



**ANNUAL GENERAL MEETING**  
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# ETIOLOGY AND MANAGEMENT OF POST-HARVEST FUNGAL DISEASES IN POMEGRANATE (*PUNICA GRANATUM*) FRUIT IN SOUTH AFRICA

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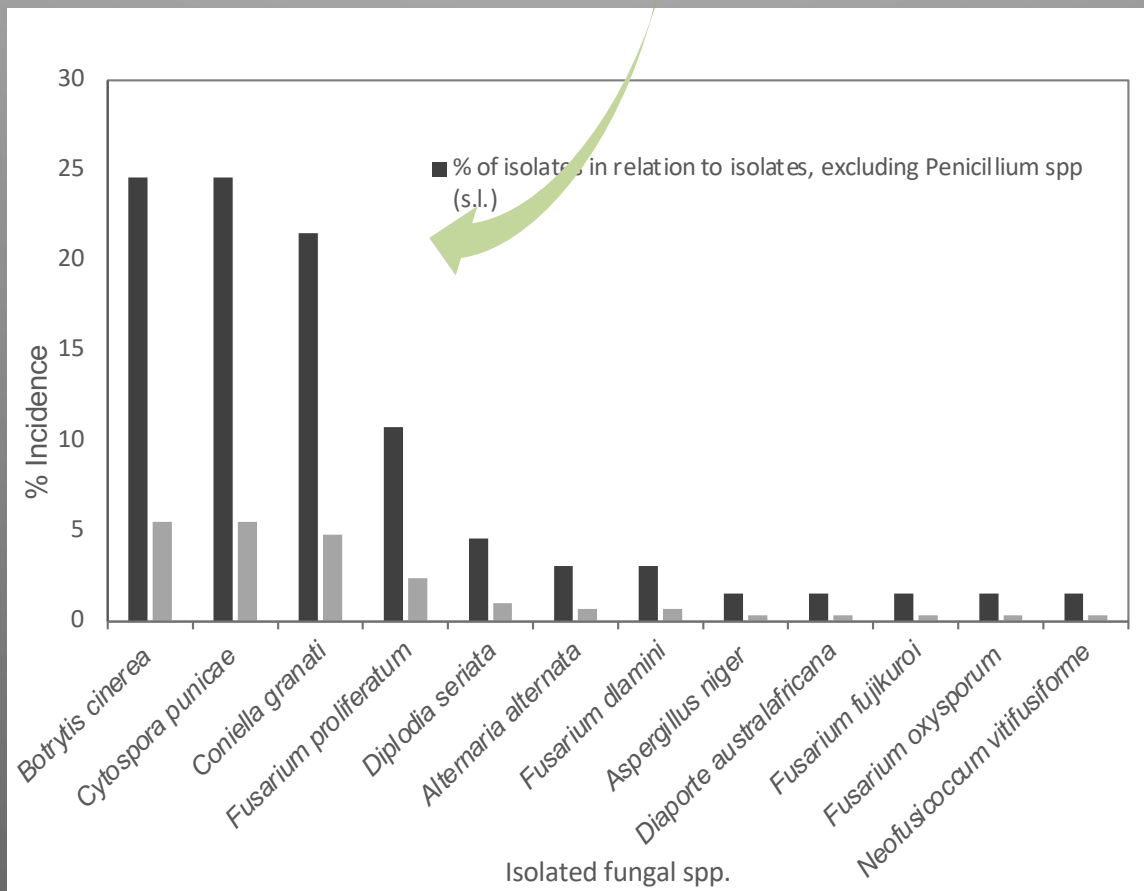
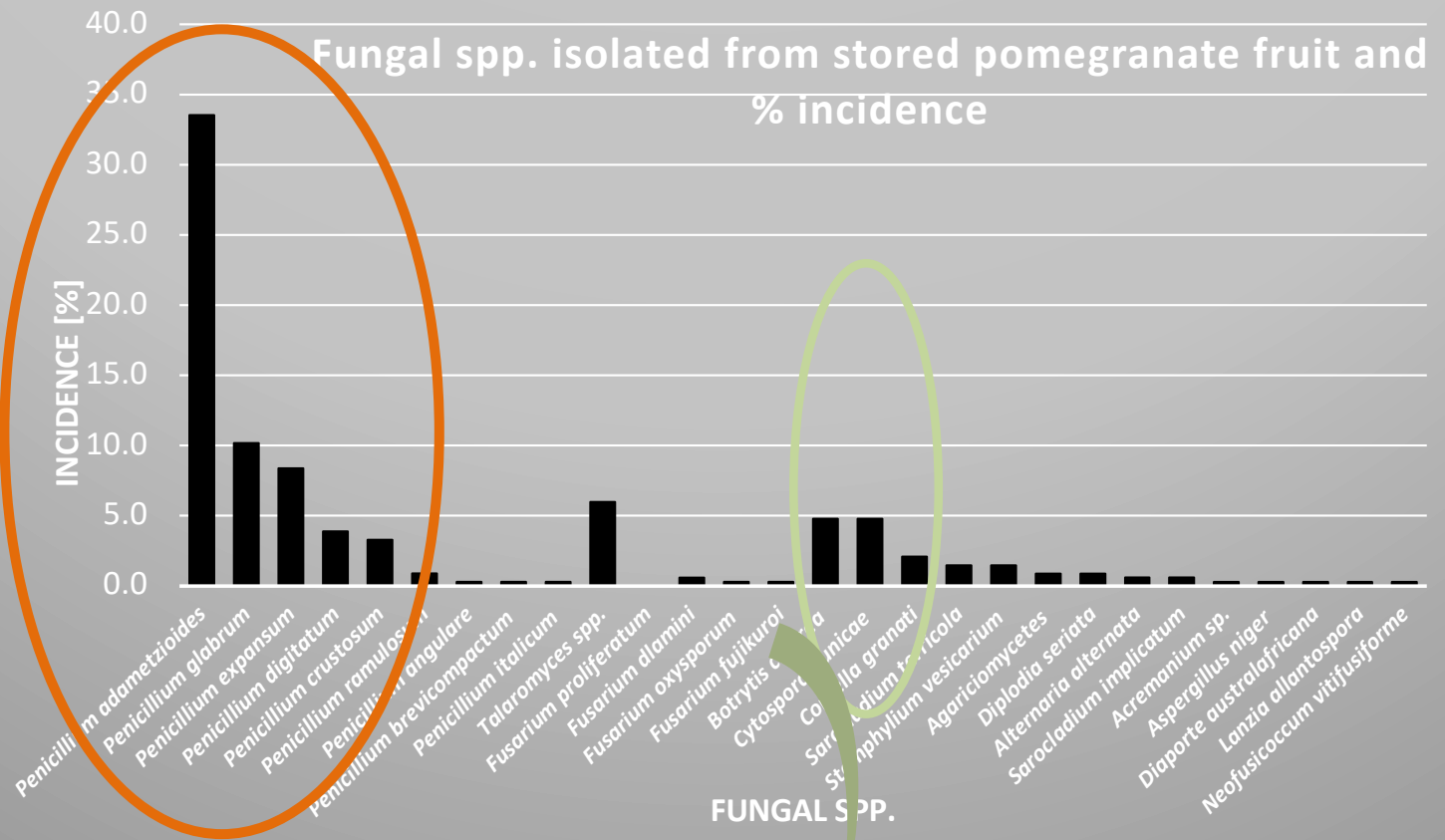
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## Chapter 2

