Rhizopus Rot on Peaches

ammonia gas fumigation immediately following harvest may provide effective control of disease causing serious losses

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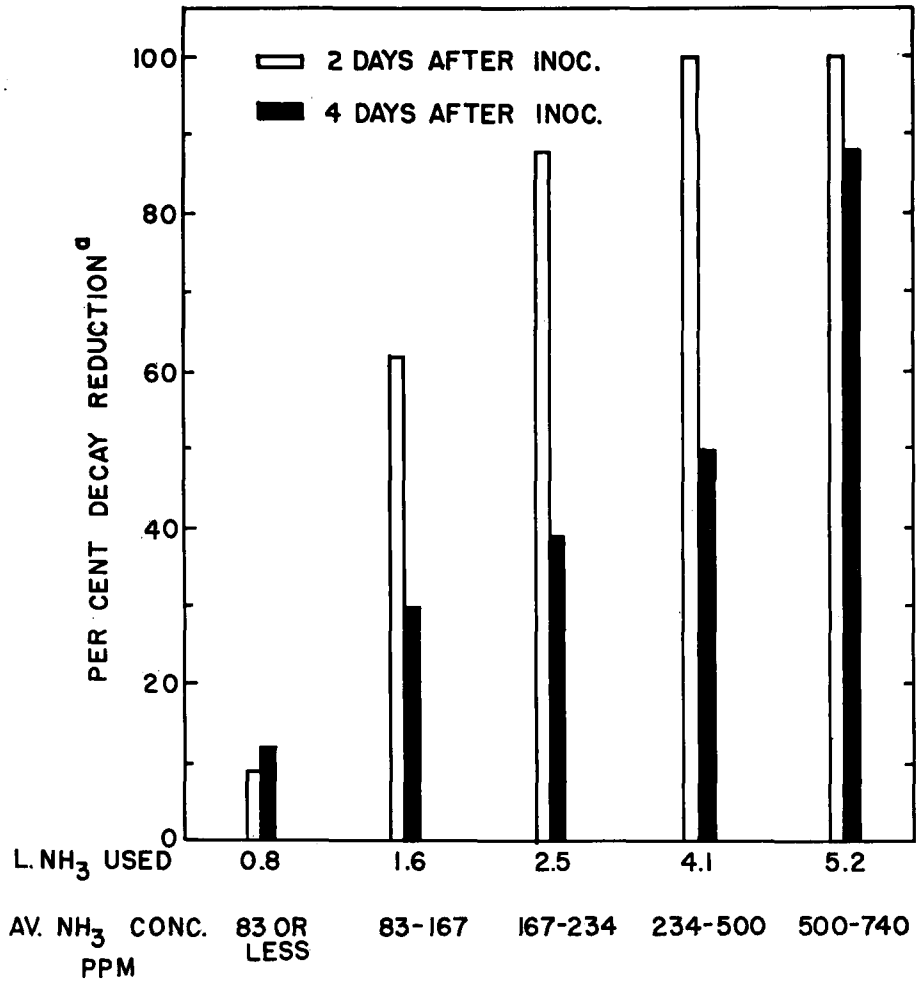
It is probable that effective control of Rhizopus rot—*Rhizopus nigricans* Ehr. —on peaches can be obtained—without fruit injury—by two 6-hour fumigations of an average ammonia concentration of about 250 ppm—parts per million.

Rhizopus spores gain entry to harvested peaches through picking and handling injuries. Processing peaches—harvested at full maturity—are particularly susceptible to the ravages of Rhizopus rot. Because ammonia gas—under somewhat similar circumstances—has shown considerable promise for control of certain diseases on citrus fruits, investigations were made on the use of ammonia gas fumigation immediately after harvest for control of Rhizopus rot on peaches.

Peaches Inoculated

Peaches of various varieties and stages of maturity were used in the studies. Two to four hours prior to fumigation, firm to soft peaches were scratch inoculated with a Rhizopus spore suspension. Fumigations were carried out in 8-cubic-foot wood chambers, except in one test, when a metal-lined walk-in refrigerator box—600 cubic foot capacity—was used. The atmosphere in both chambers was continuously circulated during the fumigations. Temperatures of 70°F–75°F prevailed during all fumigations and subsequent holding periods. Ammonia gas—fertilizer grade anhydrous ammonia—was metered into the chambers through calibrated capillaries over a 6-hour period. At definite times during the fumigation, gas samples were withdrawn from the fumigation chambers, washed with water, and the quantity of ammonia in the pooled washings determined colorimetrically after nesslerization.

Effect of a 6-hour ammonia gas fumigation on the incidence of Rhizopus rot on peaches two and four days after inoculation.



L. NH_3 used refers to the total amount of ammonia gas in liters delivered to the 8-cubic-foot chambers during the fumigation. *Av. NH_3 conc. ppm* refers to the average concentration of ambient ammonia gas in the chamber during the 6-hour fumigation period.

[a] Percent decay reduction equals % decay on control minus % decay on treatment multiplied by 100 and divided by % decay on control.

Variations

Despite identical gas flow rates, considerable variation in the ambient ammonia concentration was encountered on successive fumigations. Slight variations in the conditions existing within the fumigation chambers have considerable influence upon the amount of free ammonia in the atmosphere. To counteract these influences, minor adjustments were made in the ammonia flow rate during the fumigation to maintain a uniform concentration surrounding the fruit.

