Plant diseases: pear scab: control by fungicidal sprays

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Scab is an important fungal disease of pears in Western Australia. Serious fruit losses occur in orchards where spraying is neglected, poorly timed or inefficiently carried out. A full spray schedule, using a proven fungicide, must be adopted from spur burst onwards to ensure protection of fruit and foliage.

Previous recommendations published by the Department of Agriculture in 1958 have proved satisfactory for the control of pear scab or black spot, as it is commonly called. More recent research at Bridgetown and Parkerville has led to the inclusion of the newer fungicide dodine (Melprex) as an alternative fungicide in the spring spray schedule.

Cover sprays of dodine should prove useful for scab control, especially after petal fall when phenyl mercury fungicides cannot be used and also in very wet seasons. Adoption of the measures described below should result in full commercial control of this disease.

**SCAB CAN BE CONTROLLED**

It has been amply demonstrated that clean fruit can be produced in one year in any orchard with a previous history of severe scab. If scab still occurs in the orchard this may be due to an insufficient number of spray applications or the use of inadequate spray equipment.

Growers should be aware of the need to spray early and so prevent the disease from becoming established. By the time scab is noticed on the fruit it is too late to attempt eradication by spraying with fungicides. Also it is useless to attempt scab control if the equipment cannot deliver the spray at a sufficiently high pressure. A further important factor is thorough coverage of fruit and foliage.

**TIMING OF SPRAYS**

Research work in the past season at Dinninup and Parkerville has not only confirmed the value of the basic spring spray schedule but also pointed to the need for timing of sprays in relation to rainy periods.

Spraying is normally based on growth stages as indicated later but, if missed because of wet weather, should be carried out as soon as possible (within 24-48 hours) after the onset of rain when this is practicable. At Parkerville, complete control of scab was achieved by adopting a spray schedule based on wet periods rather than growth stages.

**RUSSET FREE CROPS**

The fungicides recommended for scab control are not only highly effective against the disease but also allow russet-free crops to be harvested. Consequently they are preferred to Bordeaux mixture or other copper-containing fungicides which are always prone to cause russetting on some varieties of pears. Nevertheless, some
growers may prefer to use a copper-containing fungicide as a spur burst spray. Such a spray has not been found to be superior to the organic fungicides such as captan and dodine ("Melprex") but it is still a useful spray providing it is not used on russet-labile varieties at any stage.

**VARIETIES AFFECTED**

The varieties of pears vary in their susceptibility to attack by the scab fungus. Bartlett, Josephine and Packham's Triumph are very susceptible while Kieffer and Comice are more resistant. However these latter varieties, which often show little fruit infection, still develop severe foliage scab, which is detrimental to growth.

**DISEASE SYMPTOMS**

The scab fungus (*Venturia pirina*) produces easily recognisable spots on the fruit and foliage in spring and early summer. Less conspicuous are the small pustules formed on the current season's shoots of some pear varieties.

**Blossom Infection**

Small black spots are commonly found on flower stalks and beneath the calyx portion during or following the blossoming period. Affected blossoms often drop, causing a considerable reduction in fruit set.

**Fruit Spots**

Pin-point black spots develop on affected fruit and, under favourable conditions, rapidly enlarge to cover a considerable area of the skin. The typical dull olive-green or black colour of the spots is due to the formation of enormous numbers of spores (fungal seeds) known as conidia.

Extensive scabbing at an early stage of fruit development produces malformed pears which are unmarketable at harvest.

Both small and large spots may occur on the same fruit as a consequence of separate infections occurring during the season (Fig. 1). The later infections cause pock-marking, which is also unsightly.

**Leaf Spots**

Small, slightly sunken, dark spots form on the undersurface of leaves. These spots enlarge (Fig. 2) and assume a dull olive-green colour similar to that of the fruit spots. Large spots cause curling and malformation of the leaves and give the upper surface a blistered appearance.

**Shoot Pustules**

On some pear varieties, including Winter Nelis, small pustules or blistered areas are formed on the current season's shoots. These pustules persist until the following spring (Fig. 3).
LIFE CYCLE OF THE SCAB FUNGUS

The pear scab fungus overwinters from one season to the next as mycelium (fungal threads) in fallen leaves and, much less commonly, in infected shoots. During the winter the fungus continues to grow in the dead leaf tissues and produces minute flask-like fruiting bodies known as perithecia.

Two-celled spores, known as ascospores, develop in these perithecia and when mature are forcibly discharged into the air. Wetting of the fallen leaves by rain, or possibly heavy dew, is necessary to bring about this discharge of ascospores. Depending upon weather conditions these spores are ejected from the perithecia at intervals, commencing before bud burst in September and continuing until the end of November. They can be blown for considerable distances by wind and so are able to infect other orchards.

Moisture must also be present on the leaves and fruit before the ascospores which have fallen on them can germinate and infect the tissues. Showers of rain therefore serve a dual purpose in releasing ascospores into the air and permitting infection of new growth on the trees.

Fig. 2.—Pear leaves showing black spots typical of the disease

Fig. 3.—Small pustules on one year old shoot of Winter Nelis variety resulting from scab attack the previous growing season
Study of the life cycle of the pear scab fungus has resulted in the following control methods:

1. Fungicidal sprays applied in spring and summer protect foliage and fruit against infection by ascospores and conidia, and

2. Fungicidal sprays applied after harvest but before leaf fall prevent formation of perithecia. This is supplementary to method (1).

