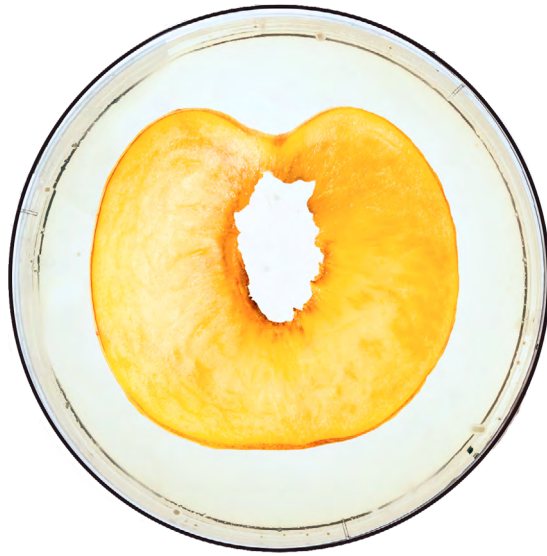
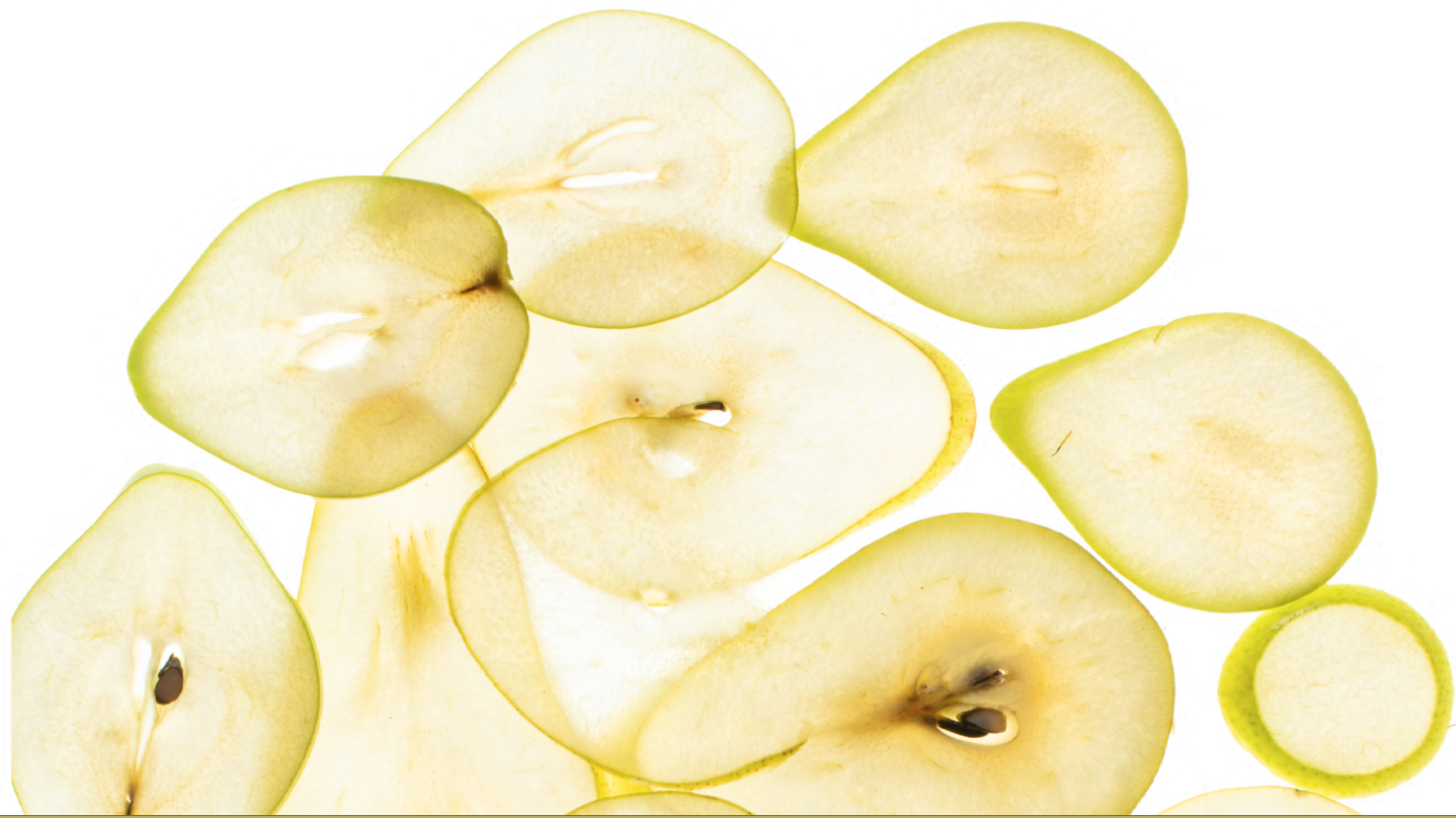




