ALTERNARIA CORE ROT

Alternaria complex

1 PATHOLOGICAL PROFILE

1.1 Distribution and status

Alternaria-core rot, also known as navel-end rot and black rot, occurs in all areas of southern Africa. The disease is most prevalent on those citrus cultivars such as navels and Clementines characterised by the presence of a secondary fruit called the fruit-navel, which varies in size and develops at the stylar end of the primary or main fruit. These fruitlets are extremely sensitive to environmental stress conditions during early stages of development and are therefore also prone to diseases such as navel-end rot and physiological disorders.

Infected fruit colour prematurely and if they do not drop, later develop a deeper orange colour than healthy fruit. The difference in colour of fruit at the time of packing is not always enough to aid the grading out of infected fruit. The disease is also a problem for the processing industry, because only a small amount of rot imparts a bitter flavour to the juice and small black fragments of rotten tissue spoil its appearance.

1.2 Description

The spores, called conidia, are the primary source of infection during blossom. The microscopic, diagnostic features of *Alternaria* core rot are as follows:

Conidia are produced solitarily or in chains, ranging in shape from ellipsoidal to obclavate and are dark blackish-brown in colour. Transverse and longitudinal septa range in numbers from one to six and up to three, respectively. Conidia are beakless when ellipsoidal, or with a cylindrical beak, 3 to 4 µm in diameter and up to 13 µm long.

1.3 Symptoms

Alternaria core rot is linked to large fruit-navels or to the abnormal growth of the secondary fruit into primary-fruit locules (a in Fig. 6.1), which leads to the formation of points of entry through which fungi can penetrate to form infections which remain quiescent until favourable conditions stimulate further fungal growth.

1.3.1 Blossoms

The style and stigma of navel blossoms are milky white at first and then turn light brown in colour and abscise cleanly. This happens one week after petals have dropped and young fruit are ± 8 mm in size. The two sets of stylar tissue present in the primary and secondary fruit locules can be injured during the blossom period if harsh weather conditions prevail for one or more days (hot days >25°C), and low relative humidity (<20%) followed by heavy dew during the evenings. This causes the outer or primary style to turn brown and dry out, while the inner or secondary style remains unaffected inside the outer style and continues to develop and swell in size to result in longitudinal cracks in the outer tissue (b & c in Fig. 6.1). The longitudinal cracks enlarge as the orange increases in size. The inner ovary projects even more as the orange approaches maturity. This results in a large, irregular-shaped navel-end and creates an ideal site for *Alternaria* infections (d & e in Fig. 6.1).

1.3.2 Young fruit

When young fruit is sectioned longitudinally it can be observed that the secondary ovary passes straight down the centre of the primary ovary to be connected at the ovules. Although the secondary ovary is attached at the base, it fits loosely in the primary ovary and there may be a space (or opening to the exterior) through which the fungus can penetrate almost to the heart of the fruit (c & d in Fig.6.1).

1.3.3 Mature fruit

It has also been reported that where *Alternaria* rot may develop during storage, some fruit may have protrusions of tissue from the secondary fruit into primary fruit segments. These protrusions are probably other rudimentary fruitlets which form in addition to the secondary fruit. This phenomenon may result in the rupturing of juice vesicles stimulating growth of *Alternaria* and fruit infection (f in Fig.6.1). In advanced stages of development of large navel-ends, strains and pressures from the large

navel-ends can also cause splits and rupturing of juice vesicles which stimulate *Alternaria* decay development. These protrusions were also observed in Minneola tangelos where rupturing of juice vesicles lead to *Alternaria* decay.

1.4 Transmission

Spread of the disease from one tree or orchard to another is by airborne spores produced within rotten fruit. Mealybugs are also known to serve as vectors of the disease.

1.5 Seasonal occurrences

Although the pathogen is present throughout the year, symptoms only occur as fruit mature.

2 MANAGEMENT ASPECTS

Commercial control of *Alternaria* core rot can only be achieved through the use of systemic fungicides such as tebuconazole (Horizon, 25% EW) and difenoconazole (Score, 25% EC).

