

Effect of Bitertanol, Fenarimol, and Urea as Fall Treatments on *Venturia pirina* Ascospore Production

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ABSTRACT

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A significant reduction in the ascospore productivity of *Venturia pirina* was obtained with a late-season application of bitertanol, fenarimol, or urea. The best inhibition was achieved with fenarimol at 30 ml/100 L, followed in order by bitertanol at 60 g/100 L and 2% urea. The first ascospores were caught on untreated controls on 27 August when trees were at the green tip stage of fruit bud development; thereafter, a continuous emission was recorded until late December. The overall discharge period lasted more than 17 wk.

Additional key words: *Pyrus communis*

Pear scab caused by *Venturia pirina* Aderh. is the most damaging disease of pear in the Central Valley of Chile. Despite efforts by growers to control it, severe outbreaks occurred during the 1978, 1979, and 1980 growing seasons, significantly reducing yields and fruit quality. The disease has been particularly severe on cultivars Winter Nelis, Bartlett, and Packham's Triumph.

Ascospores from the overwintering fungus in fallen, infected leaves are the most important source of primary inoculum. However, the fungus can also survive the winter as mycelium in infected twigs and develop conidia the following spring. This is particularly common on Winter Nelis pear during years favorable for scab development.

Fall treatments with fungicides or urea for the reduction of ascospore production have been well documented for the apple scab fungus, *V. inaequalis* (2,4-7). This method has been applied successfully in apple orchards in Chile, mainly using 2-4% urea, for reducing the inoculum pressure and facilitating the conventional control program the following spring.

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This study was conducted to determine the effectiveness of urea and the newly developed fungicides bitertanol and fenarimol for reducing the ascospore productivity of pear scab fungus and to determine the ascospore discharge period of *V. pirina* in the Central Valley of Chile.

MATERIALS AND METHODS

This experiment was performed in a heavily infected orchard of pear cultivar Winter Nelis. Scab was estimated to have occurred on more than 90% of the leaves the previous season.

Fungicides. The fungicides evaluated were bitertanol (Baycor 25 WP) at 60 g/100 L, fenarimol (Rubigan 12.5 E) at 30 ml/100 L, and 2% (w/v) urea. Four trees were sprayed with each fungicide to runoff, or approximately 10 L per tree. The application was done with a Solo air-blast sprayer at the early leaf-fall stage on 14 April. The trial was designed as complete randomized blocks with three treatments and an untreated check, replicated four times. Diseased leaves were collected from each tree immediately after spraying and kept in nylon mesh bags beneath the trees until the following spring.

Evaluation. Treated and untreated leaves were periodically assessed for ascospore productivity from late August through December. At each sample time, 30 leaves were removed from each nylon mesh bag and immediately assessed for ascospore productivity in a wind tunnel built according to Hirst and Stedman (4). Sixty-five leaf disks measuring 1.76 cm² each were cut from leaves of each treatment and placed on a perforated zinc tray, alternating the upper and lower surface of the leaves. Trays of leaves were sprayed with 10 ml of distilled water each, placed for 15 min in the wind tunnel, sprayed with another 10 ml of distilled

water, and placed in the wind tunnel for another 15-min period. The ascospores were caught as a single deposit line on a microscope slide coated with a thin layer of petroleum jelly containing 1% (v/v) phenol. The total number of ascospores caught in the middle of the deposit line was counted under a light microscope.

Temperature, rainfall, dew, and leaf wetness were recorded in the orchard, using a standard 7-day recording hygrothermograph and a recording dew balance, Hiltner type (Lambrech Measuring Instruments).

RESULTS AND DISCUSSION

The earliest ascospore discharges were recorded on treated and untreated leaves on 23 August when trees were at the green tip stage of fruit bud development. Thereafter, similar trends but different levels of ascospore productivity were obtained with each treatment. The maximum ascospore production was obtained just after petal fall on 8 October, and the overall period of discharge lasted for more than 17 wk until late December. This period was longer compared with the overall ascospore discharge period determined for the apple scab fungus in Chile and other countries (1,3,4,8-10).

Of interest is the fact that the major output of ascospores was always recorded after periods of dryness. For instance, a low emission of ascospores was obtained from leaves removed from the orchard on 24 September, immediately after 5 rainy days, but the highest amount was obtained on 8 October, after a dry period of 14 days. This results from the continuing maturation and accumulation of mature spores within pseudothecia during the dry periods (Fig. 1). A similar situation was observed on 5 October and 20 November.