HORTGRO science

Annual Report 2022





The research that we fund focuses on generating new knowledge, technologies or practices that are required to mitigate, avoid or overcome threats and risks and to leverage opportunities. Our primary objective is to keep South African pome and stone fruit growers internationally competitive and economically sustainable.



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Hortgro Science Advisory Council



Stephen Rabe
Chairman



Grant Smuts
Vice Chairman



Raymond Koopstad



Anton Rabe
Observer



Karen Theron



Frikkie Jacobs



Ilse Trautmann



Charl Stander



Linde du Toit



Chairman's Report

STEPHEN RABE | HORTGRO SCIENCE CHAIRMAN

With international travel once again a reality, the management of Hortgro Science has spread its wings and attended several symposia and events around the globe. Detailed travel reports provide feedback to the advisory council on these trips as well as action plans to execute the various findings.

The challenges within our industry continue. Having a well-resourced group of technical experts with the physical resources and capacity to assist in addressing these immediately is paramount in ensuring we remain competitive and relevant within the export markets. The Hortgro phytosanitary laboratory (PHYLA) is one example of an investment that ensures we can research very specific projects for our industry. Dr Renate Smit and her capable team will be managing the projects within this facility, feeding back to Hortgro Science.

The Industry Leadership Development Programme, under the auspices of Hortgro, is entering its second and final year for the current group of participants. One of the objectives of the programme is to identify future advisory council members. We propose inviting selected members to attend advisory council meetings as observers for a year to gauge their interest in contributing at this level.

The challenges within our industry continue. Having a well-resourced group of technical experts with the physical resources and capacity to assist in addressing these immediately, is paramount in ensuring we remain competitive and relevant within the export markets.

My thanks and appreciation are extended to the Hortgro Science management team, Wiehann, Matthew, Marno and Anita, and Hortgro Technical manager, Hugh. Your commitment, passion and expertise make my involvement and that of the advisory council a pleasure. To all those who contribute directly or indirectly to the continued efforts of Hortgro Science and Hortgro Technical, thank you very much. You are all much appreciated.



