SAPPA GOOD PRACTICE GUIDE

Pecan scab management

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1. Introduction to pecan scab in South African pecan orchards

Pecan scab is a fungal disease that affects developing nuts, leaves and young green stems. Fungi associated with pecan scab have been found across South Africa's pecan-growing areas, but the disease is mainly a concern in humid production regions such as Limpopo, Mpumalanga, KwaZulu-Natal and the Eastern Cape, where environmental conditions favour disease development.

South African research has linked pecan scab to several closely related fungi in the *Cladosporium cladosporioides* species complex, many of which were reported in the country for the first time. These findings differ from the United States of America, where *Venturia effusa* is the recognised cause of pecan scab. There is considerable genetic diversity in the *Cladosporium cladosporioides* species complex in South Africa, and this diversity could influence their ability to cause disease and their response to control measures, although its practical effect on control is not yet established.

Early infection damages the green husk and can restrict nut growth, leading to nut drop and crop loss. Damaged husks may also crack, allowing other fungi to enter and affect nut quality. Infections that develop later in the season, after nut filling, generally have a smaller effect on yield.



The fungi associated with pecan scab occur in all pecan production areas of South Africa. However, the wetter, more humid eastern regions (shaded green) favour disease development more than the drier production areas (shaded orange).

2. Identification

2.1 Symptoms of nuts

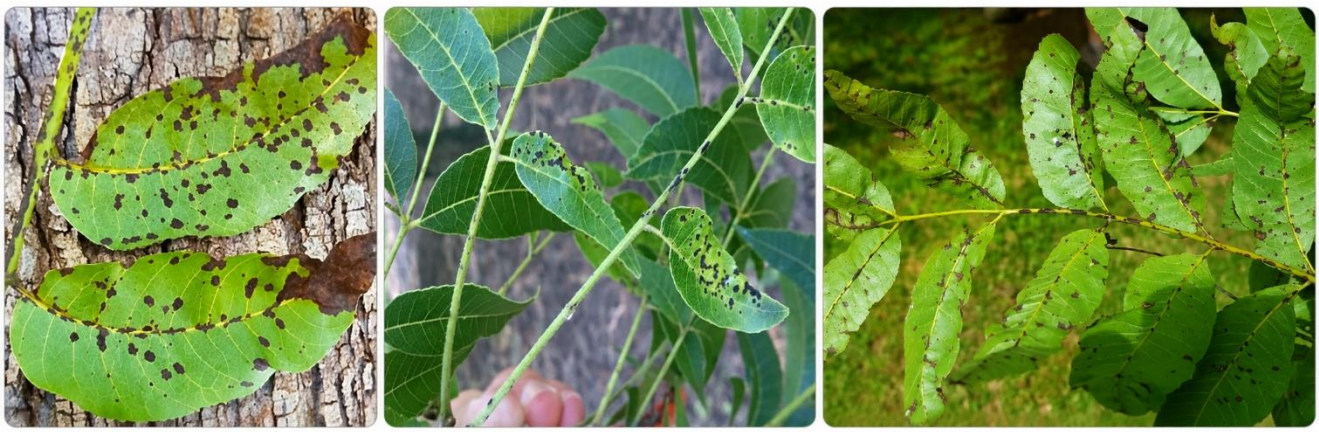
Pecan scab typically begins as small brown or black spots on the green husk. Young spots may appear powdery. As the lesions mature, they darken and release airborne fungal spores, leaving a black, crust-like surface. The spots may enlarge and merge, covering larger areas of the husk. Severe infection can restrict nut expansion and cause affected nuts to drop. Husk damage may also lead to cracking, creating entry points for secondary fungi such as pink mould.



Typical coalesced brown or black spots or lesions on the green husk characteristic of pecan scab.

2.2 Symptoms on leaves and stems

Scab can cause brown to black spots on leaves and darkened areas on young green stems. Leaf spots may enlarge and join to form larger patches of dead tissue. Severe scab can occur on nuts without obvious symptoms on nearby leaves.



Leaf spots on pecan stems and leaves.