### **INCIDENCE AND IDENTIFICATION OF FUNGAL PATHOGENS ASSOCIATED WITH POST-HARVEST DECAY IN LONG-TERM STORED POMEGRANATE FRUIT**


#### Significance

- To determine which diseases are involved in post-harvest decay in South African pomegranate fruit.
- To quantify the incidence of respective diseases
- To use information to identify and prioritise chemical registration or other management strategies
- To utilise the information for Market Access purposes (PIP & negotiations of export programs)



# Post Harvest Diseases Originating in the Orchard

**Alternaria spot**




Dark spots develop on fruit and leaves

Symptoms limited to fruit surface

Control  
Orchard treatment  
Orchard sanitation

**Bacterial blight**




Systemic infection in trees

Diseases ca spread from tree to tree in humid conditions and through pruning

Control  
Clean propagating material  
Orchard sanitation

**Botryosphaeria sp.**



Systemic infection in trees

Diseases ca spread from tree to tree in humid conditions and through pruning

Control  
Orchard sanitation  
Orchard treatment

**Elsinoë puniceae**




Also known as scab

Spores spread from tree to tree in humid conditions and through pruning

Control  
Orchard sanitation  
Orchard treatment

**Alternaria alternata**




Also known as Black Heart Disease

Infection initiated during flowering

Not visible from outside of fruit

Control : Orchard treatment / Orchard sanitation

**Botrytis cinerea**

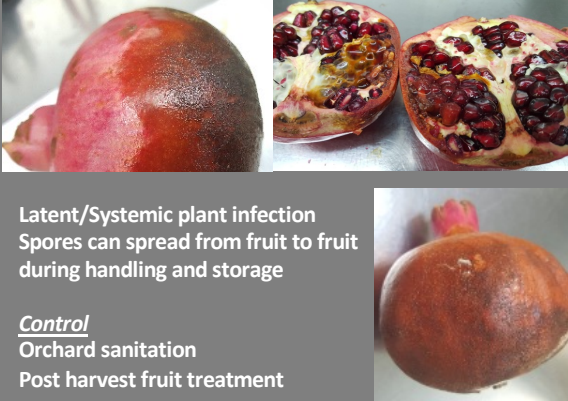


Also known as Crown rot

Can spread to adjacent fruit in packed cartons

Control  
Pre-and post-harvest treatments

**Coniella granati**



Latent/Systemic plant infection

Spores can spread from fruit to fruit during handling and storage


Control  
Orchard sanitation  
Post harvest fruit treatment

**Cytospora puniceae**


Latent /Systemic infection in trees

Spores spread between trees through water or pruning . Mummified fruit on the orchard floor is inoculum

Control  
Orchard sanitation



**Penicillium spp.**



Primarily a wound or secondary pathogen

Can spread to adjacent fruit in packed cartons

Control  
Avoid fruit damage during harvest and packing  
Post-harvest treatments