General Manager's Report

WIEHANN STEYN | HORTGRO SCIENCE GENERAL MANAGER

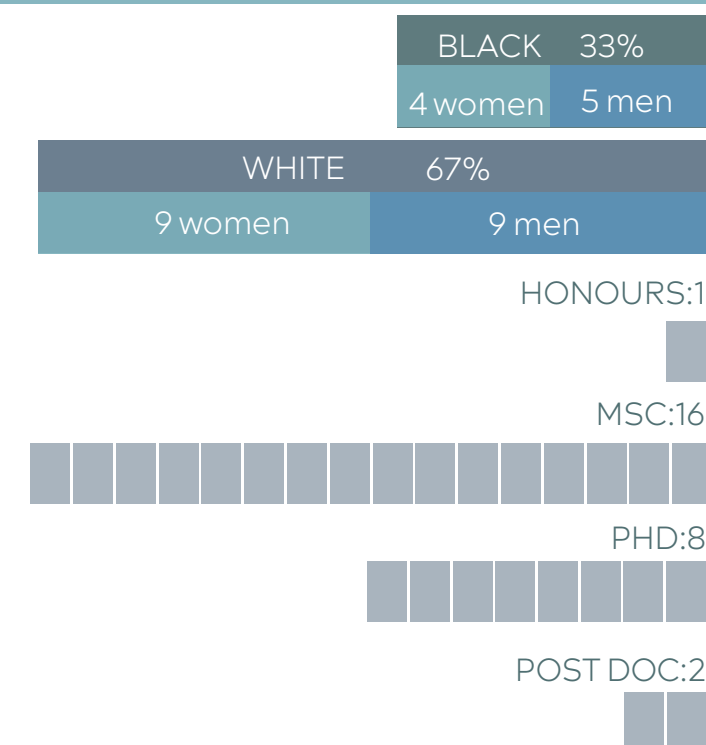
The year 2022 was by no account a normal year. It was very challenging on various fronts and deciduous fruit growers are going through a very tough time, mostly due to factors outside of their control. However, the past year also presented a return to normality after Covid with the resumption of face-to-face meetings, a Hortgro technical symposium and overseas travel. The challenging conditions and the ad hoc issues that 2022 dredged up illustrated the value of having a Hortgro and a research programme in place that keeps chipping away at industry problems and can address emerging issues.

What will it take for the South African deciduous fruit industry to survive or, preferably, flourish in an increasingly volatile and competitive world? I firmly believe that our future success as an industry comes down to our ability to maintain and open new markets for our fruit and to the expertise/quality of people we have in place at different levels of our industry to grow, export and sell our fruit.

Our industry is highly technical and is, therefore, dependent on a steady supply of well-trained graduates who are up to speed with the latest technology and future directions of fruit production to ensure that our product is of high quality, safe, sustainable and preferred by consumers. We also need access to “knowledge resources”, experienced researchers and academics, who can provide direction to the industry, lead change and troubleshoot sticky issues. These knowledge resources are becoming increasingly scarce in applied fields. One way to ensure a steady supply of highly skilled people is through our research programme, which during 2021/22 funded twenty-seven post-graduate students. Of these students, one was studying towards an Honours degree, 16 towards an MSc and eight towards a PhD. In addition, there were two post-doctoral students. Forty-eight percent of the students were women and 33% of the students were black. One-quarter of the research budget was directed towards funding research posts seconded to Stellenbosch University.

To maintain existing markets and access new ones, the fruit industry needs to comply with increasingly restrictive phytosanitary requirements for pests and diseases that occur locally. New diagnostic technology is making it easier to unearth novel pathogens that might be of concern for importing countries. At the same time, increasing global trade, and the accompanying movement of people and plant material increases the risk of the introduction of harmful pests and diseases. Furthermore, climate change and possibly also changes in chemical usage are causing the emergence of new pests and diseases. Chemical control options for existing and new pests and diseases are rapidly diminishing. In line with the above, Hortgro Science is observing a definite increase in the number of projects focusing on market access, phytosanitary requirements, new pathogens, and biological control. In the next levy cycle, we intend to develop a research focus on regenerative agriculture. The science team works closely with Lindi Benić's market access team of to identify the most pressing market access research needs, while the

