

HH1303SPC

To evaluate plant responses to the aerial environment leading to improved product quality and productivity for greenhouse crops

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Project Code:	HH1303SPC
Project Title:	To evaluate plant responses to the aerial environment leading to improved product quality and productivity for greenhouse crops
Research Providers:	Horticulture Research International

Abstract and Purpose

With home production of sweet pepper satisfying less than 15% of demand the potential for expansion of this sector of the industry is clear. However, one of the main constraints on maximising production and produce quality is the paucity of knowledge relating to the gross physiology of this crop. This will be addressed by examining the effects of humidity, training systems, and different nutrition regimes.

Work on tomatoes will focus on summer CO₂ enrichment, investigating whether the photosynthetic efficiency of leaf canopies changes over the course of each day. This work will include a number of commercial cultivars and will investigate the effect of plant/shoot density so that optimal fruit size can be maintained.

Scientific Aims and Objectives

1. To assess the effects of humidity and reduced nitrate input on sweet pepper yield and fruit quality and calcium distribution within fruits.
2. To optimise the use of summer carbon dioxide, with a view to improving tomato fruit yields while maintaining optimal fruit size.

Materials and Methods

Peppers

Work at Efford evaluated the effects of four humidity regimes (0.1/0.1, 0.1/0.4, 0.4/0.1, 0.4/0.4 KPa Day/Night) as the main treatments. In addition Double Row and 'V' Systems were compared at 'low' (122 mg/litre NO₃-N) and 'high' (207 mg/litre NO₃-N) nutrition regimes.

Tomatoes

At Stockbridge House tomatoes were enriched with CO₂ during the summer to a level of 425 ppm either in the morning, afternoon or all day in comparison to no enrichment. Four tomato cultivars (Calypso, Liberto, Pronto and Gourmet) were sown on 16 November and planted on 29 December 1993. These were grown at 2 different densities; plants were either established at 9,370 plants/acre increased to 11,250 shoots/acre by taking side shoots from 1 in every 5 plants, or an initial density of 11,250 plants/acre increased to 14,050 shoots/acre by taking shoots from 1 in every 4 plants.

A 16 compartment multifactorial glasshouse facility was used for this trial, this comprised four blocks each consisting of four 200m² compartments. Each CO₂ treatment was replicated in each block, and the cultivar and density treatments were applied to the 8 experimental rows within each compartment.

Plant growth (height, stem diameter and leaf area) was recorded as was yield and fruit quality.

Results/Conclusions

In the pepper experiment at Efford, the 0.1 KPa by day humidity treatment significantly reduced total marketable yield by 4% to the end of May. Low NO₃-N inputs also reduced the yield by 7% over the same period. Interestingly, the 'low' NO₃-N regimes generated higher levels of Blossom End Rot (BER) in the crop contrary to expectations.

In the tomato experiment at Stockbridge House the yield response to CO₂ enrichment in the morning or afternoon compared to all day were additive. Yield was related to the daily average CO₂ concentration; there was no significant difference between adding CO₂ in the morning or afternoon. Higher CO₂ levels increased fruit size above the optimum grade suggesting further work to determine the interaction of CO₂ and plant density is required.

Outputs Including Publications/Presentations and Further Technology or Knowledge Transferred from the Project

- Hand, D.J. (1994). Effects of Humidity and Nutrition on Sweet Pepper yield and fruit quality. Tomato and Sweet Pepper Growers' Walk, HRI Stockbridge House, 15 June 1994.
- Hand, D.J. (1994). Effects of Humidity and Nutrition on Sweet Pepper yield and fruit quality. Tomato and Sweet Pepper Growers' Walk, HRI Efford, 26 July 1994.
- Harriman, M. (1994). Summer CO₂ enrichment studies. Tomato and Sweet Pepper Growers' Walk, HRI Efford, 26 July 1994.
- Harriman, M. (1994). Optimisation of CO₂ enrichment. Conference paper at the National Tomato Conference, HRI Littlehampton, 5 October 1994.

RELATED RESEARCH

Reference	Title	Sponsor	Start & End Dates
HH1306SPC	Optimisation of carbon dioxide enrichment in glasshouse tomato	MAFF	01/04/94 – 31/03/98
HH1311SPC	Optimisation of the aerial environment of protected crops	MAFF	01/10/94 – 30/09/97
HH1313SPC	The prediction of yield and of average fruit size in the tomato crop	MAFF	01/10/94 – 30/09/97