

# Development of Control Measures for *Alternaria* Fruit Rot on Oranges in Arizona<sup>1</sup>

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## Abstract

*The incidence and severity of Alternaria fruit rot on navel oranges has increased in Maricopa County. The objectives of this study were to test the efficacy of two fungicides, Kocide 101 and Rovral, for disease control and to determine an application schedule that will result in optimum control of disease. In 1994, compared to nontreated trees, a significant reduction in the number of dropped oranges occurred on trees sprayed one to five times with Rovral at monthly intervals from April through August. In the same year, monthly applications of Kocide 101 from April through August were no better than leaving trees untreated. In 1995, Rovral treatments from March through August provided no apparent beneficial effects on control of Alternaria fruit rot, while a single application of Kocide 101 in December, January, or February resulted in significantly less dropped oranges compared to nontreated trees. Because of the inconsistent activity of Kocide 101 and Rovral in these two studies, an additional trial is in progress during 1996. The additional data from 1996 may help identify when and what fungicide(s) could provide significant control of Alternaria fruit rot of navel oranges in Arizona.*

## Introduction

*Alternaria* fruit rot is a fungal disease caused by *Alternaria citri*. The fungus attacks only citrus fruit and occurs throughout the citrus producing areas of the world. *Alternaria* rot is mostly a problem on fruit in storage; however, the disease can develop in the orchard, where premature fruit drop and rot of ripening fruit can occur. Diseased fruit in the orchard color prematurely and may develop a light brown to blackish discoloration of the rind at or near the styler end. On the other hand, some fruit show no external evidence of infection and must be cut open to reveal internal decay. This disease has occurred in Maricopa County navel orange groves since the crop was first grown in the region. Recently, however, the incidence and severity of *Alternaria* fruit rot in navel oranges has increased, with annual losses as high as 0.5 box of fruit per tree. In citrus groves, *Alternaria citri* grows on dead citrus tissue during wet weather, producing airborne spores. Initially, the fungus is believed to establish a quiescent infection on the developing fruit. Colonization of fruit is facilitated when splits or growth cracks occur. The effectiveness of fungicide treatments for disease control in the grove is uncertain, although certain fungicides are used to control some diseases caused by other species of *Alternaria* on other agricultural crops.

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The specific objectives of this research were to test the efficacy of two fungicides, Kocide 101 and Rovral (iprodione), for disease control and to determine an application schedule that will result in optimum disease control. The achievement of these objectives could provide the means to manage *Alternaria* fruit rot in Arizona citrus groves.

### Materials and Methods

Two field trials were established in navel orange groves with a high incidence of *Alternaria* fruit rot. In the 1994 study, a series of Rovral applications were sprayed onto test trees, beginning in April and continuing at one-month intervals through August. Six groups of five 2-tree replicates were established within each test citrus grove. One group served as an untreated control. Five of the groups were treated with Rovral in April, four groups in May, three groups in June, two groups in July, and one group in August. This sequential treatment scheme was established to help identify the critical time period when infection occurs and when fungicide treatment is necessary. An additional treatment consisted of a monthly Kocide application from March through August, 1994. In the 1995 trial, Rovral applications were started in March and terminated in August, so that treatments consisted of one to six applications of this fungicide. Kocide treatments were applied once in November or December in 1994 or January, February, or March in 1995. Disease development was monitored by determining the amount of fruit drop occurring before harvest as well as final disease severity and yield loss at crop harvest.

### Results and Discussion

In 1994 a significant reduction in the number of dropped oranges occurred on trees sprayed one to five times with Rovral compared to nontreated trees (Table 1). Monthly applications of Kocide 101 from April through August were no better than leaving trees untreated. In 1995, Rovral treatments from March through August provided no apparent beneficial effects on control of *Alternaria* fruit rot, while a single application of Kocide 101 in December, January, or February resulted in significantly less dropped oranges compared to nontreated trees (Table 2). Because of the inconsistent activity of Kocide 101 and Rovral in these two studies, an additional trial is in progress for 1996. The additional data from 1996 may help identify when and what fungicide(s) could provide significant control of *Alternaria* fruit rot of navel oranges in Arizona.

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Table 1. Maricopa County 1994 Alternaria fruit rot fungicide trial

Treatment	Month(s)	Total number of dropped oranges per tree	
Untreated control -----		114	b <sup>1</sup>
Rovral	April	77	a
Rovral	April-->May	72	a
Rovral	April-->June	72	a
Rovral	April-->July	66	a
Rovral	April-->August	71	a
Kocide 101	April-->August	96	b

<sup>1</sup> Numbers followed by a different letter are significantly different ( $P=0.05$ ).

Table 2. Maricopa County 1995 Alternaria fruit rot fungicide trial

Treatment	Month(s)	Total number of dropped oranges per tree	
Untreated control -----		105	c <sup>1</sup>
Kocide 101	November	88	c
Kocide 101	December	62	a
Kocide 101	January	53	a
Kocide 101	February	66	ab
Kocide 101	March	84	bc
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Untreated control -----		64	ab
Rovral	March	50	a
Rovral	March-->April	69	bc
Rovral	March-->May	64	ab
Rovral	March-->June	83	cd
Rovral	March-->July	97	d
Rovral	March-->August	72	bc

<sup>1</sup> For each fungicide and its respective untreated control, numbers followed by a different letter are significantly different ( $P=0.05$ ).