Funded Postgraduate Students

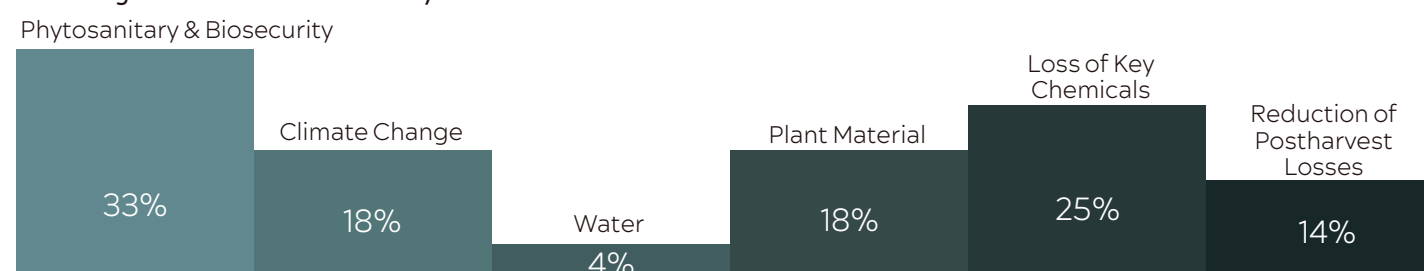


phytosanitary and biosecurity workgroup identifies potential new pests and diseases. These include recently imported pests like the polyphagous shot-hole borer (PSHB), pests that might arrive in South Africa like *Drosophila suzukii*, and indigenous species such as the antestia bug that seems to have developed a liking for pome fruit. Several new projects have been initiated to pre-emptively study the incidence of new pests and diseases and to find solutions.

The building of the phytosanitary facility (PHYLA), adjacent to the insectary at Welgevallen Experimental Farm of Stellenbosch

Total Research Projects 2021/22: 102

Projects Per Priority Area 2021/22:



Projects 2021/22:	completed	continuing	new	total
POME	22	37	24	61
STONE	6	11	9	20
POME & STONE	6	15	6	21
NUMBER OF MULTI-INSTITUTIONAL PROJECTS 2021/22:	13			
NUMBER OF MULTI-INSTITUTIONAL PROJECTS 2010/11:	2			

University, was completed and the first phytosanitary trials have commenced. Dr Renate Smit was appointed as PHYLA manager and phytosanitary researcher. PHYLA and Dr Smit’s appointment will strengthen our capacity to deal with crop protection and phytosanitary issues. PHYLA will allow us to conduct crucial market access-related research on fumigation and cold sterilisation.

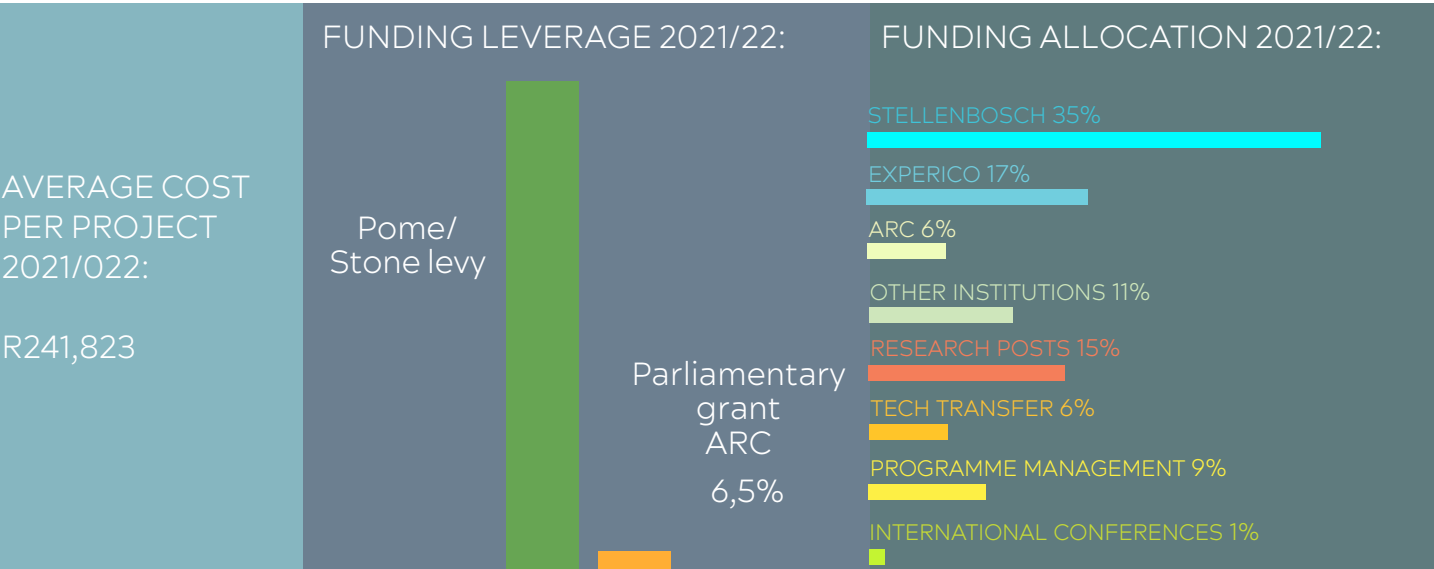
Research by Prof Francois Roets at the Department of Conservation Ecology and Entomology at Stellenbosch University found that pome and stone fruit trees are very susceptible to the Fusarium fungus carried by PSHB, which makes PSHB a serious threat to our industry. To date, there is no effective treatment for PSHB once established in a tree and it might prove very difficult to prevent the spread of PSHB. In this regard, a steering committee was established to guide communication, government lobbying, and research efforts. Monitoring for PSHB has commenced in most production regions together with the training of monitors. In the past year, Hortgro Science also had to contend with the widespread occurrence of galls on apple nursery trees. Efforts to identify the cause and origin of the galls have been

