

Taking stock of what plagues pomegranate

A scientifically based post-harvest fruit rot manual for pomegranates will soon see the light, giving growers and exporters alike a reference source to consult when in doubt.

THE POST-HARVEST INNOVATION Fund in collaboration with the South African Pomegranate Growers' Association (POMASA) jointly funded a survey of the post-harvest fungal diseases that threaten South Africa's emerging pomegranate industry.

It is led by Dr Cheryl Lennox, senior lecturer in the Department of Plant Pathology at Stellenbosch University, who has for the past 15 years been studying fungal diseases that impact the local fruit industry. Insights are also provided by Prof. Linus Opara who holds the South African Research Chair in Post-harvest Technology at Stellenbosch University. He is regarded as one of the world's foremost pomegranate researchers.

The hands-on research work is done by PhD student Elrita Venter. As former general manager of POMASA, and being involved in the industry from the outset, she can tap into very specific industry knowledge and experience to make the project work.

In the past decade, pomegranates have become one of the few new additions to the local fruit basket. The industry has seen significant growth since the first plant propagating material was brought in from India, Israel and the USA in the early 2000s.

By 2016 an industry survey placed the total number of plantings at 1 000ha. Production



has grown from 1 500 tonnes in 2012 to about 8 000 tonnes in 2016. It is predicted that the local industry could expand to as much as 5 000ha, to capitalise on being one of the few Southern Hemisphere producers of this high value crop.

"Research and development is extremely important and a compulsory investment for all new crops in South Africa, including pomegranates," says Elrita. "The industry needs scientific backing, not only in terms of production matters but also about the post-harvest aspects that should be considered to ensure that the best possible quality products reach the market."

A worrying factor has been that post-harvest losses can sometimes be as high as 30% or more because of fruit decay caused by fungal diseases, such as black heart diseases, caused by an *Alternaria* sp.

"Fungi colonise the inside of the fruit during flowering," explains Cheryl. "Because external symptoms are seldom visible at harvest, it is quite difficult virtually impossible to detect and identify these post-harvest pathogens before consignments are shipped off."

Until Elrita started her studies, no scientific work had been done on a proper survey to



1 Elrita Venter (PhD student), Dr Julia Meitz-Hopkins (joint study leader), Dr Cheryl Lennox (project leader) and Michelle Leybrand (laboratory assistant).



PROJECT TITLE

Determining of the profile and epidemiology of post-harvest fungal diseases in the SA pomegranate industry with the phytosanitary assessment of risk related to market access and proposed solutions

PRINCIPAL INVESTIGATOR

Dr Cheryl Lennox

CONTACT DETAILS

+27 (0)21 808 4796
clennox@sun.ac.za

DURATION

Three years

PHI PROGRAMME & INDUSTRY CONTRIBUTIONS

R359 876 & R85 661

LEAD INSTITUTION

Stellenbosch University (Department Plant Pathology)

BENEFICIARY

The South African pomegranate industry

FOCUS AREAS

Post-harvest disease and insect control, including phytosanitary compliance

HUMAN CAPITAL DEVELOPMENT

One PhD Agric student

PUBLICATIONS

Two

PRESENTATIONS AND PAPERS

Two



1 More than a thousand fungal samples from the three most prominent cultivars planted in various production areas in South Africa have been taken to identify and study these phytopathogens.



determine the scope of the various post-harvest pathogens prevalent in the South African pomegranate industry.

There are also many unsolved issues regarding appropriate, registered chemical treatments, and the alignment of these treatments with internationally acceptable standards, maximum residue levels and aspects of phytosanitary concern.

Objectives and methodology

The aim of the project, jointly funded by POMASA and the PHI Programme, is to develop a proper post-harvest fungal profile for South African produced pomegranates that can help the industry to predict, detect and manage diseases effectively and in compliance with international export market requirements.

So far Elrita has taken more than a thousand fungal samples from the most prominent cultivars planted in South Africa, such as 'Acco', 'Herskovits' and 'Wonderful'. Stored fruit from different production areas, including the Western Cape, Orange River area and Free State, were also sampled, as were fruit that arrived at the port of Rotterdam in the Netherlands. Fungal cultures were furthermore isolated from fruit with visual disease symptoms.

