

The Effects of Ozone and SO₂ on
Processing Tomato Yields and Quality

Executive Summary

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EXECUTIVE SUMMARY

Central California produces over 90 percent of the processing tomatoes grown in the United States. Most of the 235,000 acres of tomatoes, worth over 300 million dollars, are grown in areas subject to significant air pollution, primarily photochemically produced ozone and sometimes sulfur dioxide produced by coal and oil-burning industries.

Previous studies with processing tomatoes near Tracy, California had indicated only a 4.4% loss due to ambient oxidants and no response to up to 0.12 ppm SO₂. A can-yard study with market tomatoes grown in cans at southern California locations differing in ozone concentrations indicated reduced fruit size associated with increasing ozone level.

This study involved exposing two varieties of processing tomatoes, UC-204-B and E-6203, to four levels of ozone and two levels of SO₂. The object of the experiment was to study the effects of SO₂ and/or ozone on tomato vegetative growth, fruit yields and fruit quality. Ozone concentrations expressed in terms of outside oxidant levels at Parlier were .25, .50, 0.90 and 1.5 times ambient levels. A SO₂ concentration of 0.1 ppm was maintained six hours per day, four days per week from June 10 until August 26 when the chambers were removed in preparation for fruit harvest.

The 48-vine subplots of each variety were harvested by cutting the vine off at soil level, removing all of the fruit which was sorted into "reds," "greens," and "rots." The vines minus the fruit were weighed, as were the three lots of fruit. One 25 kg bin of ripe fruit was hand counted to establish the average fruit size (weight). A ten pound representative subsample of the ripe fruit of each variety from each subplot was taken to the Tomato Quality Laboratory at University of California, Davis, where it was subjected to standard quality tests.

The yield data obtained in this experiment indicated a 20% reduction in vine weights and 27% reduction in weight of red fruit by vines receiving ambient ozone as compared to similar vines receiving filtered air. Exposure to 0.1 ppm SO₂ produced 7% less vines and approximately 8% less fruit as compared with no SO₂ exposure. Increasing the ozone level to 1.5 times ambient reduced yields an additional 15% but did not reduce vine weights, an indication that yield reductions may be due to an ozone effect on flower production and/or pollination. Results of the fruit quality tests performed at the Tomato Quality Laboratory indicated that increasing ozone levels reduce soluble solids (Brix), and they reduce viscosity, an important indicator of processing behavior. Exposure to SO₂ in the concentrations used increased total solids but had no measurable effect on viscosity or consistency.

In conclusion, results of this study indicate that ambient levels of ozone occurring near Parlier in Fresno County can have a significant negative impact on yields of processing tomatoes. Exposure to SO₂ in concentrations averaging 0.1 ppm six hours per day, four days per week can also reduce yields, but by a much lesser amount. Ambient ozone levels had no significant impact on fruit quality, but increasing the ozone level to 1.5 times ambient did reduce soluble solids and viscosity.