Urea and the new fungicides bitertanol and fenarimol were effective in inhibiting ascospore production. A significant reduction in the number of ascospores discharged between late August and the second week of December was obtained from treated leaves compared with those that were not treated (Table 1). The greatest reduction was achieved with fenarimol, which reduced ascospore productivity 95.6% when compared with untreated controls, followed by bitertanol (89%) and urea (79.8%). All treatments were significantly different from the controls at $P = 0.05$, and each treatment

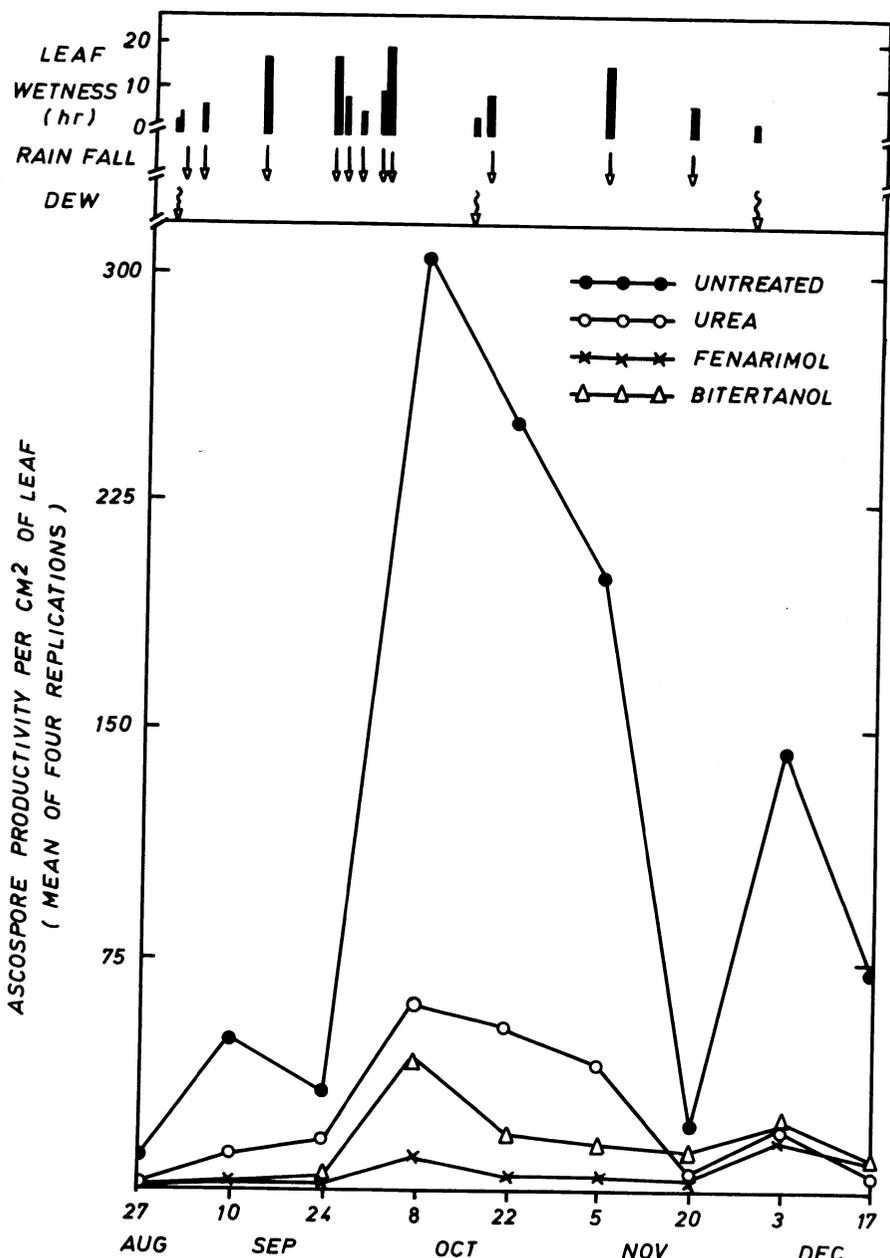


Fig. 1. Effect of late-season applications of bitertanol, fenarimol, and urea on ascospore productivity of *Venturia pirina*.

was also significantly different from each other (Table 1).

Reduction in production of *V. inaequalis* ascospores following fall treatments with urea and some fungicides (eg, benomyl) have been well documented (6,7), but there is little or no information

regarding the pear scab fungus. The results obtained in this experiment demonstrated that late-season applications of fungicides or urea may be useful for reducing the inoculum potential in the orchard during the following spring, particularly if heavy infection occurred

Table 1. Effect of late-season applications of bitertanol, fenarimol, and urea on the ascospore productivity of *Venturia pirina*

Treatment	Ascospore productivity ^y (no./cm ² of leaf)	Reduction ^z (%)
Fenarimol	48.12 d	95.6
Bitertanol	119.62 c	89.0
Urea	219.06 b	79.8
Untreated check	1,085.83 a	...

^yNumbers followed by the same letter are not significantly different ($P = 0.05$) according to Duncan's multiple range test.

^zWhen compared with the untreated check.

during the previous season. Nevertheless, spring spray application should still be necessary for getting satisfactory scab control. We recognize the need for further field work to evaluate the practical usefulness of fall treatments for scab control.

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