

# EVALUATION OF THE EFFECT OF OZONE EXPOSURE ON DECAY DEVELOPMENT AND FRUIT PHYSIOLOGICAL BEHAVIOR

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## 1. Introduction

Since the declaration of GRAS status (Generally Recognized As Safe) for ozone in the United States in 1997, interest in developing ozone applications in the food industry has increased.

## 2. Materials and methods

Artificially inoculated oranges, peaches, and table grapes were stored at 5°C and 90% RH under 0 (control room) or 0.3 ppm ozone (OSHA short-term exposure limit). Decay incidence and severity, and external disease appearance, as well as the number of infected berries around the inoculated berry were checked weekly. Respiration and ethylene production of 'O'Henry' peaches, previously stored for 1, 2, and 3 weeks at 5°C and 90% RH under ozone free or 0.3 ppm ozone, were measured daily during a 5-day softening period at 20°C and 90% RH. Individually weighed 'Zee Lady' peaches were stored for 6 weeks at 5°C and 90% RH under 0 or 0.3 ppm ozone. Weight loss was recorded weekly.

## 3. Results and discussion

Ozone at 0.3 ppm did not affect decay incidence or severity on artificially inoculated 'Elegant Lady' peaches during 4 weeks storage at 5°C, except for brown rot, caused by *Monilinia fructicola* (Table 1). Ozone exposure at 5°C altered normal mycelium growth and inhibited sporulation. Normal mycelium growth resumed after ozone exposure. The incidence of citrus green and blue molds, caused by *Penicillium digitatum* and *P. italicum*, respectively, on inoculated 'Valencia' oranges was significantly delayed by 1 week under 0.3 ppm ozone at 5°C (Fig. 1). Ozone exposure prevented the sporulation of both pathogens. Ozone at 0.3 ppm eliminated gray mold (*Botrytis cinerea*) nest formation on 'Thompson Seedless' table grapes stored for 7 weeks at 5°C (Fig. 2). Peach respiration and ethylene production were not affected by 3 weeks ozone exposure (0.3 ppm). After 4 weeks exposure to 0.3 ppm ozone, peaches became more susceptible to water loss (data not shown).

## 4. Conclusions

The lack of nesting and 'soilage' could have an economic impact on bin stored fruit. Ozone treatment could reduce the proliferation of fungicide-resistant strains. Ozone at 0.3 ppm did not prevent decay of artificially inoculated fruits. Diseases developing on fruit infected by wound pathogens in the field would be difficult to control using ozone in air during storage.

## Tables

- Influence of ozone exposure (0.3 ppm) on disease incidence and severity on artificially inoculated ‘Elegant Lady’ peaches stored at 5°C and 90% RH.

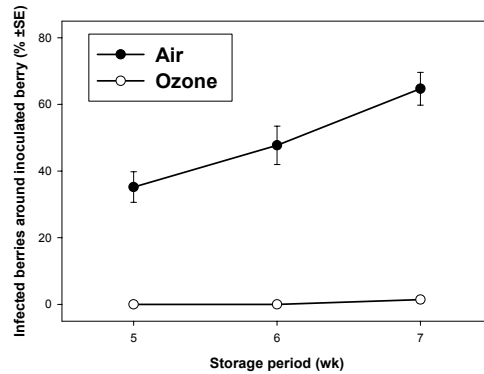
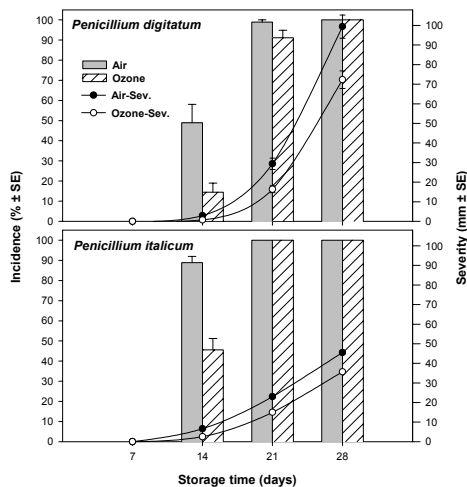
Pathogen	Treatment <sup>x</sup>	Storage period (days)					
		14		21		28	
		Incidence <sup>y</sup> (%)	Severity <sup>z</sup> (mm <sup>2</sup> )	Incidence (%)	Severity (mm <sup>2</sup> )	Incidence (%)	Severity (mm <sup>2</sup> )
<i>Monilinia fructicola</i>	Control	80.0 a	55.3 a	98.7 a	818.0 a	100.0 a	2955.1 a
	Ozone	28.7 b	14.9 b	95.0 a	267.8 b	100.0 a	1305.9 b
<i>Botrytis cinerea</i>	Control	56.2 a	22.8 a	93.7 a	477.0 a	100.0 a	2828.6 a
	Ozone	63.7 a	32.4 a	97.5 a	443.2 a	100.0 a	2326.3 a
<i>Mucor piriformis</i>	Control	2.5 a	40.5 a	2.5 a	384.8 a	21.2 a	606.9 a
	Ozone	2.5 a	15.3 a	2.5 a	133.0 a	5.0 b	389.8 a
<i>Penicillium expansum</i>	Control	0.0	0.0	73.7 a	69.0 a	100.0 a	353.0 a
	Ozone	0.0	0.0	58.7 a	48.7 a	93.7 a	296.6 a

<sup>x</sup> For each pathogen, values within columns followed by unlike letters are different according to Fisher’s protected LSD test ( $P = 0.05$ ).

<sup>y</sup> Incidence data were transformed to the arcsine of the square root of the proportion of infected fruits before the analysis of variance. Actual data are shown.

<sup>z</sup> Lesion area.

## Figures



- Citrus green and blue mold incidence (bars) and severity (lines) on artificially inoculated ‘Valencia’ oranges stored for 4 weeks at 5°C and 90% RH under 0 (air) or 0.3 ppm ozone.

- Proportion of infected berries surrounding one berry inoculated with *B. cinerea* in clusters of ‘Thompson Seedless’ table grapes stored at 5°C and 90% RH under 0 (air) or 0.3 ppm ozone.