

Field Evaluation of Potential New Fungicides for Control of Downy Mildew of Broccoli in 1994 and 1995

Michael E. Matheron and Martin Porchas

Abstract

*Downy mildew of broccoli is caused by the plant pathogenic fungus *Peronospora parasitica*. Cool damp weather with high humidity is highly favorable for sporulation, dissemination of spores, and infection by this pathogen. The severity of disease is affected by the duration of weather conditions favorable for disease development. Potential new fungicides were evaluated for disease control in field trials conducted during 1994 and 1995. Downy mildew did not occur in the 1994 trial. In 1995, disease was moderate and all tested fungicides provided significant disease control compared to no treatment at all. Three new fungicides, Fluazinam, Dimethomorph, and ICIA-5504, show promise as potential new materials for control of downy mildew on broccoli.*

Introduction

Downy mildew of broccoli, caused by the plant pathogenic fungus *Peronospora parasitica*, is commonly found in areas where this crop is grown during the winter vegetable season. The severity of the disease is strongly influenced by environmental conditions. Cool damp weather with high relative humidity and air movement favor sporulation, dissemination of spores, and infection by the pathogen. Generally, frequent periods of high humidity and free moisture do not occur in a desert environment, although the presence of dew on the leaves provides conditions favorable for disease development. The severity of downy mildew is affected by the duration of moist weather conditions stimulatory to pathogen growth, sporulation, and infection of host leaf tissue.

Initial disease symptoms include the appearance of grayish white fluffy fungal growth on the underside of infected leaves during cool, moist weather. Spots or lesions initially yellow, then turning brown in color appear on both sides of the leaf where the fungal growth originally was observed. Severe infections will cause extensive necrotic areas on leaves, resulting in reduced photosynthesis. In broccoli, the fungal pathogen may spread systemically to stems and flowers, causing black streaks in infected plant parts.

Control of downy mildew can be achieved by planting cultivars that are tolerant or resistant to the disease. If susceptible cultivars are grown, optimum disease control is achieved by having fungicidal protection in place when environmental conditions become favorable for disease development. To increase the potential number of chemical disease control options available to growers for control of downy mildew of broccoli and related crops, field trials were initiated in 1994 and 1995 to test the efficacy of potential new fungicides for disease control.

Materials and Methods

These experiments were conducted at the Yuma Valley Agricultural Center. For the 1994 trial, broccoli (Pirate) was seeded on October 7, 1993 in double rows 12 inches apart on beds 40 inches between bed centers. Treatments were replicated five times in a randomized complete block design. Each replicate consisted of 25 feet of bed. Broccoli plants were spaced 6-7 inches apart within the row. Treatment beds were separated by single nontreated beds. Fungicide treatments were applied with a tractor-mounted boom sprayer that delivered 100 gallons/acre at 100 psi to nozzles spaced 12 inches apart. Foliar application of fungicides was made on December 16, 1993. For the 1994 trial, maximum and minimum ranges of air temperature (F) were as follows: December 1993, 61-72, 34-48; January 1994, 60-82, 33-47, while total rainfall (in.) was as follows: December, 0.00; January, 0.01. Furrow irrigation was used for the duration of the trial. For the 1995 study, broccoli (Emperor) was seeded in early October and foliar application of fungicides was made December 15, 1994. Maximum and minimum ranges of air temperature (F) were as follows: December 1994, 58-75, 31-53; January 1995, 53-74, 36-55, while total rainfall (in.) was as follows: December, 1.77, January, 0.58. At crop maturity (February 3, 1995), disease severity was determined by collecting the oldest nonsenescent leaf from each of 15 plants from each replicate plot of each treatment and counting the number of downy mildew lesions present.

Results and Discussion

Downy mildew did not develop during the 1994 trial. However, disease was moderate in 1995 and the results of this fungicide trial are presented in Table 1. All treatments significantly reduced the severity of downy mildew compared to plants not treated with any fungicide. Three potential new fungicides, Fluazinam, Dimethomorph, and ICIA-5504, provided levels of disease control equivalent to Maneb, Aliette, and Bravo, fungicides currently available for use to combat downy mildew of broccoli. The possible future expansion in the number of fungicides available for control of downy mildew of broccoli will be of great help in managing potential development of resistance by the pathogen to the fungicides in use now or in the future.

Table 1. Effect of fungicide treatments on development of downy mildew of broccoli in 1995 field trial. Michael Matheron and Martin Porchas, Yuma Agricultural Center, University of Arizona.

Treatment	Rate of ai/A	Number of lesions *
Fluazinam 500F	1.0 lb.	15.8 a **
Dimethomorph 50WP	0.25 lb.	17.2 ab
Maneb 75DF	2.0 lb.	18.2 ab
Bravo 720L	1.5 lb.	19.2 abc
Aliette 80WG	2.4 lb.	19.6 abc
ICIA-5504 80WG	1.0 lb.	20.2 bc
Bravo Ultrex 82.5DG	1.5 lb.	21.2 bc
Bravo 500L	1.5 lb.	23.0 c
Control	-----	30.2 d

* Each value is the average number of lesions recorded from the oldest nonsenescent leaf from each of 15 plants from each replicate plot in a treatment.

** Values followed by the same letter are not significantly different ($P=0.05$) according to the Duncan-Waller K-Ratio (LSD) Test.