exhaustive but unsuccessful to date. The examples of PSHB and the apple nursery tree galls are evidence of how the environment in which Hortgro Science operates is changing. We are increasingly dealing with technical challenges that require an integrated and holistic approach and where research is just part of the package. To deal with the challenges of the future, Hortgro Science will need to strengthen its technical capacity with staff who can address issues as they arise.

The leverage of external funding and access to government funding remains a challenge. The level at which the South African government and industry funds research needs to grow substantially to be on par with some of our competing nations.

Hortgro is currently co-funding three projects with the Water Research Commission (WRC), while we will also participate in the fifth round of the Postharvest Innovation Fund co-funded by the Department of Science and Innovation and administrated by the Fresh Produce Exporter’s Forum.

Hortgro Science utilised 17 different university departments and research organisations to conduct its research during 2021/22



with 41% of the total budget being allocated to Stellenbosch University. We have observed a broadening of the research scope and an increase in multidisciplinary projects (two in 2011/12 vs 13 in 2021/22) in line with our strategy to cluster more capacity and concentrate funding in key focus areas, viz. market access and the management of phytosanitary and invasive pests and diseases, production efficiency (volume of exportable fruit per unit area) through use of rootstocks, technology and data systems, climate change mitigation and water productivity, plant material quality and availability, and the maintenance of post-harvest quality and reducing risk throughout the value chain.

The Pro-Hort Ecophysiology Platform is one of the structures put in place to enable more focused research in key priority areas. The platform is managed by the private fruit evaluation company, Provar, and consists of 10 genotypes of apple, pear, plum and cherry varying in chill and heat requirements planted at three climatically diverse localities. Current projects utilising the platform include the investigation of the effect of climate on aspects of tree architecture relating to profitability and the correlation of the various chill models with the bud break performance of the various genotypes at the different sites. Various new projects to study dormancy, the effect of climate on fruit size, sunburn and heat stress are in the pipeline.

Hortgro Science is continually challenged on the question of whether our research is focused on the correct issues. We are guided by over 200 individuals, made up of technical advisors, growers, researchers, industry experts and retired academics who sit on our 30 focus workgroups, peer

workgroups and technical advisory committees. All new projects funded during the current cycle were identified by the fruit growers, technical advisors and researchers forming part of the focus workgroups. We are greatly indebted to our small pool of researchers and the larger pool of technical people who assist us in these endeavours.

In terms of communicating our research, the *Fresh Quarterly* which now has its own website (www.freshquarterly.co.za) with functionality like keyword searches, is going from strength to strength. The 2022 Hortgro Science technical symposium was a huge success and very well attended despite COVID-19 restrictions on the number of attendees. Prof Lee Kalcsits from Washington State University attended the symposium, while four international presenters from as far afield as New Zealand and Brazil delivered online presentations. The stone fruit app was updated with additional cultivars, Phytclean protocol, marbling management information and cross-pollination compatibility. A climate change forecast app, based on climate change modelling conducted under

the leadership of Prof Stephanie Midgley, is in development.

The Hortgro Science website (www.hortgro-science.co.za) has been overhauled and provides detailed information on the research process and those involved in the different workgroups and committees.