Depending on subsequent temperatures the typical fruit and leaf spots become obvious some two or three weeks after infection occurs.

A different type of spore, the one-celled conidium, develops in large numbers in the leaf and fruit spots. These spores are spread by rain and wind, causing infections additional to those produced by the ascospores.

Diseased leaves which fall to the ground in the autumn enable the fungus to complete its life cycle.

CONTROL IN RELATION TO LIFE CYCLE

From a study of the life cycle of the fungus has come the concept of attempting scab control in two ways, the second method supplementing the first:

- Apply fungicidal sprays to prevent spring infection from ascospores and subsequently from conidia.
- Prevent carry-over of the fungus in fallen leaves in autumn, so stopping ascospore production in the following spring.
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Referring to the first method of control, a clean crop can be assured only by adopting a regular fungicidal spray programme in spring and early summer.

Following the standard recommendations made in 1958 for the use of captan and phenyl mercury compounds, recent spray trials conducted at Bridgetown, Dinninup, Bedfordale and Parkerville have confirmed the value of dodine (Melprex) as an alternative fungicide. In addition to protecting foliage and fruit from infection, dodine, like the captan plus phenyl mercury combination, has the ability to eradicate or kill out recent infections by the fungus. This can only be done if the fungicide is applied within 48 hours of the beginning of infection. The infection is considered to start at the onset of a rainy period.

A supplementary method of control is suppression of the formation of perithecia in fallen leaves by chemical means. This method was first developed by the New South Wales Department of Agriculture for use against the closely related apple scab disease. It consists of spraying infected orchards after harvest but before leaf fall with phenyl mercuric chloride or phenyl mercuric nitrate fungicide.

This supplementary method of control is particularly recommended for orchards with a history of severe scab. Complete eradication of the fungus in fallen leaves has resulted from the use of phenyl mercuric chloride at 0.1 per cent. strength (2.5 lb. of 40 per cent. wettable powder formulation) but such a spray is costly.

ACKNOWLEDGMENTS

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Thanks are also due to Messrs. R. Cahill and J. Hart, Horticultural Instructors, for their assistance in conducting the spray trials.

CONTROL MEASURES

In orchards where scab is a problem the disease can be controlled by a routine spray schedule each season.

A. SPRING AND EARLY SUMMER SPRAY SCHEDULE

The recommended schedule of spring and early summer sprays for pear scab control is detailed on the opposite page. The illustrations are a guide to the timing of applications which should start at spur burst.

Aspect and air drainage of an orchard have a direct bearing on the number of sprays required in the schedule. Low-lying moist situations need the maximum for adequate protection of fruit against scab.

Because of risk of spray injury the phenyl mercury fungicides should not be used on the Josephine variety at any stage and not later than petal fall on all other varieties.

It is important to realise that infection of fruit and foliage occurs during prolonged periods of showery weather, and adjust spray programmes accordingly. If any of the sprays cannot be applied because of wet weather they should then be applied as soon as possible (within 24-48 hours) after the onset of rain.

B. AUTUMN POST-HARVEST SPRAY SCHEDULE

Pre leaf-fall applications of a suitable phenyl mercury fungicide should be applied after harvest.

Suitable sprays are:

**Phenyl mercuric chloride** (40 per cent. wettable powder)—4 oz. in 100 gallons (0.01 per cent.); or

**Phenyl mercuric nitrate** (7 per cent. wettable powder)—1.5 lb. in 100 gallons (0.01 per cent.).

Thorough spraying of trees is essential to ensure coverage of both surfaces of leaves. Add a suitable wetting agent to the spray vat.
GUIDE TO SPRING AND EARLY SUMMER SPRAYS

1.—SPUR BURST

Dodine ("Melprex")—\(\frac{3}{4}\) lb. in 100 gallons,

or

Captan—2 lb. in 100 gallons,

or

Captan—1\(\frac{1}{4}\) lb. in 100 gallons,

with either

(a) 2 oz. (40 per cent.) Phenyl mercuric chloride ("Stop spot," "No spot," "PMC spray," "Spotspray"

or

(b) 12 oz. (7 per cent.) Phenyl mercuric nitrate ("Mertan").

• Do not use phenyl mercury fungicides on the Josephine variety.

• Add a suitable wetting agent such as Agral B.A.S.F., Colloidal X-77, Plus 50, Triton, etc.

2.—WHITE BUD

Spray as for spur burst.

3.—FULL BLOOM

Captan—2 lb. in 100 gallons water; or

Dodine—\(\frac{3}{4}\) lb. in 100 gallons water.

Spraying at this stage would be valuable in wet seasons and on varieties in which the interval between white bud and petal fall exceeds 14 days.

4.—PETAL FALL

Spray as for spur burst.

5.—AFTER PETAL FALL

Spray at 12-14 day intervals, if required, with

Captan—2 lb. in 100 gallons water,

or

Dodine—\(\frac{3}{4}\) lb. in 100 gallons water.

6.—DURING THE SUMMER, IMMEDIATELY AFTER A PERIOD OF PROLONGED DRIZZLY RAIN

Dodine—\(\frac{3}{4}\) lb. in 100 gallons water.

This spray would only be necessary in orchards where the scab has not been successfully controlled in the spring.
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