Morphological and molecular biology techniques, such as polymerase chain reaction, are used to identify the pathogenic fungal species present.

Results and implications

Final results are expected by the end of 2017. Preliminary results have so far confirmed the presence of *Botrytis* (causing grey mould or crown rot), *Alternaria* (causing *Alternaria* rot or black heart disease), *Pilidiella granati* (causing *Pilidiella* fruit rot) and various *Penicillium* and

Aspergillus (causing *Aspergillus* rot) species.

The fungus *Cytospora punicae* was also identified for the first time as a potential pathogen on pomegranate fruit (see side bar).

Pathogenic studies are now being conducted to confirm that these fungi are the culprits causing fruit decay. The extent to which the fungi cause damage and are controlled by the current standard industry post-harvest protocol is also evaluated.

For Elrita the survey is about more than providing a tick list of the most common fruit rots and persistent decay problems that producers and exporters need to be wary of.

It will provide the scientific basis for a phytosanitary information package (PIP) to be compiled. The phytosanitary assessment of the risks associated with each of the fungi types also has implications for future exports.

"This study will enable the industry to predict which protocol could be used as part of an integrated post-harvest control programme, and how the fruit should be handled and stored to deliver the best returns," says Elrita.

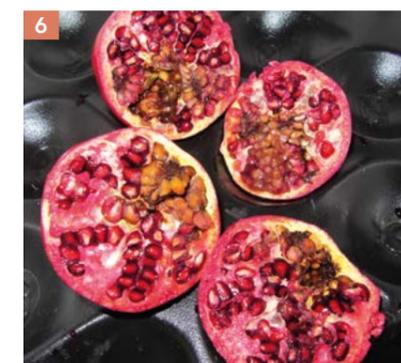
South Africa's production window corresponds with that of Peru. "The survey



results will enable our producers to earn better market prices and predict which early and late fruit cultivars could sharpen their competitive edge," says Elrita, who hopes that the findings will also help producers to comply with GLOBALG.A.P. and other international standards.

The study further paves the way for the registration of chemical remedies against post-harvest fruit rot. When considering fungicide interventions, aspects such as maximum residue limits, toxicology and withholding periods will have to be considered.

"Trials have been done in countries such as Spain on treatment options for post-harvest fungal diseases, but the lack of registered chemicals for a minor, yet high value, crop such as pomegranate should be considered in local trials," says Cheryl. She believes application for registration or label extension in terms of Act 36 must be done in cooperation with agrochemical companies.



OH NO, NOT FRUIT TOO!

The PHI Programme-funded survey has revealed a potentially worrying first: the first record from anywhere in the world that the typical wood rot fungus *Cytospora punicae* can also do direct damage to pomegranate fruit.

It was isolated from long-term stored fruit from the Uniondale and Wellington areas in the Western Cape in 2015.

The fungus causes external yellow lesions on the fruit rind, which extends into the subcutaneous area, with a yellow corky appearance and black fruiting structures on the fruit.

The *C. punicae* fungus was first isolated from pomegranate plants in Greece in 2014, with collar rot symptoms on trees. In the USA and Tunisia it is linked to pomegranate plants suffering from wood canker and branch dieback, and in Cyprus with trunk canker symptoms.

"To our knowledge *C. punicae* has not been reported on pomegranate fruit, which makes this report the first of this nature," Elrita Venter writes in a paper published in January 2017 in the *Plant Disease* journal of the American Phytopathological Society. It was co-authored by Dr Cheryl Lennox and Julia Meitz-Hopkins, also from Stellenbosch University's Department of Plant Pathology.

"The finding has significant implications for post-harvest diseases of pomegranates in South Africa and other countries where *C. punicae* has been detected," says Elrita.



The industry needs scientific backing, not only in terms of production matters but also about the post-harvest aspects that should be considered to ensure that the best possible quality products reach the market.

Elrita Venter



- 2** 'Wonderful' pomegranate fruit shortly before harvest.
- 3** Stored pomegranate fruit covered with fungal growth.
- 4** Black heart disease caused by *Alternaria*.
- 5** *Alternaria* is known to infect during the flowering stage.
- 6** Internal fruit rot caused by *Pilidiella granati*.