FLOWER AND FRUIT DEVELOPMENT IN PROCESSING TOMATOES

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ABSTRACT

Processing tomato crops are mechanically harvested from a single destructive harvest. The timing of this harvest to coincide with the maximum yield of factory grade fruit is of considerable importance to the efficiency of the field operation. There is a lack of information regarding where the factory grade fruit is produced on the plant and for how long the yield of factory grade fruit is maintained at its maximum level in the field.

Two experiments were carried out in the Manawatu using the processing cultivars Castlehye 1204 Improved and UC 82B. The first experiment determined the time of flowering of all the flowers on the plant, the trusses in which these flowers were to be found and the position of these trusses on the plant. 132 days after planting all the plants were harvested and the number and position on the plant of the flowers which set fruit was determined. A normal distribution was found to satisfactorily describe the relationship between the number of flowers reaching anthesis and time. Plants on average carried up to 37 trusses. 65% of the yield was carried on the first 10 trusses to flower with 95% of the yield carried on the first 20 trusses to flower. The efficiency of trusses in producing fruit varied from 66% with the earlier flowering trusses down to negligible levels. Plants had up to 8 main order laterals and together with their attached sub laterals each carried from 4-5 trusses. The efficiency of flowering decreased with the position of the truss up the lateral. It was suggested that the competition

between trusses for assimilates is far more important within laterals than between laterals. These results have implications for both crop management and plant breeding programmes.

In the second experiment 9 successional destructive harvests were carried out commencing at the first sign of coloured fruit. Ethryl was not applied to the crop. The yield of red and factory grade fruit was found to peak sharply over time. The normal distribution curve was found to satisfactorily describe the relationship between time and the yield of both red and factory grade fruit and fruit numbers of these grades of fruit. Harvesting one week earlier or one week later than the optimum harvest date resulted in a loss of factory grade fruit of from 10-15 tonnes per hectare. The major cause for this rapid fall in yield from the optimum was due to an increase in the yield of red rotten fruit. In fact over half of the total number of fruit had rotted by 136 days after planting. This included a significant number of green fruit. The magnitude of this loss was only apparent because successional harvests were carried out. The total yield of fruit (all grades) was maintained over a considerable period as the loss in fruit numbers was balanced by the increase in mean fruit weight of the crop. The mean fruit weight of fruit did not increase once they had coloured. The percent soluble solids of red fruit decreased the week following any significant amount of rainfall.

In the light of this research the effect of ethryl on the maturity characteristics of processing tomato crops needs to be re-examined by the use of successional harvests. Reliable techniques also need to be developed to predict the time of optimum harvest as these results suggest that it is much shorter than is commonly thought. The importance of fruit rots in reducing yields and thus effecting the length of the optimum

harvest period is also apparent and is another area of research which requires further study.

In the first experiment, the Normal Distribution Curve was found to describe the frequency of flower anthesis versus time relationship in two processing tomato cultivars; Castlehye 1204 Improved and UC 82B. Early fruit setting flowers acted as a strong sink as 90% of the final yield was carried on the first 18 trusses. Yield contributing trusses followed a pattern of increasing distance from the root system the later they flowered. Competition for photosynthate was mainly within laterals but also there was some between lateral competition. Flower trusses exhibited decreasing efficiencies in producing red fruit the later first flower anthesis occurred on the flower truss.

In the second experiment, the yield of Factory Grade tomato fruit from the same two processing tomato cultivars peaked sharply over time. Harvesting one week earlier or later than the optimum harvest date resulted in a Factory Grade yield loss of up to 10-15 t ha^{-1} for both cultivars. The Normal Distribution Curve was found to describe the relationship between Factory Grade fruit weight and number over time for both cultivars. Both red and coloured fruit weight were also found to follow the Normal Distribution. Over half of the total number of fruit rotted by 136 days after planting. Percentage Soluble Solids of red fruit decreased as rainfall increased in the week preceding harvest, with the converse also shown to apply.

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INTRODUCTION

An important criteria for the successful harvesting of processing tomatoes, is that a high proportion of the fruit harvested is at the correct stage of maturity for processing. In New Zealand, processing tomatoes are generally harvested when a sample drawn from the crop indicates that optimum maturity has been achieved.

The objective of this study was to demonstrate how the time of harvest for two common cultivars of processing tomatoes used in New Zealand, is very critical and harvesting outside the optimum time can result in a large loss of potential yield. It was also decided to study the flowering pattern of the same two tomato cultivars to find which flower trusses were contributing to the yield of processing grade fruit.