

# Pear Scab in Oregon

## Symptoms, disease cycle and management

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### Introduction

Pear scab is a disease of European and Asian pear. It has been an economic problem in Oregon orchards since 1932, potentially causing significant economic losses to producers from reduced value of damaged fruit. Control programs for preventing damage add significantly to the cost of production.

All commercially important pear cultivars produced in the U.S. are considered to be susceptible to pear scab. Pear scab is present in all pear growing districts of Oregon, in the White Salmon district of Washington, and in the coastal pear growing areas of California. Pear scab also occurs in most other pear producing regions of the world, including Europe, North and South America, Australia, New Zealand, South Africa, Japan, and Israel.

This publication describes disease symptoms and the disease cycle, and outlines an integrated approach to disease management. This approach may increase grower profits by optimizing fungicide use and reducing fruit losses.

### Cause and symptoms

Pear scab is caused by the fungus *Venturia pirina*, which infects leaves, fruit, and young twigs. On leaves and fruit, the disease appears as olive green to dark brown to black, velvety circular spots (lesions) (Figure 1). As the lesions age on fruit, the velvety look disappears and infected areas become cracked and corky (Figure 2).

Fruit lesions in the orchard are about  $\frac{1}{8}$  inch in diameter. Late-season fruit infections cause lesions that may not become visible until fruit have been in storage (Figure 3, page 2). These lesions are much smaller. Scab lesions on leaves are about  $\frac{3}{16}$  to  $\frac{3}{8}$  inch in diameter.



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Figure 1. Leaf and fruitlet of Bartlett pear showing scab lesions. Note the velvety appearance and irregular margins.



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Figure 2. Scab lesions on Bosc fruitlet. Notice the cracked, corky appearance of the largest lesion.

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Whether on leaves or on fruit, lesion margins are not smooth and sharp but irregular and diffuse. This distinguishes them from the many other spots commonly seen on pear fruit and foliage.

On young, actively growing shoots, velvety spots change to corky, canker-like areas as the season progresses (Figure 4). Twig lesions are not common in the Pacific Northwest, where the primary loss is from damaged fruit.

## Disease cycle

The annual cycle of fungus development and infection begins during the winter, in infected pear leaves that have fallen to the orchard floor at the end of the previous season. Microscopic spores (**ascospores**) are produced in these overwintering leaves and released during the following spring, starting at bud swell. Ascospores are released over a 3- to 4-month period, and the number of mature spores is highest during bloom.

Most ascospores are discharged when leaves become wet from rain or dew during daylight, but some are released at night. Ascospores are carried to young, susceptible leaves and fruit by air currents. For infection to occur, plant tissue must remain wet for 10 to 25 hours. The specific length of time depends on temperature during the wetness period (see Table 1, page 4). In general, cooler temperatures require longer wetness periods, and warmer temperatures require shorter wetness periods for an infection to occur. Symptoms appear about 2 to 3 weeks after infection.

A second spore type (**conidia**) is produced on newly infected tissue. Conidia can infect young leaves and fruit even after ascospore production has ended for the season, and several secondary cycles of infection may occur during the growing season.

Temperature and wetness conditions for infection with conidia are similar to those for ascospores; but, at temperatures less than 53°F,



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Figure 3. Scab lesions which developed on fruit in storage from late-season infections.



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Figure 4. The scab lesions on this twig of Bosc pear have progressed to canker-like areas with corky margins.

conidia need about 2 hours more wetness than ascospores. In areas where overhead irrigation is used, daytime irrigation and night dews may result in infection cycles additional to those resulting from rainy days.

Fully-expanded leaves are resistant to infection. Fruit are most susceptible to infection when young, but even mature fruit may become infected if wet periods last 24 hours or longer. Fruit that are infected a few weeks before harvest show symptoms after 2 to 6 months in storage.

*V. pirina*-infected leaves can survive in fruit storage bins kept in cold storage with controlled atmosphere and air. Bin transport among districts may explain long distance spread of pear scab.

## Control

Effective control of pear scab may be accomplished with well-timed applications of protectant and eradicant fungicides. The number of applications required depends on several factors, but under Oregon conditions pear scab usually is controlled with two to five fungicide applications.

A standard approach uses protective sprays initiated at the “pink” stage of flower development and applied every 10 to 14 days until ascospores are exhausted (late May to early June).

- Group 3 (Procure) and Group 11 (Flint, Pristine) fungicides have eradicant activity (“kickback”) and can be applied up to about 4 days after infection.
- Older fungicides such as dodine (Syllit) and the ethylenebisdithiocarbamates (mancozeb) are good protectants but have limited eradicant properties.
- Group 1 fungicides (Topsin M) are effective but their use is generally not recommended because of potential problems with fungicide resistance, especially in storage.
- Ziram and sulfur are moderately effective, but sulfur may cause damage to fruit on sensitive pear cultivars if used after bud scales drop.

### Use pesticides safely!

- Wear protective clothing and safety devices as recommended on the label. Bathe or shower after each use.
- Read the pesticide label—even if you’ve used the pesticide before. Follow closely the instructions on the label (and any other directions you have).
- Be cautious when you apply pesticides. Know your legal responsibility as a pesticide applicator. You may be liable for injury or damage resulting from pesticide use.

Several fungicide products from different chemical groups are available. Fungicides from **different groups** should be rotated to delay fungicide resistance. See the latest edition of the *Pest Management Guide for Tree Fruits in the Mid-Columbia Area* (EM 8203) for current recommendations regarding fungicides registered for pears in Oregon.