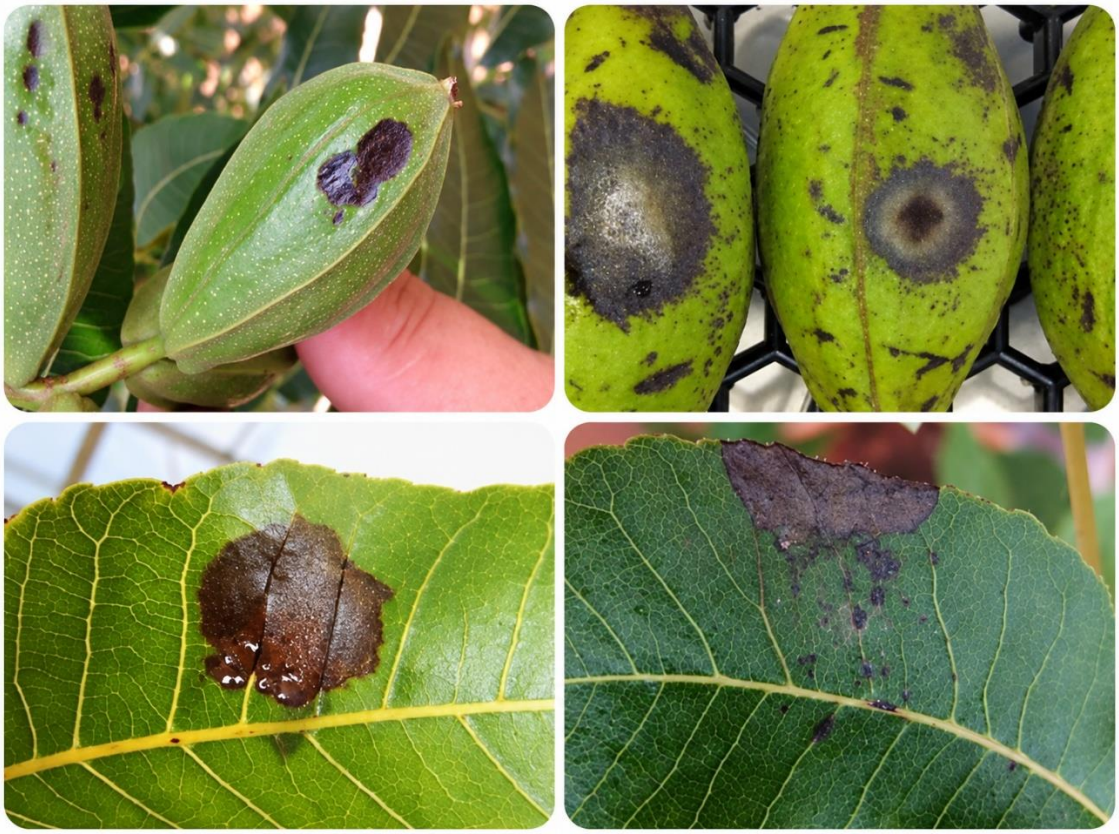
2.3 Distinguishing scab from other diseases

Other fungal diseases can also cause dark lesions on pecan nuts and leaves. The table below highlights the differences between pecan scab, black blotch and Alternaria black spot.

	Pecan scab	Black blotch	Alternaria black spot
Agent	*Cladosporium cladosporoides*	*Neufusicoccum parvum*	*Alternaria alternata*
Symptoms of nuts	Small brown or black spots on the green husk. Young spots may appear powdery. As lesions mature, they darken and release airborne fungal spores, leaving a black, crust-like surface. The spots may enlarge and merge, covering larger areas of the husk.	Rapid blackening of nuts, affecting the entire husk within a short period.	Sunken round black lesions.
Symptoms of leaves	Brown to black spots on leaves. Leaf spots may enlarge and join to form larger patches of dead tissue.	Brown discolouration of leaves normally develops between veins, resulting in square necrotic lesions. Although the progression of the black discolouration of the nuts is rapid, leaf necrosis is mostly limited to small parts of a leaflet.	Brown, often circular lesions on leaves not limited between the veins. Lesions may start on the edge of the leaflets from where they spread and can affect a substantial part of the leaflet.



Black blotch symptoms on pecan nuts and leaves.



Alternaria black spot symptoms on pecan nuts and leaves.

3. Integrated pest management of scab

Integrated Pest Management (IPM) combines prevention, monitoring and targeted intervention to reduce disease damage and unnecessary pesticide use. For pecan scab, the aim is to recognize periods of increased risk and protect susceptible growth stages at the correct time.

3.1 Prevention

3.1.1 Know the risk in your orchards

Keep records of blocks and cultivars that have experienced pecan scab. These records help identify where closer monitoring and early protection are most important. Typical scab symptoms are mainly observed in Limpopo, Mpumalanga, KwaZulu-Natal and the Eastern Cape. However, *Cladosporium* fungi are found in all pecan production regions. Growers in drier areas should therefore remain alert when conditions become unusually humid.

3.1.2 Consider cultivar susceptibility

Cultivar selection is an important part of pecan scab management, especially in the warmer, more humid production regions where disease manifests. When establishing an orchard, consider disease susceptibility together with yield, nut quality, pollination requirements and suitability for the production area.

