Effect of Mechanical Injury on Ripeness and Quality of Mature Green Tomatoes

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INTRODUCTION

In the tropical zone,several vegetables,such as tomato,lettuce and carrot,can normally neither grow nor develop. The supply of these important vegetables are not enough to consumer in the North of Brazil. For this reason,a long distance transportation of commodities by truck has bee prevailing among many cities, especially from production area to consumption areas. In this case,mechanical force by pile and vibration or rough handling has ofte led to deteriorate the quality of vegetables.

This paper was designed to evaluate the effect of mechanical injury on the quality of tomato at mature green stage using a transport simulation equipment for 48 hours.

MATERIALS AND METHODS

Sample preparation: About 25 kg of tomatoes(Lycopersicon esculentum Mill.,cv.Santa cruz "Angela Giante") was obtained from CEASA in Brasilia on 10th of April,and immediately subjected to successive procedures. Eighty fruits of mature green stage were chosen visually for uniform weight (107±12g FW/fruit),and numbered respectively.

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Simulation test of transport: The simulation of transport by truck was done by the following treatment. The numbered 40 fruits were placed at the bottom of a plastic container (25x25x 35cm), and then about 10 kg of tomatoes were added to it. The container was shaked horizontally at 100 cycle/min with an amplitude of 3 cm during 48 hours under room temperature. The other numbered 40 fruits were placed as a control at room temperature.

Determination of pigments: Periodically two medium colored fruits for treatment and control were sampled. Each tomato was vertically divided into 8 similar sections, and a pair of its opposite section was cut into small pieces after remval of seed. The excised flesh was well mixed, and ten gram of it was homogenized for use in pigments determination. Chlorophyll was extracted by a total of 40ml of ethanol, and filtrated through a glass filter. The combined filtrates was filled up to 50ml and measured photomeritically at 665nm as shown in Fig.1. For carotenoids, the residue was extracted by a 50ml mixuture of acetone and n-hexane (6:4,v/v), and the combined filtrates was washed by water to remove the lower layer of acetone and water. The upper layer of n-hexane containing carotenoids was also measured photometrically at 475nm after filling up to a 25 to 250ml as shown in Fig.2. In this case, dilution rate depends on the concentrations of carotenoids.

Determination of ethylene prodution and CO_2 respiration rates:

About 1 kg (9 or 10 fruits) of tomatoes was placed and sealed in a 4.9 l volume of glass vessel. After holding for two hours at about 26°C in this system, gas samples were taken by 1 ml of syringes for injection into a gas chromatograph (INSTRUMENTOS CIENTIFICOS C.G.LTDA, model 3527-D) equiped with FID and TCD detectors. Two to four of gas determination for each treatment were made periodically.

RESULTS AND DISCUSSION

Preliminary analysis of pigments showed that the maximum absorption wave length of chlorophyll and carotenoids was at 665nm in ethanol and at near 475nm in n-hexane, respectively.

The shaking treatment for 48 hours accelerated slightly carotenoids biosynthesis of mature green tomatoes, but prompted chlorophyll decomposition in comparison with control (Fig.3).

Respiratory climacteric rise was observed in 3 days after purchase. The shaking treatment caused a significant higher C_2H_4 and CO_2 production rates than those of control, but this effect disappeared in 2 and 6 days after treatment (Fig.4), respectively. Several workers (1,2) also reported that mechanical injury induced a higher ethylene and CO_2 production rates of tomato.

The results shows that rough handling would shorten the shelf-life of tomato. Therefore, in order to keep the quality, tomatoes should have a carefull handling during packing, shipment and transportation after harvest.