Table 6.2. *Alternaria* core rot control programmes

Fungicides	Dosage/100 ℓ water	Timing of sprays *
Horizon	80 ml	50% + 100% petal fall
Score	50 ml	50% + 100% petal fall

* Uneven flowering over an extended period of time will result in reduced efficacy of triazoles. Due to the characteristics of the disease and the effect of unpredictable weather conditions, control may be variable and may not meet the standards required for export fruit.

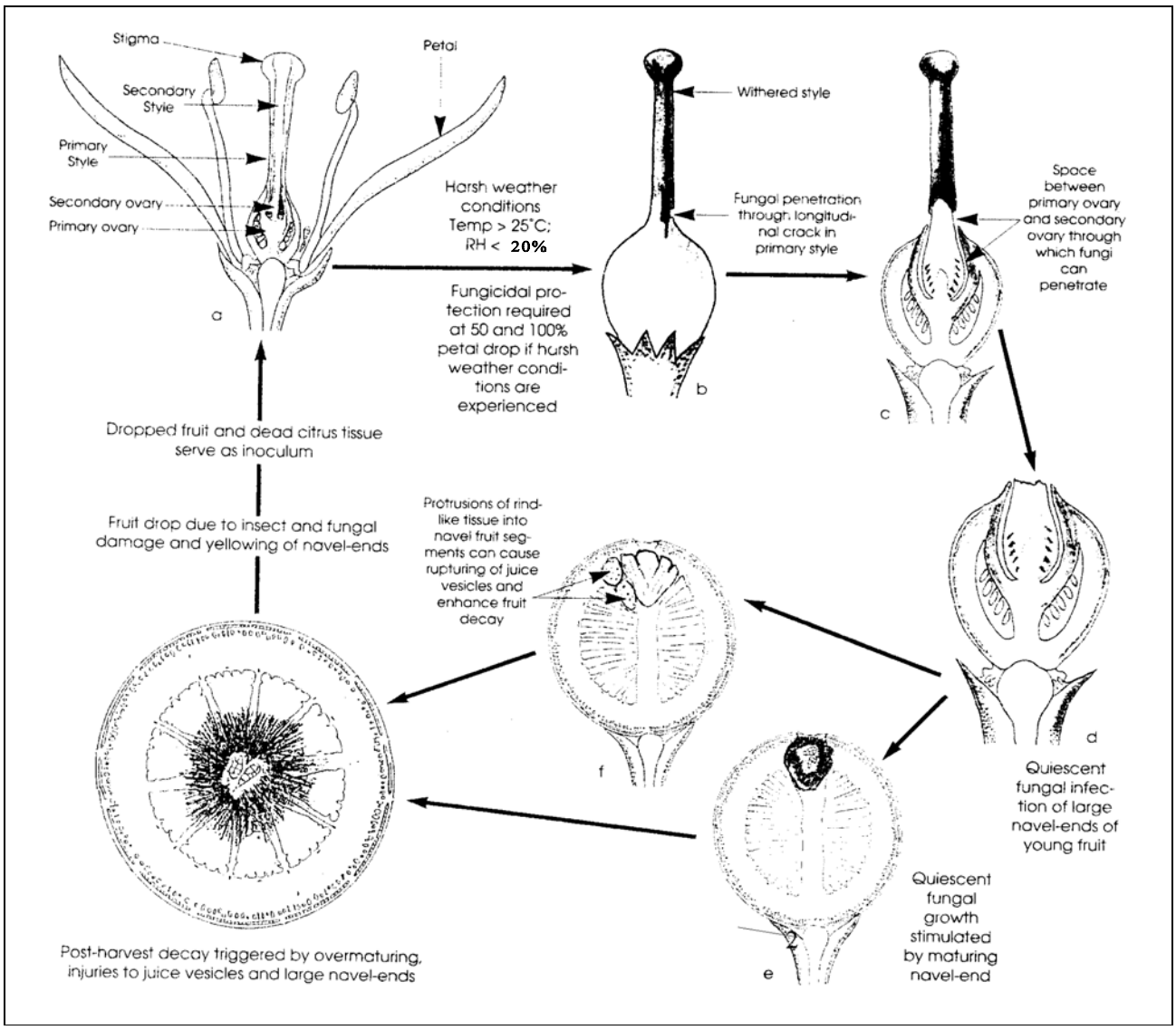

Figure 6.1. Disease cycle of navel-end rot caused by *Alternaria citri*