Hortgro Science is guided in its strategies and operations by the Hortgro Science Advisory Council which reports to the Hortgro Board and the Pome and Stone Producer Councils. Prof Karen Theron and Dr Ilse Trautmann joined the council in 2022, adding vast experience in the field of research management. I especially want to thank Stephen Rabe, the advisory council chair, who leads by example through his passion for our industry, enthusiasm for what we do, positive outlook, guidance and unwavering support.

Hortgro Science is a small team that links into a much bigger network focused on facilitating and driving technological innovation in the pome and stone fruit industry. It is a privilege to serve the deciduous fruit industry in this capacity and to work with the dedicated team at Hortgro Science.

Crop Production Research Programme

Research within the crop production programme addresses current problems experienced by fruit growers but is also future-directed. Research has a long lead time and it is important to start building the capacity and conduct the research for the solutions that will be needed in the future. In this sense, the crop production research strategy is directed and aligned with the requirements and key risks to the orchards of the future. Hence, increasing orchard productivity and efficiency as well as improving fruit quality are the main drivers of the crop production programme while climate change, extreme weather, plant material quality and water availability and quality are key risks that are addressed.

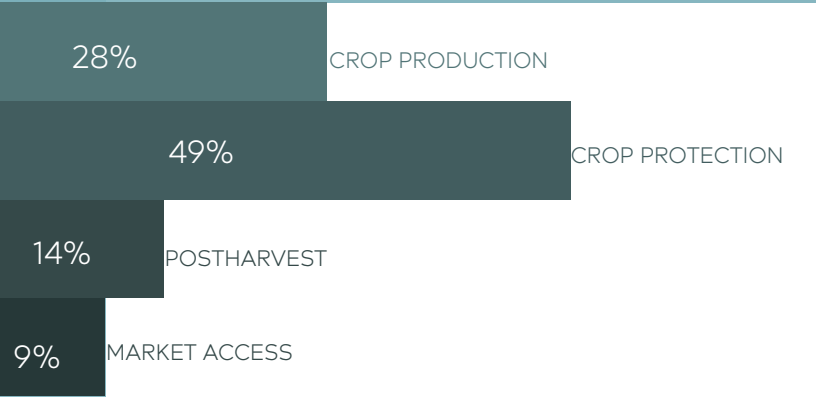
The crop production research programme is structured into six themes: dormancy, farming technology, irrigation and nutrition, rootstocks and nursery tree quality, growing season climate, and reproductive biology. The research strategy for each

theme is determined by a workgroup (one workgroup per theme) consisting of fruit growers, technical advisors and researchers. When considering research strategy, the workgroups always keep in mind the changes we need to make to our orchards to remain internationally competitive as well as profitable. They also consider the major future risks, as identified within the overarching research strategy, which may jeopardise our profitability.

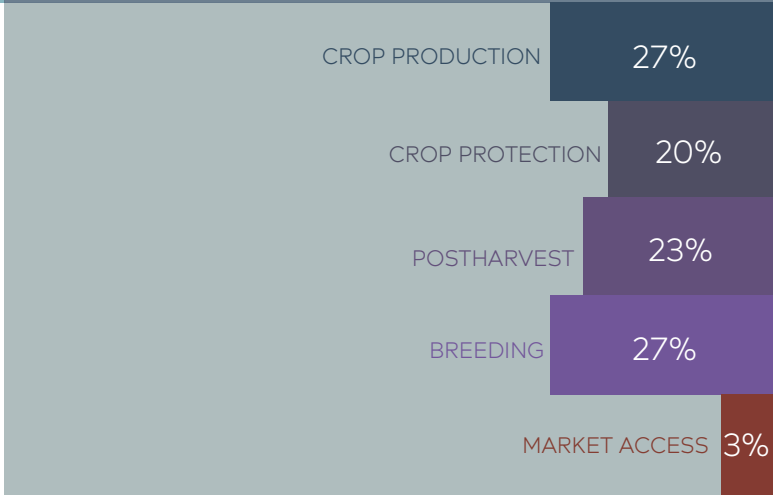
DORMANCY

Research on this theme is aimed at understanding the progression of dormancy under mild winter conditions and the impact of insufficient winter chill on fruit production. We also study dormancy release to potentially identify new and safer rest-breaking chemicals. Furthermore, it is becoming increasingly evident that the induction of dormancy under mild, local conditions requires further study. To this end, we are utilising the Pro-Hort