## The OSU-MCAREC model

A three-part model was developed at the Oregon State University Mid-Columbia Agricultural Research and Extension Center (OSU-MCAREC) to predict scab risk and help time fungicide sprays. Use of the three model features is discussed below.

### Part I. Delayed first spray

Leaf infection levels at the end of the season reflect the potential for new infections the following spring. The infection level can be used as a decision-making tool for omitting fungicide applications the following spring.

Determine the fall leaf infection level by counting the number of infected leaves on 10 shoots per tree on 10 trees (100 shoots total) in about a 2-acre area of the orchard that is most prone to scab. If the number of infected leaves is 5 or less, no fungicide spray is necessary when the following spring first infection period occurs. The first fungicide application can be delayed until the second infection period.

Note: Although the first scab spray may be delayed, a preventative fungicide application for powdery mildew is still advised at the “pink” stage of flower development for pears within 300 feet of an apple orchard.

### Part II. Pear scab infection periods

For ascospore infection of young leaves and fruit to occur, plant tissue must remain wet for a specific length of time that depends on temperature during the wetness period. The combination of wetness and temperature defines an **infection period** (Table 1, page 4).

Use the table during April and May to monitor infection periods and time fungicide applications. Spray within 96 hours of the **start** of the wet period with Group 3 or Group 11 fungicides to stop the infection.

**Note:** Protectant fungicides must be applied **before** wetness occurs.

This model feature has been adapted to a degree-hour calculator on the OSU Integrated Plant Protection Center (IPPC) web pages for the **Hood River** and **Medford** growing districts. Scab infection starts when 320 degree-hours have accumulated. Model options change periodically. For assistance with accessing the model through the IPPC web pages, contact your **local OSU Extension Service office**.

### Part III. End of ascospore season

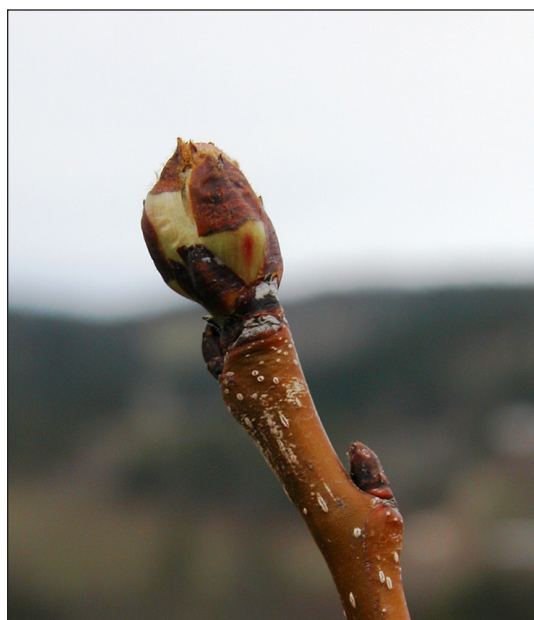
If an orchard is free of scab at the end of ascospore production, no additional fungicide applications are necessary for the season, regardless of subsequent infection periods. Maturity of ascospores of *V. pirina* is closely related to accumulated degree-days with a base temperature of 32°F, starting with a biofix when bud scales separate (stage 1, delayed dormant; Figure 5). The primary ascospore season ends when 1,620 degree-days have accumulated, followed by at least 0.01 inch of rain, dew, or irrigation for spore discharge.

This model feature has been adapted to the IPPC web page for **Hood River**. At the IPPC website, click on the “pear scab season” button for the appropriate weather station location. Then, click “calculate” to get the cumulative degree-days in the last column. Additional features of this web page are preset start dates (biofix) for each location and the option to use site-specific weather forecast data.

This scab model has been used at the OSU-MCAREC in Hood River since 2001. One to two fungicide sprays per year have been applied, and pear scab control has been excellent. Almost no scab has been found in the autumn evaluations, and the first spray of the season each year has been omitted. The ascospore season usually has ended between late May and mid-June, and no

**Table 1. Temperature and wetness conditions required for ascospore infection period.**

Average temperature during leaf wetness (°F)	Minimum hours of leaf wetness required for infection
44.6	25.1
46.4	21.8
48.2	19.1
50.0	16.8
51.8	14.9
53.6	13.5
55.4	12.4
57.2	11.6
59.0	11.0
60.8	10.6
62.6	10.4
64.4	10.4
66.2	10.4
68.0	10.4
69.8	10.4
71.6	10.3
73.4	10.1
75.2	9.7



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Figure 5. Pear bud showing the delayed-dormant stage of development, with bud scales separated, used to start Part 3 of the model (“End of ascospore season”).

sprays are applied after these dates, even when infection periods occur based on temperature and leaf wetness duration.

Several nonchemical methods should be used to lower inoculum in the orchard. These include application of dolomite lime to fallen leaves, mowing fallen leaves, and application of urea to leaves just before leaf fall. These practices are thought to speed the decay of leaves, reducing the number of ascospores causing primary infections the following season. Note that these practices do not eliminate the need for fungicides.

Integrating the nonchemical methods described above and fungicide applications optimized with the OSU-MCAREC three-part model can result in:

- Production of high-quality pears with reduced production costs
- Multiple benefits from lower pesticide use, such as lower risk of resistance development, reduced environmental loading of pesticides, and reduced pesticide exposure

## References

*2010 Pest Management Guide for Tree Fruits in the Mid-Columbia Area*. EM 8203. Castagnoli, S., H. Riedl, R.A. Spotts, L. Long, P. Shearer, J.W. Pscheidt, J. Olsen, and E. Peachey. 2010. Oregon State University Extension Service.

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Published May 2010.