3.1.3 Improve airflow through the orchard

Good air movement helps the canopy dry, reducing conditions that favour fungal diseases, and improves access for spraying. Dense, shaded growth retains moisture and can encourage disease development. Manage overcrowding through appropriate pruning and, where necessary, planned thinning. Pay particular attention to overlapping canopies and sheltered areas that remain humid.

3.1.4 Maintain tree health

Provide irrigation and nutrition according to tree requirements and soil and leaf analyses. Address drainage problems, nutrient deficiencies and other sources of stress. Good tree health supports overall disease management, but it does not replace pecan scab protection where infection risk is high.

KEY TAKE HOME MESSAGE

Reduce scab risk through suitable cultivar selection, good canopy airflow and early protection of susceptible growth.

3.2 Monitoring

Monitoring should begin early in the growing season and continue while susceptible growth and developing nuts are present. It should combine physical orchard scouting with an assessment of weather conditions and crop development. High humidity is an important factor in pecan scab disease expression. Pay closer attention during wet or humid periods, particularly in blocks with previous pecan scab problems. Record rainfall and note whether leaves and nuts remain wet or the canopy dries slowly.

3.2.1 Scout leaves, stems and nuts

Inspect different parts of each block, including:

- Cultivars and trees with a history of scab
- Dense or sheltered areas
- Young leaves and green stems
- Developing nuts and nut clusters

Check both the inside and outside of the canopy, on nuts as well as leaves. Where practical and safe, assess upper branches as well. Look for new spots, enlarging lesions, husk cracking and affected nuts dropping from trees. Do not assume that clean leaves mean the nuts are free of pecan scab.

3.2.2 Keep useful records

Record the block, cultivar, date, crop stage and symptoms observed. Take photographs of affected nuts and leaves to help track changes. Keep scouting records alongside spray records. Together, they help show whether protection was applied at the right time and whether disease is concentrated in particular blocks or parts of the canopy.

KEY TAKE HOME MESSAGE

Scout nuts as well as leaves and stems, paying particular attention during wet or humid periods and in blocks with a history of scab

3.3 Intervention

3.3.1 Protect the crop early

Fungicide programmes in pecan scab-prone orchards need to start early in the season as early infection is particularly damaging because the nuts are still expanding. Management should therefore focus on protecting susceptible growth and developing nuts before significant disease establishes.

Fungicides form part of an integrated pecan scab-management programme. Their effectiveness depends on correct timing, appropriate product selection and good coverage. Use only products registered for the intended use on pecans in South Africa. Follow the label for application rates, intervals, maximum applications, withholding periods and safety requirements.

Active ingredient	FRAC Group	How it works	Practical implication
Azoxystrobin	11	Blocks fungal respiration, preventing energy production.	Best used preventatively. Avoid repeated applications of Group 11 fungicides.
Azoxystrobin + difenoconazole	11 + 3	Combines inhibition of fungal respiration with disruption of cell membrane formation.	Combines two modes of action. Rotate with products outside both groups where possible.
Chlorothalonil	M5	A contact fungicide that disrupts several processes in fungal cells.	Protects treated surfaces; thorough coverage is essential. Does not cure established infections.
Difenoconazole	3	Inhibits sterol production needed to form fungal cell membranes.	Has systemic activity. Apply preventatively or early in infection, according to the label.
Fentin hydroxide	30	Disrupts fungal energy production by inhibiting ATP synthesis.	A non-systemic fungicide; good coverage of susceptible tissue is important.
Propiconazole	3	Inhibits sterol production, disrupting fungal cell membrane formation.	Has systemic activity. Alternating with difenoconazole does **not** constitute rotation between FRAC groups.
Potassium bicarbonate	NC	Acts on the fungal surface, disrupting conditions needed for spore germination and growth.	Contact activity requires thorough coverage. Follow label instructions for concentration and compatibility.
Pyraclostrobin	11	Blocks fungal respiration, preventing energy production.	Best used preventatively. Alternating with azoxystrobin does **not** constitute rotation between FRAC groups.

FRAC = Fungicide Resistance Action Committee; M = multisite activity; NC = not classified. Modes of action follow FRAC classification.

3.3.2 Resistance management

Repeated use of fungicides with the same mode of action can favour resistant fungi and reduce control over time. The registered pecan fungicides comprise eight active ingredients across five FRAC groups, so plan rotations carefully to alternate between different FRAC groups, as changing products or active ingredients alone may not change the mode of action. Follow label restrictions on consecutive applications and the total number of applications per season. For mixtures, consider the FRAC groups of all active ingredients when planning subsequent sprays.

KEY TAKE HOME MESSAGE

Successful scab management starts before symptoms become widespread. No single practice provides complete scab control. An integrated programme brings together airflow, monitoring and timely fungicide applications to protect yield and nut quality.