FUNDING PER FOCUS AREA 2021/22:



FUNDING PER FOCUS AREA 2013/14:



ecophysiology platform. It consists of 10 genotypes each of apple, plum, pear and cherry varying in chill (and heat) requirements planted at three climatically contrasting sites. The platform allows the researchers to tease apart the effect of chill and heat requirements on the adaptability of cultivars to local conditions. It will also enable us to correlate the output of the various chill models with vegetative bud break and flowering data to identify the most suitable model for South African conditions.

In terms of completed projects, Dr Esmé Louw set out to quantify the impact of insufficient winter chill on apple fruit quality. She found considerable variation in fruit maturity of Golden Delicious apples between trees within an orchard and between different positions on the tree. However, the extent of variation was similar in the colder Koue Bokkeveld and the warmer Grabouw regions.

EXPERTISE

Dormancy workgroup

RESEARCH TEAM

Crop production programme leader

Prof Wiehann Steyn

Researchers

Dr Esmé Louw

Dr Xolani Sibozza

Dr Nigel Cook

Ms Laura Alderman

Dr Tara Southey

Dr Iwan Labuschagne

Mr Tristan Dorfling

Mr Chad van Wyk

Students

Mr Andrew van Lingen – MSc student

Ms Anika Kock – MSc student

Mr Dian Craven – MSc student

NEW PROJECTS

- Climate profiling and change analysis of the Elgin-Grabouw-Vyeboom-Villiersdorp (EGVV), Koue Bokkeveld (KBV) and Langkloof (LK) production areas specific to Pome fruit (T Southey) – See Growing season climate
- Historic and future modelling and mapping of early season temperature patterns and extremes, and impacts for pome and stone fruit production in South Africa (S Midgley) – See Growing season climate.

CURRENT PROJECTS

- Adaptability indexing of new pome (apple and pear) and stone fruit (plum and cherry) cultivars in diverse South African growing areas (I Labuschagne, E Louw, A Kock and T Dorfling) – see Growing season climate
- Investigating the significance of temperature on flowering phenology by establishing a South African apple and plum phenophase-temperature database (E Louw and I Labuschagne)
- Growth synchronisation of stone fruit rootstocks and scions with different chilling requirements (C van Wyk) – see Rootstocks and nursery tree quality
- Apple rootstock influence on Granny Smith scion growth, productivity and fruit green colour (T Dorfling) – see Rootstocks and nursery tree quality.

COMPLETED PROJECTS

- Quantifying the impact of insufficient winter chill on apple fruit quality (E Louw and A van Lingen)
- Leaf defoliation of Cripps' Pink and Granny Smith apples in the EGVV – effect on vegetative and reproductive development (X Sibozza, K Theron and D Craven) – see Reproductive biology
- Evaluation of alternative rest-breaking agents for apples (X Sibozza, K Theron and D Craven)
- Investigating the effect of different autumn/winter scenarios on the spring bud break in apple trees (E Louw and L Alderman)
- Validation of the shoot assay as a proxy to determine the progression of dormancy in intact apple trees (E Louw and L Alderman)

ROOTSTOCKS AND NURSERY TREE QUALITY

Finding more precocious and productive rootstocks adapted to South African conditions is integral to our orchard of the future vision. For this reason, various pome and stone fruit rootstocks are evaluated in an increasing number of industry trials in commercial orchards.

Hortgro Science has appointed Provar to run new rootstock trials with input from Hortgro and the rootstock evaluation committee. Together with the new funding strategy of rootstock evaluation, which involves co-funding by IP owners and licensees, this increases the number of trials that are conducted. More trials mean

better data and hopefully earlier and more confident recommendations regarding new rootstocks.

