YIELD RESPONSES OF TOMATO

(*Lycopersicon esculentum* Mill.)

TO FRUIT THINNING AND PLANT SPACING

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Abstract

Control of individual tomato (*Lycopersicon esculentum* Mill.) fruit weight during a crop cycle is of commercial benefit to improve marketable yield. To assess the main causes of variability in tomato fruit size, plant spacing and fruit thinning effects on fruit yield and individual fruit weight down the truss was examined.

Three fresh market tomato cultivars, Alboran (Standard), Ophir (Beefsteak) and Cherita (Cherry) were grown, in New Zealand during winter and spring months of 2001, in a greenhouse with NFT at three plant densities (2.76, 3.67 and 4.59 plant per m^2). Each tomato cultivar was fruit thinned to three different levels (3, 4 and 5 fruit per truss for Alboran; 1,2 and 3 fruit per truss for Ophir; 4, 8 and 12 fruit per truss for Cherita). Total fruit weight and fruit number were taken at each harvest for all treatments. At the low density (2.76 plants per m^2) individual fruit weights within each truss were taken for all fruit thinning treatments. A total soluble solid measurement was also taken during an August harvest.

Alboran showed a significantly higher final fruit yield per surface area than Ophir and Cherita cultivars, indicating why Alboran is a standard cultivar. No difference in fruit yield or fruit number surface area was observed with both Alboran and Ophir cultivars as plant density increased. This was the result of flower and / or fruit abortion at the higher densities, due to low solar radiation levels observed under winter and spring conditions in this study. Cherita, although not significant, showed a trend of increasing fruit yield per surface area as plant density increased. The low solar radiation levels did not have as larger effect on flower and / or fruit abortion in Cherita. It had a lower fruit (sink) load and was able to support more fruit development with the low levels of photosynthetic assimilate produced under the low solar radiation levels. Larger mean fruit weights, in all three cultivars, were observed with more fruit thinning due to increased photosynthetic assimilate being available to the remaining fruit. No difference in fruit yield per surface

area was observed with both Alboran or Ophir cultivars as more fruit were left on the truss, which was due to the smaller mean fruit weight and a greater proportion of flower and / or fruit abortion caused by the high fruit load with low solar radiation levels. However thinning Cherita to 4 fruit per truss did produce significantly lower yields per surface area compared with 8 and 12 fruit per truss.

Individual fruit weight down the truss, of all three cultivars, reduced in size by a constant factor or slope. A slope of -13 g / fruit position was observed for Alboran, which was flatter than that of Ophir (-17 g / fruit position) and steeper than that of Cherita (-0.15 to -0.60 g / fruit position). The number of fruit on the truss did not affect the slope of Alboran and Ophir cultivars, while thinning Cherita to 4 fruit per truss produced a significantly steeper slope (-0.60 g / fruit position) than 8 and 12 fruit per truss (0.25 g / fruit position). More fruit present on a truss produced smaller proximal (first) fruit, thus reducing the size of the remaining fruit on the truss proportionately. Individual trusses within Cherita were also shown to have a constant slope of fruit size down the truss.

These results suggest that plant density and fruit thinning can be used to produce more fruit within the desired marketable fruit size range all year round. However a greater understanding of plant density and fruit thinning interactions during different growing seasons must first be achieved.

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Table of Contents

Chapter 2 Materials and Methods

Chapter 3 Results

List of Tables

List of Figures

List of Plates