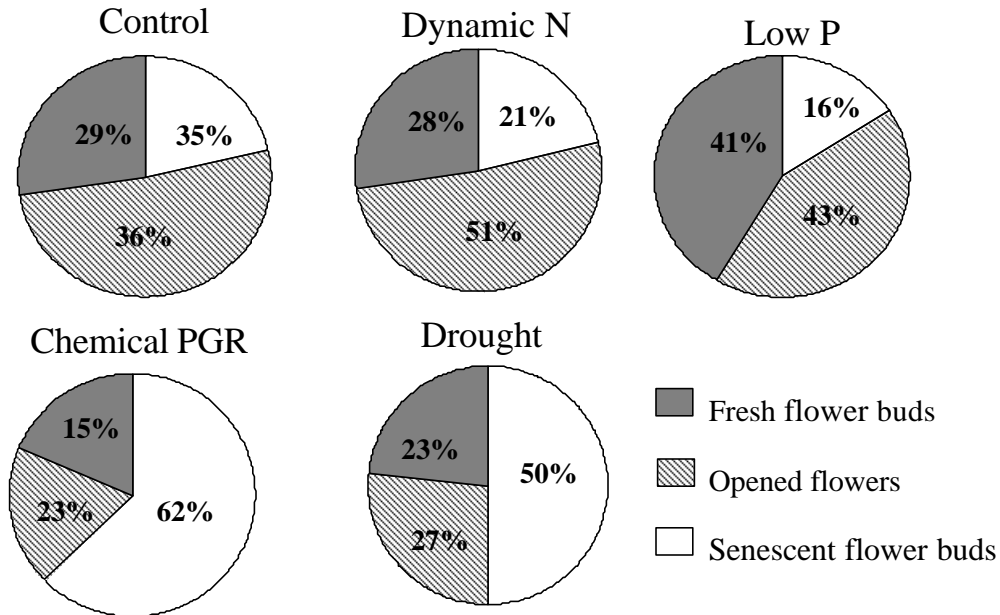


Figure 1. Post-production evaluations showed that chemically growth regulated plants had the highest percentage of senescent flower buds throughout the 28 days post-production evaluation in interior room compared with control plants (not growth regulated) and with plants grown at reduced nutrient availability.

LITERATURE CITED

- Hansen, CW and KL Nielsen. 2001. Reduced phosphorus availability as a method to reduce chemical growth regulation and to improve plant quality. In: Horst, WIJ. Et al. (eds.). Plant Nutrition: Food security and sustainability of agro-ecosystems through basic and applied research. Kluwer Academic Publishers, 314-315.
- Hansen, CW and KK Petersen. 2004. Reduced nutrient and water availability to *Hibiscus rosa-sinensis* 'Cairo Red' as a method to regulate growth and improve post-production quality. *Europ.J.Hort.Sci.*, 69 (3). In press.

For more information about the Compalox®-P buffer technique, please see <http://www.martinswerk.de> and <http://www.agrsci.org/ahp/cwh>