**Rhizopus**

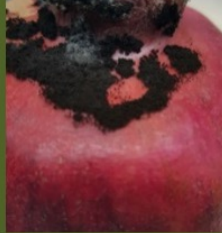


Also known as Black bread mould

Acts mostly as saprophyte on dead tissue

Control  
Avoid fruit damage  
Post-harvest treatments

**Aspergillus niger**

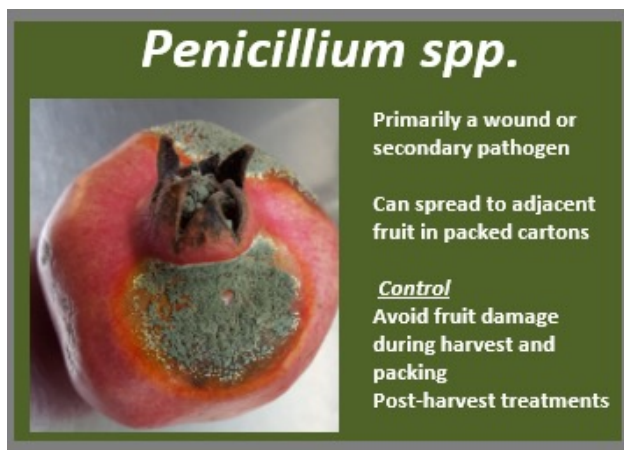


Also known as Black mould

Could occur also inside fruit following orchard infection

Control  
Avoid fruit damage  
Post-harvest treatments

## Diseases Developing in Storage - After Harvesting and Packing



## Wound Pathogens

- Pomegranate fruit stored within the temperature range of 5 - 7°C are generally well protected against the development of *Aspergillus* decay, as the growth of most *Aspergillus* species is restrained at temperatures below 15°C. However, most retailers typically showcase the fruit at room temperature, which considerably elevates the risk of developing decay
- Optimum conditions for *Penicillium* spp. development are between 21°–25°C (in combination with high relative humidity) although some species are not significantly inhibited by storage temperature of 5°C !
- After cold storage when fruit are kept at 20°C for several days, the incidence of *Penicillium* rot can increase considerably. *Penicillium* spp. are the primary cause of post-harvest fruit rot in pomegranate world-wide, especially after prolonged periods of storage and several species have been identified to cause fruit loss to a varying extent.
- *FLU is mainly registered to control B. cinerea, although it very effectively controls Penicillium spp., and Aspergillus niger . The purpose of FLU applications is primarily to control infections initiated during blossom period and during harvesting and handling of the fruits. Thus FLU is a contact fungicide and is not systemic; the efficacy of FLU decreases when the infections occur earlier than 24 h before FLU treatment.*

## *Alternaria alternata*



- *Also known as Black heart disease*
- *Alternaria spp.* can follow different means for penetrating host tissue such as through wounds natural openings (e.g., lenticels) or direct breaching of the host cuticle in some cases
- Infection initiated during flowering – through stigma and style , latent infection of seed
- No sufficient reporting on efficient pre-harvest control strategies available for this disease
- although research work on potential systemic chemical actives such as fluxapyroxad and pyraclostrobin (Puckett *et al*, 2016) /Early applications of copper oxide (before flowering)
- In SA : Azoxystrobin (Obstructo) and Difenoconazole registered in SA (ICA). + Tebuconazole + Pyrimethanil/Fludioxonil (Tutor)
- IR4 project - pomegranate growers in California and Florida will soon be able to use Fluxapyroxad + Pyraclostrobin, manufactured by BASF and sold as Merivon® Xemium® Brand Fungicide, to reduce disease

## *Botrytis cinerea*



- Also known as Crown rot
- It is an airborne necrotrophic plant pathogen and can infect plant tissue directly, through wounds or after a period of latency. Can spread in packed carton.
- In pomegranate, *Botrytis* infection in the orchard during flowering where flower parts become infected leading to latent infections in fruit, where it remains quiescent until the post-harvest stages In-orchard, fruit invasions are likely when conidia (asexual spores) are carried by wind or water and gain entry through natural openings, cracks or micro-cracks on the fruit surface where they could remain latent
- Pomegranate fruit calyx seems most prominent infection source and pathway where the fungus remains latent until after harvest when it causes fruit rot - hence referred to as Botrytis crown rot
- Pre- (Azoxystrobin (Obstructo) and Difenoconazole), Pyrimethanil/FLU (Tutor) and post-harvest treatments (Fludioxonil)



## *Coniella granati*



- *Coniella granati* (Sacc.) Petr. & Syd. (Syn: *Pilidiella granati* Sacc.) is considered a serious pomegranate trunk and fruit pathogen
- *Widespread* - depending on the area and seasonal conditions, to cause pre- and post-harvest pomegranate fruit rot with losses of up to 50%
- Cell wall degrading lytic enzymes produced by this pathogen is anticipated to compromise the fruit rind and become largely responsible for the complete breakdown of the decaying fruit
- Pyraclostrobin could be a candidate fungicide for controlling *C. granati* (orchard & post-harvest)
- Spores can spread from fruit to fruit during handling and storage

## *Cytospora punicae*



- Typical trunk diseases, *Cytospora punicae*, has been reported in the form of disease notes to cause pomegranate trunk disease in California, Cyprus, Greece, Iran, Malta and Tunisia
- This fungus has only recently for the first time been recorded as a post-harvest fruit pathogen in South Africa (Venter *et al.*, 2017) and Italy (Mincuzzi *et al.*, 2017b).
- Latent /Systemic infection in trees
- Spores spread between trees through water or pruning. Mummified fruit on the orchard floor is inoculum
- No chemical control available, Orchard sanitation

# Thank you Dankie

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