REFERENCES

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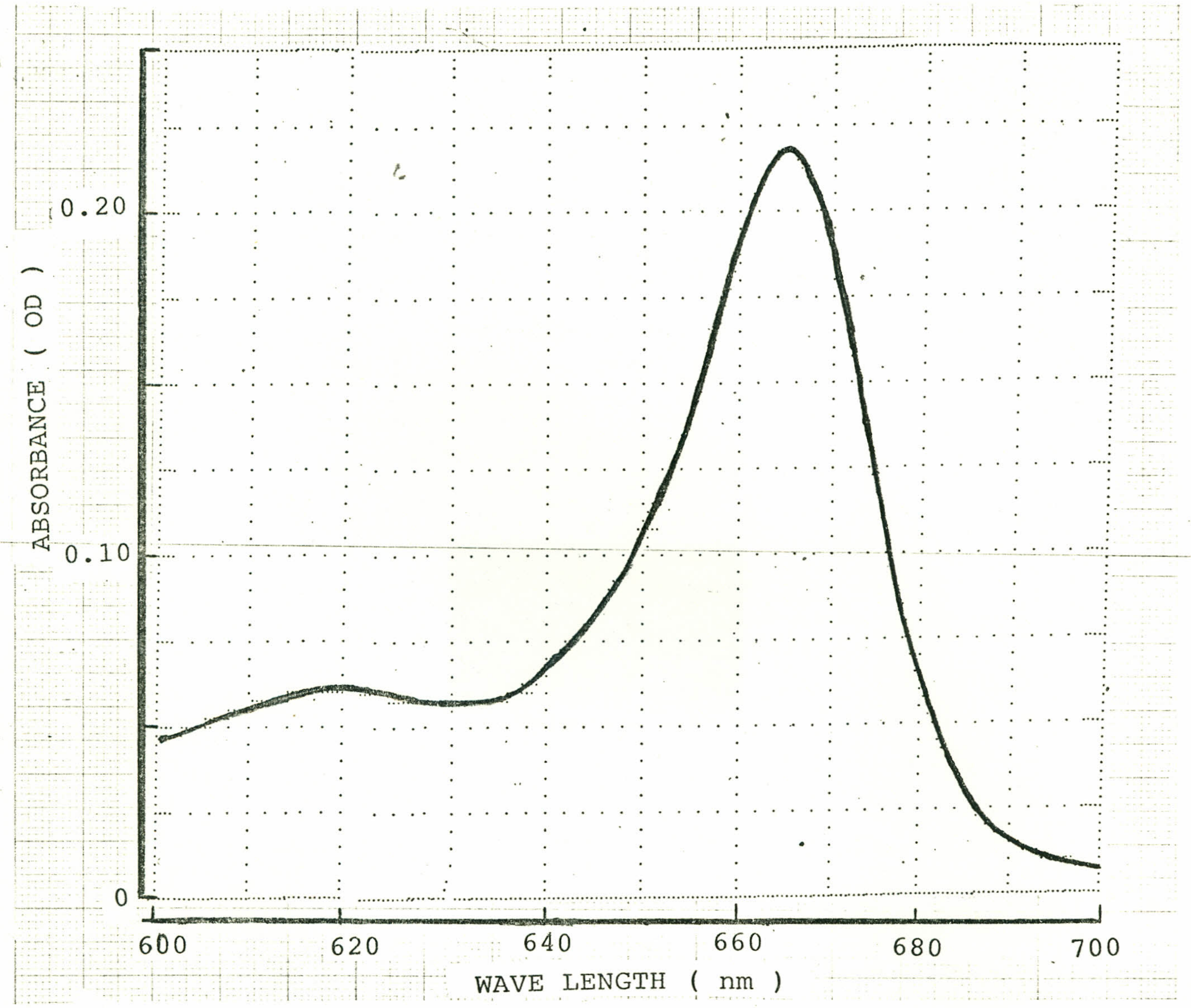

Fig.1.Absorption spectrum of a typical mature green tomato fruit chlorophyll in ethanol solution

