



**NORTHERN**

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# SAFFLOWER

## SECTION 9

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## DISEASES

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ALTERNARIA BLIGHT (CAUSED BY ALTERNARIA CARTHAMI) |  
PHYTOPHTHORA ROOT ROT (CAUSED BY PHYTOPHTHORA CRYPTOGEA) |  
RUST (CAUSED BY PUCCINIA CARTHAMI) | OTHER DISEASES

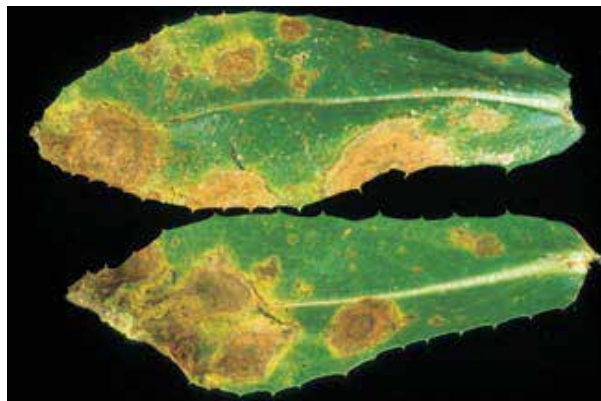
# Diseases

Several diseases can infect safflower, especially in warm and humid conditions. No fungicides are registered for disease control in safflower in Australia; however, some success has been achieved with seed- and foliar-applied products in other countries, including the United States.

Control of safflower diseases in Australia relies mainly on using appropriate crop rotations, selecting resistant varieties, using clean seed, controlling volunteer and weed hosts, using sound irrigation practices and selecting appropriate soils. Many safflower diseases are hosted on stubble, volunteer plants, other *Carthamus* species (e.g. saffron thistle) and some broadleaf crops. The main diseases of safflower in Australia are described below.

## 9.1 Alternaria blight (caused by *Alternaria carthami*)

Alternaria leaf blight (Figure 1) is the most serious disease of safflower, with heavy infection reducing yield by  $\geq 50\%$ . Infected seed is often smaller with reduced oil content.



**Figure 1:** *Alternaria blight* infection on safflower leaves.

Photo: Hans Henning Mündel

### 9.1.1 Varietal resistance or tolerance

The cultivar Sironaria was bred by CSIRO in 1987 with resistance to Alternaria blight.

### 9.1.2 Damage caused by the disease

Alternaria blight is a fungal disease that attacks leaves, stems, heads and seeds. Transmission may be on infected seed or airborne spores released from crop residue for up to 2 years.<sup>1</sup>

### 9.1.3 Symptoms

Infected seeds may have typical sunken lesions on the seedcoat, but they can also appear healthy. Seedborne infection results in reduced germination, death of plants at pre-emergence stage and death or malformation of seedlings. Initial symptoms in established plants often appear as large, brown, irregular spots (lesions) on the lower

<sup>1</sup> N Wachsmann, T Potter, R Byrne, S Knights (2010) Raising the bar with better safflower agronomy. Agronomic information and safflower case studies. GRDC, <http://www.grdc.com.au/BetterSafflowerAgronomy>

leaves. With warm and humid conditions, the disease then spreads up the plant to infect the upper leaves, stems, flower head, and eventually the seeds.<sup>2</sup>

### 9.1.4 Conditions favouring development

Rainfall and high temperatures, or humidity during and after flowering, are the conditions most favoured by *Alternaria* blight. It can occur in all safflower-growing regions, but it is often more prevalent in northern regions because temperatures in late spring are often warmer and the chance of summer rainfall is higher. Losses can be minimised by avoiding poorly drained soils and by using sound irrigation practices that minimise the incidence of waterlogging.<sup>3</sup>

### 9.1.5 Management of the disease

Control of *Alternaria* blight is largely preventative via careful crop rotation, stubble management and control of volunteer hosts. Sowing at the correct time is also important to minimise the chance of warm, humid conditions after flowering. Seed from infected crops should not be used as planting seed, and resistant cultivars such as Sironaria are available.<sup>4</sup>

## 9.2 Phytophthora root rot (caused by *Phytophthora cryptogea*)

Phytophthora root rot (Figure 2) can be an unpredictable fungal disease and it usually occurs in wet soils, especially when temperatures are high. It is present in all growing areas, but is most prevalent in irrigated crops, where yield may be significantly reduced depending on the timing and extent of infection. Losses tend to be most serious as crops approach maturity. Spread is by spores, which can be transported by wind, rain splash, surface drainage and waterways.



**Figure 2:** Patches of dead plants due to *Phytophthora* root rot.

Photo: Bob Colton

### 9.2.1 Varietal resistance or tolerance

The cultivar Sirothora was bred by CSIRO in 1987 with resistance to *Phytophthora* root rot.