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Effect of One and Two Independent 6-hour Ammonia Fumigations (consecutive days) on the Control of Rhizopus Rot on Peaches

NH_3* delivered liters	Av. NH_3 conc. ppm	Number fumigation	Decay after 2 days %	Decay after 4 days %
Part 1[1]. 8-cubic-foot chambers				
0.0	0	1	85	98
0.0	0	2	79	90
0.8	90	1	8	54
1.6	90	2	27	63
2.5	250	1	4	58
5.0	250	2	1	12
5.0	470	1	1	59
10.0	470	2	2	8
Part 2[2]. 600-cubic-foot chamber				
0	0	–	–	95
154	500	1	–	9
254	500	2	–	3

[1] Each treatment represents 60 fruit (1 lug), each inoculated twice with a spore suspension containing 300,000 Rhizopus spores per cubic centimeter.

[2] Each treatment represents 330 fruit (5 lugs) each inoculated once with a spore suspension of 130,000 spores per cubic centimeter.

* Ammonia gas.

PEACHES

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Decay control was evaluated on both the second and fourth days after inoculation because decay development is rapid on mature fruit and canning peaches are seldom held more than a few days before processing.

The percent decay reductions of five tests—18 samples averaging 50 fruit per sample—are combined in the graph on page 7 according to the quantity of ammonia used and the resulting range of ambient ammonia concentrations in the fumigation chambers. Relatively low ammonia concentrations—167–234 ppm—retarded decay for two days following inoculation, and fruit held four days required relatively large amounts of ammonia—500–740 ppm—for good decay control. Typical examples of the fruit two days after inoculation are shown in the photograph on this page. Fruit injury due to the ammonia was not apparent in any of the tests.

Effectiveness

The effects of one and of two independent 6-hour ammonia fumigations are presented in the table on page 7. Although the second fumigation did not appear to improve the ammonia treatment as evaluated two days after inoculation, the four day counts indicated a definite advantage of the two fumigations at the two higher dosages. The results show good control by both the one and the two fumigations. Slight fruit injury developed following two 6-hour fumigations at 500 ppm amount concentration ammonia.

Sampling Necessary

The data obtained in these studies show that ammonia gas fumigation is effective in controlling Rhizopus rot of peaches. However, with the severe inoculation procedures used, comparatively high ambient concentrations were required for good control. Under conditions of less severe inoculation, effective control should be possible with two 6-hour fumigations with an average ammonia at about 250 ppm concentration. Any fumigation must be accompanied by sampling to determine the ambient ammonia concentration in the chamber. Commercial treatments require extensive field testing and statistical evaluation of the test results.

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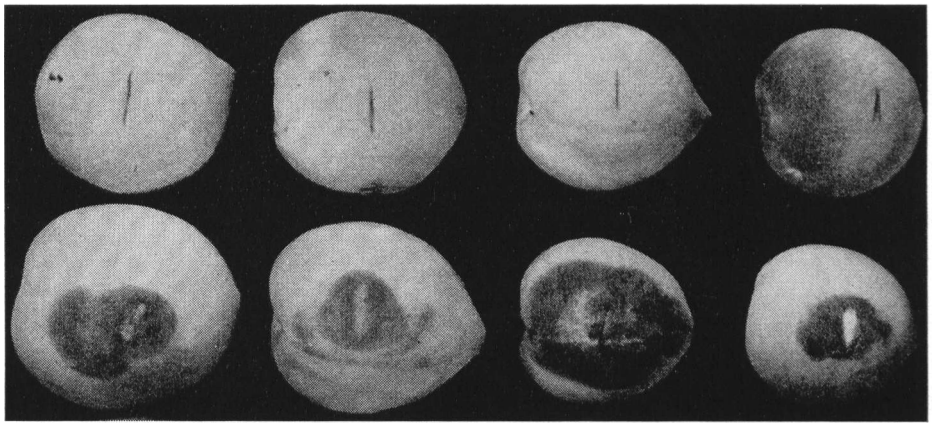
Peaches two days after inoculation. The top row of fruit received a 6-hour fumigation at an average ammonia concentration of 170 ppm. The bottom row of fruits were untreated.



SOLAR

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heat. A roof overhang of several feet will still permit most of the sun's rays to enter the room. Double glazing is often used on the windows for better insulation, to aid in maintaining the warmth in the interior of the building.

Summer Shade

The other extreme—in summer—is indicated at an angle of 73.5° above the south horizon. This is the lowest position of the sun toward the south, since at the other hours it is higher or toward the north. Trees to the south are not required, but they are especially useful to the east or west, as well as over the roof. A roof overhang of only 28″ or 30″ will completely shade the whole window-wall. No direct sunlight will enter the south windows.

During the intermediate seasons, some radiation may enter the room. A vertical solar angle of 50° or 60° may require protection or shade, and this may

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Solar Angles for a South-Facing Window-Wall and Roof Overhang required to shade an 8-foot wall or window from the south sun. (cities of similar latitude in California)

Degrees North Latitude		Noon South Vertical Angle, Degrees			Roof Overhang, Inches	
		Dec. 21	Equinox	June 21	Minimum June 21	All summer Mar.–Sept.
42	OREGON / CALIFORNIA	24 1/2	48	71 1/2	32	66
		25		72	31	
41	Hoopa Trinity Center Fall River Mills		49			83
		26		73	29	
40	Garberville Red Bluff Los Molinos Quincy		50			81
		27		74	28	
39	Lakeport Marysville Tahoe		51			78
		28		75	26	
38	San Rafael Stockton Mono Lake		52			75
		29		76	24	
37	Madera		53			72
		30		77	22	
36	Porterville		54			70
		31		78	20	
35	Taft Barstow		55			67
		32		79	19	
34			56			65
		33		80	17	
33	Escondido Brawley	33-1/2	57	80-1/2	16	62

Fig. 3 SOUTH VERTICAL ANGLES