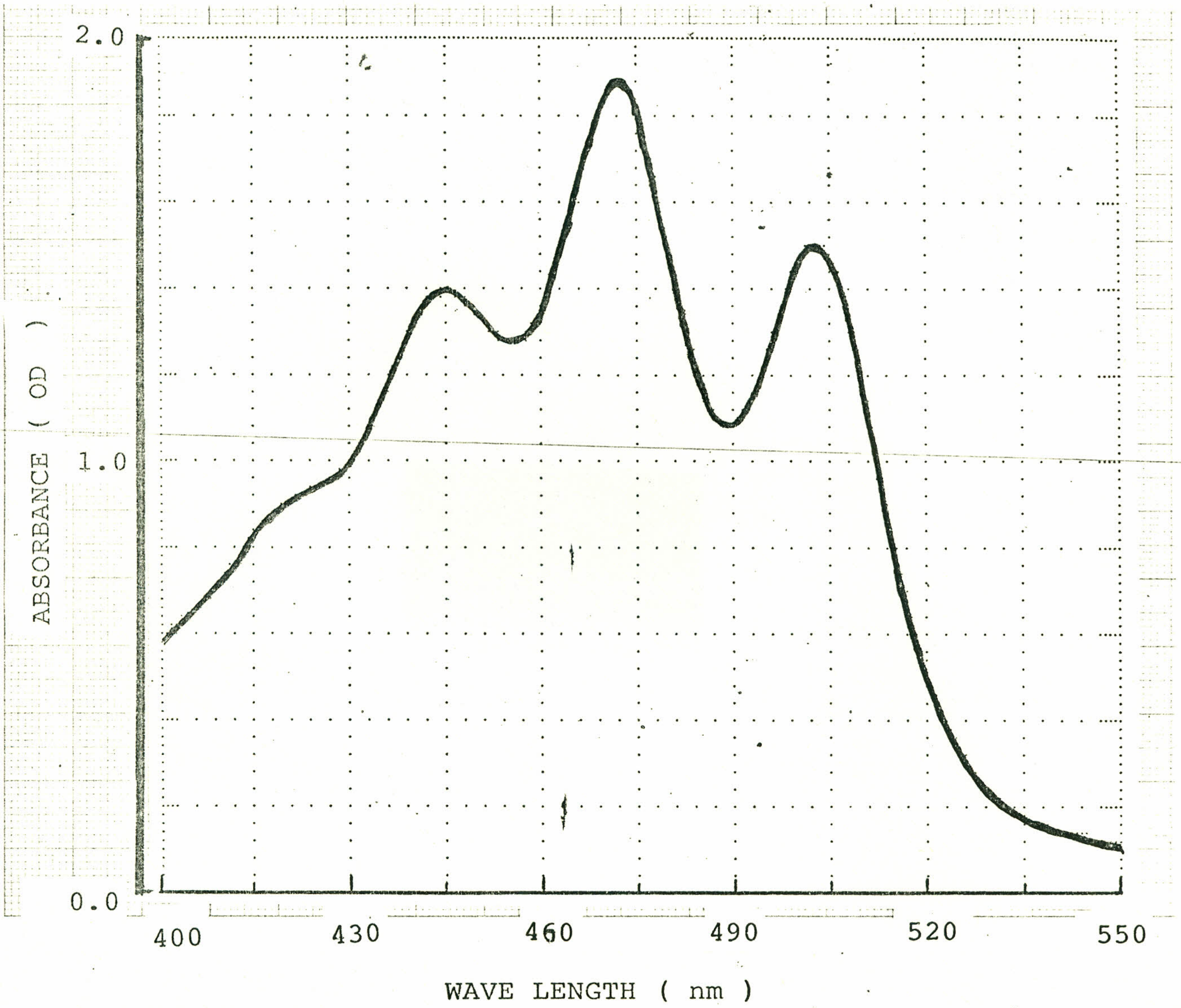

Fig.2. Absorption spectrum of a typicaly red tomato fruit carotenoids in n-hexane solution.

