

PC/10

Report on HDC funded Study Visit to Holland. 31 May - 1 June 1988

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OBJECT

The object of the Study Visit was to see experiments in progress at the Glasshouse Crops Research Station (GCRS), Naaldwijk; to discuss recent work with the Dutch researchers and advisors at GCRS, and to meet representatives of Ludvig Svensson International to discuss arrangements for a possible extension of the HDC-funded work on thermal screens at Bunting's Nursery.

GENERAL PROGRAMME

In the two days that I was at GCRS, I had separate discussions about work on protected edible crops with van Winden, Welles, Bakker, de Graaf, van Holsteijn, Janse and de Koning and saw relevant experiments in progress. On the evening of the first day I had further discussions with Mrs. Tineke Goebertus of Ludvig Svensson International about thermal screens and with van der Hoeven about new light sources and the use of coloured screens on chrysanthemums. On the second day, I also spent over 2 hours in a general discussion with all members of the Department of Horticulture and Glasshouse Climate about progress in R & D on protected crops in the UK and Holland, with special reference to work on humidity. We also discussed what directions future work on environmental optimisation might take in the two countries and how we might proceed in a cooperative way, avoiding unnecessary duplication and building on each others findings.

A. Temperature

The Dutch, especially de Koning and Bakker, have a major programme on the effects of temperature on tomato, cucumber, and sweet pepper aimed particularly at determining the ability of these crops to integrate fluctuating temperatures and to respond accordingly, and at determining more precisely their response to temperature at different stages of development. Unfortunately, the main experiment planned for this year, which would have involved growing tomato in a very large number of temperature combinations by

transferring plants between houses at different temperatures, had had to be postponed. It will now take place next year. Their work has clearly shown that cucumber and pepper seem more tolerant of fluctuating temperatures than tomato and has directed attention towards ensuring the maintenance of an appropriate balance between leaf and fruit production in tomato. Their data also confirm that of Calvert, that early production is often achieved only at the expense of later production. As with most current Dutch research, effects of treatments on fruit quality and shelf-life are also being closely examined.

B. Light

Van Holsteijn, Janse, and de Koning have some particularly interesting work in progress on the effects of using mobile shade screens on tomato crops in summer. Last year, they had used a fabric consisting of alternate strips of aluminium and open holes (LS 15F) which gave approximately 42% light transmission. In different treatments, the screen was drawn completely over the crop whenever the external sunlight achieved a value of either 450 W m^{-2} (bright), 550 W m^{-2} , or 650 W m^{-2} (very bright) and the temperature in the house exceeded 23°C .

The main object was to reduce fruit temperature and so lessen the incidence of ripening disorders, and to reduce evaporation and thus minimise stress. Screening in the manner described did reduce fruit temperature and gave firmer, more uniformly coloured red fruit with a longer shelf-life, and it did reduce humidity in the house although in that year even the unshaded crop suffered no obvious water stress.

Their most surprising observation was that, although shading reduced light transmission, the yield loss that occurred was less than anticipated. Nevertheless it was felt that the improvements in fruit quality had not been sufficient to offset the value of the yield loss and the cost of installing a shade screen, which by its nature, could not also act as a thermal screen in winter. This work has been published in Dutch in "Groenten en Fruit" (8 April 1988) but they gave me translations in English which I have circulated to ADAS.

This year the screen was primed to draw at external irradiances of 450, 550 and 650 W m^{-2} as before, but the screens were actually drawn only if the house temperature also exceeded a certain minimum value. This value varied with the shade treatments, being lowest at 450 W m^{-2} and highest at 650 W m^{-2} . It was hoped that this would reduce both the light and yield losses still further. In addition, Ludvig Svensson had introduced a new shade material (LS 14F) with even more holes, which should reduce both the light and yield losses and may not lessen the beneficial effects of shading on fruit quality.

C. Humidity

The Dutch have temporarily stopped work on this topic while they evaluate their results and experimental procedures. They are keenly interested in the MAFF-funded work at Efford and the MAFF- and HDC-funded work at Littlehampton on this topic, and are, at present, deciding whether to erect a new research glasshouse facility to include the best features of M Block Efford. For the moment, therefore, we have a clear advantage in this field of R & D and the results we are obtaining give us a valuable asset in ensuring a continued exchange of information with the Dutch.

In discussion with them, they strongly supported the need to extend our work on tomato and to begin work on cucumber which would extend their own limited observations on the potentially beneficial effects of high humidity by day. They would like to see work on the effects of daytime humidities above 80% r.h., the upper limit of their own investigations. They particularly stressed the need to ensure that assessments of tomato and cucumber fruit quality were made in humidity experiments.

The Dutch are also interested in our approach of trying to integrate the effects of all environmental variables, i.e. temperature, humidity and solar radiation, on transpiration and I spent some time with de Graaf, discussing his system of measuring crop evaporation by means of electronic balances.

D. Thermal Screens

Tineke Goebertus agreed that although the proposed comparison of 'Tyvek' with LS11 was not of great interest to Ludvig Svensson International, they would be prepared to give some assistance as a direct comparison of the effects of the two materials on crop performance had not been made previously. They would offer Bunting's a special price for both materials but would need to know the areas involved before they could give a quotation. I agreed to communicate this information to Buntings via the HDC.

It was apparent that they were more interested in assisting with an HDC- or MAFF-funded trial at Buntings, Littlehampton, or an EHS on the relative merits of shading with LS14F and LS15F, similar to the work being done by van Holstejn, de Koning, and Janse at GCRS Naaldwijk. It is unlikely that this could be done at Buntings for there is only room for one screen in their houses and as neither LS14F nor LS15F possess significant insulation properties, the existing Tyvek would have to be used in winter and be replaced in spring by the LS materials. At present, however, there seems little point in duplicating the Dutch work, the results of which are not yet encouraging.

E. Chrysanthemum Lighting and Coloured Screens

Dutch experience (van der Hoeven) with the new SL*R lamp (18W) was that it could probably not be used simply to replace conventional incandescent lamps (150W) in existing installations, nor would it give the same effect even if installed to give the same illuminance as an incandescent lamp at crop height. This agrees with our predictions and experience. The Dutch have further experiments in progress.

Van der Hoeven had also been involved with tests of green screens for photoperiod control of chrysanthemum. They concluded that existing green screens were unsatisfactory when used alone in summer but could be used successfully in conjunction with a more opaque screen. This too agrees with our predictions and experience.

CONCLUSIONS

The Dutch researchers showed great interest in the ADAS/AFRC Integrated Programme on Energy Saving in Greenhouses, especially the work on humidity (MAFF- and HDC-funded), and also the ADAS/AFRC work on tomato fruit quality (HDC-funded) and tomato temperatures (HDC-funded). Van Winden, the Head of the Horticulture and Glasshouse Climate Department, regards meetings of the kind I had, with a general discussion session, as important as a basis for exchanging views and information about research findings and future research programmes. He stressed the need for a free exchange of information and I pointed out that there were problems of confidentiality with both HDC-funded and MAFF-funded work. I agreed, however, to discuss whether information can be provided to researchers with a restriction on its availability to Dutch growers prior to its publication in some form within the UK. In this context, it was evident that the GCRS workers are making increasing use of the commercial publication "Groenten en Fruit" as a vehicle for passing their preliminary results to Dutch growers. This may reflect the decline in the size and quality of their own government-funded advisory service.

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