2 N Wachsmann, T Potter, R Byrne, S Knights (2010) Raising the bar with better safflower agronomy. Agronomic information and safflower case studies. GRDC, <http://www.grdc.com.au/BetterSafflowerAgronomy>

3 N Wachsmann, T Potter, R Byrne, S Knights (2010) Raising the bar with better safflower agronomy. Agronomic information and safflower case studies. GRDC, <http://www.grdc.com.au/BetterSafflowerAgronomy>

4 N Wachsmann, T Potter, R Byrne, S Knights (2010) Raising the bar with better safflower agronomy. Agronomic information and safflower case studies. GRDC, <http://www.grdc.com.au/BetterSafflowerAgronomy>

### 9.2.2 Symptoms

This disease can infect seedlings, but more often plants are not affected until flowering. *Phytophthora* root rot usually becomes evident 4–5 days after rain or irrigation. Plants may dry out, appear bleached and collapse in a short time. Lower stems and roots are often discoloured and become rotted.

As the plants die, they take on a bleached appearance and the base of the stem and the roots become completely dark. Plants may die individually or in patches that often coincide with low-lying or poorly drained areas where surface water has accumulated around the plants.<sup>5</sup>

### 9.2.3 Conditions favouring development

The disease is favoured by wet, warm soil temperatures >25°C. Plants in low-lying areas of paddocks are most susceptible. *Phytophthora cryptogea* is hosted on a wide range of crops, harboured in the soil and has the ability to survive for long periods in the absence of preferred hosts. *Phytophthora cryptogea* can infect the fine roots of mayweeds without causing obvious symptoms.<sup>6</sup>

### 9.2.4 Management of the disease

Once infected, plants usually die. Losses can be minimised by avoiding poorly drained soils and by using sound irrigation practices that minimise the incidence of waterlogging. The risk of this disease is one of the reasons that many advisers recommend safflower not be irrigated after flowering.

Losses can also be minimised by controlling weeds during fallow to reduce the amount of inoculum present and by growing resistant varieties, especially where crops are irrigated.<sup>7</sup>

## 9.3 Rust (caused by *Puccinia carthami*)

Safflower rust (Figure 3) is often seen on older leaves late in the season, but significant yield losses usually require warm and humid conditions earlier in the growing season.

The fungus is borne on seed or soil, and spores from infected plants or crop residues are the main method of spread both within and between crops. Spores can survive on infected stubble from one season to the next and can be spread long distances by wind.<sup>8</sup>



Figure 3: Rust pustules on a safflower leaf.

- 5 N Wachsmann, T Potter, R Byrne, S Knights (2010) Raising the bar with better safflower agronomy. Agronomic information and safflower case studies. GRDC, <http://www.grdc.com.au/BetterSafflowerAgronomy>
- 6 N Wachsmann, T Potter, R Byrne, S Knights (2010) Raising the bar with better safflower agronomy. Agronomic information and safflower case studies. GRDC, <http://www.grdc.com.au/BetterSafflowerAgronomy>
- 7 N Wachsmann, T Potter, R Byrne, S Knights (2010) Raising the bar with better safflower agronomy. Agronomic information and safflower case studies. GRDC, <http://www.grdc.com.au/BetterSafflowerAgronomy>
- 8 N Wachsmann, T Potter, R Byrne, S Knights (2010) Raising the bar with better safflower agronomy. Agronomic information and safflower case studies. GRDC, <http://www.grdc.com.au/BetterSafflowerAgronomy>

**i MORE INFORMATION**

[Sunflower disease management.](#)

 MORE INFORMATION

[Sources of \*Alternaria carthami\* inoculum in safflower](#)

[\*Phytophthora drechsleri\* Tucker and \*Pythium\* spp. as pathogens of safflower in NSW](#)

[Environmental factors influencing safflower screening for resistance to \*Phytophthora cryptogea\*](#)

[Survival of \*Alternaria carthami\* on safflower residue](#)

[Fungi associated with root rot of irrigated safflower in the Namoi Valley, NSW](#)

Photo: Bob Colton

### 9.3.1 Symptoms

Rust pustules can appear at the base of seedlings, which can collapse and die. In mature plants, rust first appears on the upper leaf surface as small yellow pustules, and on the lower leaf surface or stems at ground level as white pustules. As the disease progresses, the pustules enlarge to form reddish brown pustules up to 3 mm in diameter, which may be bordered by a yellow rim. The spores feel like talcum powder when rubbed between the fingers. Severe infection results in premature leaf drop.<sup>9</sup>

### 9.3.2 Conditions favouring development

As with most fungal diseases, safflower rust favours warm, humid conditions where cycles of spore development may occur every 10–14 days.<sup>10</sup>

### 9.3.3 Management of the disease

The main ways to manage rust in Australia are sound crop rotations, control of volunteer safflower plants and use of clean seed.<sup>11</sup>

## 9.4 Other diseases

Other, less prevalent diseases of safflower include seedling damping off, grey mould, charcoal rot, leaf spot and Sclerotinia head rot. Most are favoured by warm, humid conditions or waterlogging and can be managed by paddock selection, sound crop rotations and use of clean seed.

Further advice on managing diseases in safflower can be obtained from plant pathologists or your local agronomic adviser.<sup>12</sup>

9 N Wachsmann, T Potter, R Byrne, S Knights (2010) Raising the bar with better safflower agronomy. Agronomic information and safflower case studies. GRDC, <http://www.grdc.com.au/BetterSafflowerAgronomy>

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