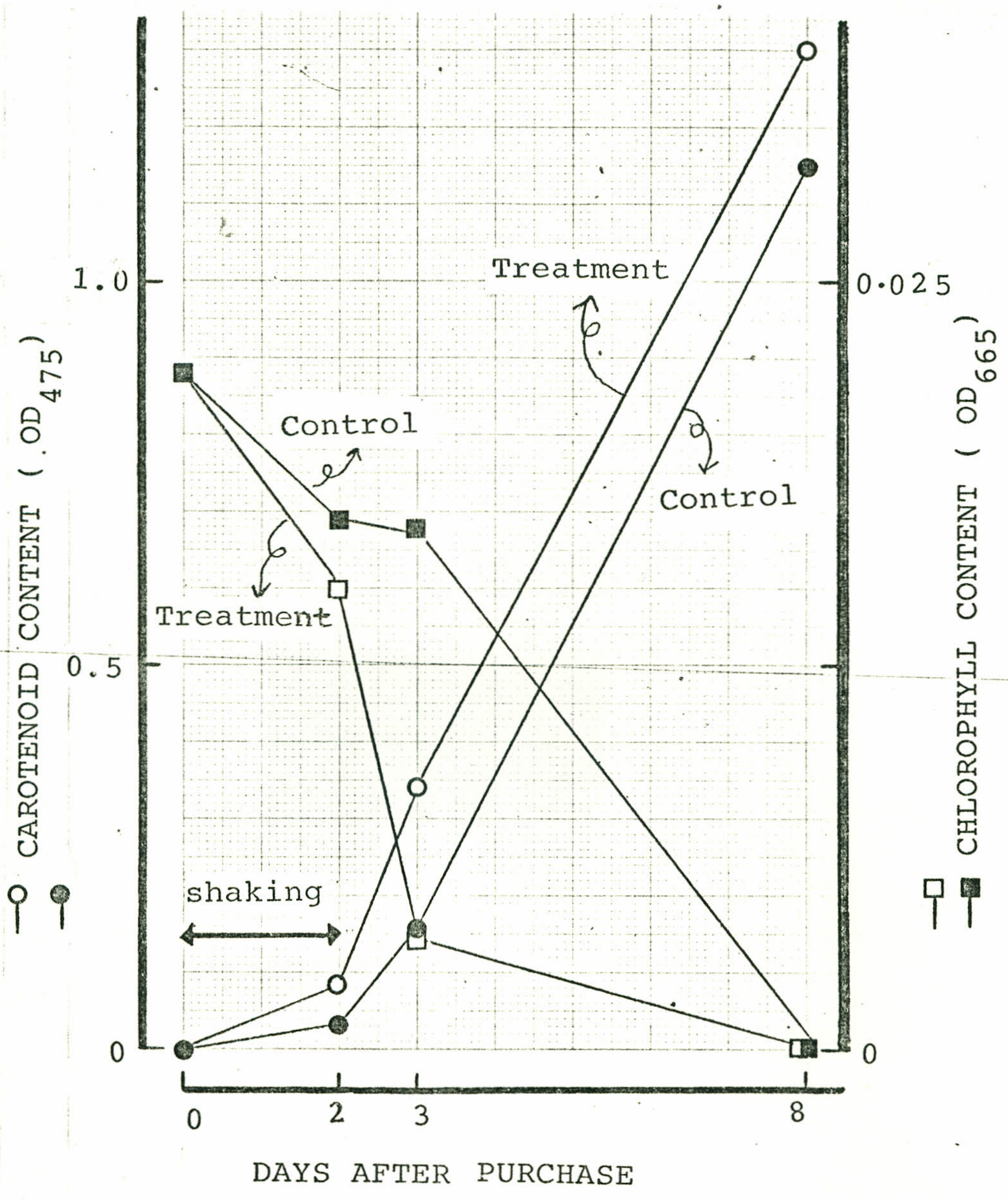

Fig.3.Effect of mechanical injury on pigment formation in mature green tomato after harvest.

NOTE: Pigments were expressed as optical density per one gram fresh weight in each solution.

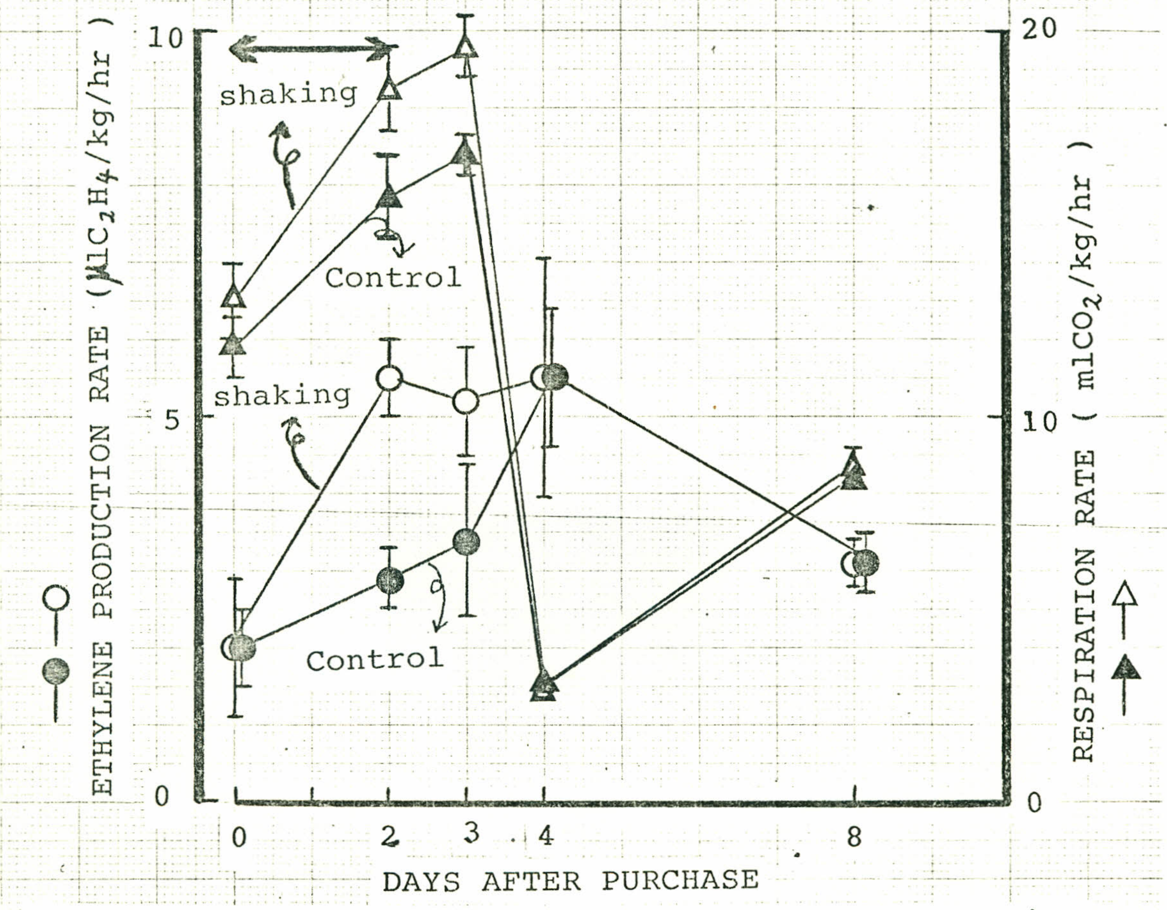

Fig.4.Effect of mechanical injury on C_2H_4 and CO_2 production rates in mature green tomato after harvest.