New apple rootstock evaluation sites will be planted to dwarfing rootstocks in the Highveld region where Western Cape results are not applicable due to the milder summer climate, planting under nets and fertile soils. A new pear rootstock evaluation trial was initiated with plantings set for four production regions.

Other rootstock research is aimed at characterising new rootstocks in terms of adaptation and disease and pest tolerance. Various projects were established to evaluate the susceptibility of rootstocks to *Phytophthora*, *Rosellinia*, woolly apple aphids, plant parasitic nematodes and replant disease. A new project will be initiated in 2023 to study the cause of galls on apple nursery trees, which has posed a serious challenge to nurseries and apple growers during 2022.

EXPERTISE

Rootstock and nursery tree quality workgroup

Rootstock evaluation committee

RESEARCH TEAM

Crop Production Programme Leader

Prof Wiehann Steyn

Researchers

Dr Xolani Sibozza

Dr Iwan Labuschagne

Prof Stephanie Midgley

Dr Nigel Cook

Mr Tristan Dorfling





Prof Adele McLeod

Mr Chad van Wyk

Mr Wouter Visser

Mr Marno van der Westhuizen

Students

Ms Lindsay Muchena – PhD student

Ms Buhle Ngidi – MSc student

NEW PROJECTS

- Evaluation of apple rootstock cultivars for woolly apple aphid resistance (M Addison)
- Evaluation of apple rootstocks against apple replant disease on ‘fumigated’ and ‘non-fumigated’ soil (T Dorfling and A McLeod)
- Calculating the projected profits for an orchard planted to different rootstocks based on actual tree costs and fruit prices as well as production data collected for a rootstock evaluation trial conducted with- in the orchard (M van der Westhuizen)
- Evaluation of pear rootstocks on different scions (T Dorfling)

CURRENT PROJECTS

- Apple rootstock evaluation and interstem combinations in Langkloof – Helderwater (X Sibozza and B Ngidi)
- Apple rootstock evaluation and inter- stem combinations in Grabouw – Breëvlei Kromco (X Sibozza and B Ngidi)
- Apple rootstock evaluation and interstem combinations in Grabouw – Oak Valley (X Sibozza and B Ngidi)
- Evaluation of peach and nectarine root- stocks for the South African fruit industry

in association with IP owners at Vaalwater (C van Wyk)

- Evaluation of plum rootstocks for the South African fruit industry in association with IP owners at Simondium (C van Wyk)
- Evaluation of pear rootstocks for Packham’s Triumph at Jackal River Farm, Vyeboom (T Dorfling)
- Evaluation of pear rootstocks for Forelle at La Plaisante, Wolseley (T Dorfling)
- Evaluation of pear rootstocks for Cheeky at La Plaisante, Wolseley (T Dorfling)
- Evaluation of plum rootstocks for South African industry: Robertson planting (C van Wyk)
- Evaluation of peach rootstocks for South African industry: Rawsonville planting (C van Wyk)
- Sensitivity of various apple rootstocks to water stress (S Midgley and L Muchena) – see Irrigation and nutrition
- Evaluation of new apple rootstocks representing three vigour classes (Môrester and Oak Valley) (T Dorfling)
- Evaluation of new apple rootstocks representing two vigour classes in two growing areas (Molteno, Bokveldskloof & Oewerzicht) (T Dorfling)
- Apple rootstock influence on Granny Smith scion growth, productivity and fruit green colour (T Dorfling) – see Dormancy

- Growth synchronisation of stone fruit rootstocks and scions with different chilling requirements (C van Wyk) – see Dormancy
- Evaluation of new plum rootstocks for South African fruit industry (C van Wyk)
- Evaluation of new peach rootstocks for South African fruit industry (C van Wyk)
- New apple rootstock plantings in the Highveld region (T Dorfling)
- Evaluation of apple rootstocks tolerance against specific apple replant disease (SARD) (T Dorfling, A McLeod and W Steyn)
- Tolerance of apple rootstocks against Phytophthora root rot (A McLeod) – See Pathology
- Effect of mulching, compost and root- stock genotype on white root rot of apple (A McLeod) – See Pathology

COMPLETED PROJECTS

- Establishing quantitative relationships between water relations, growth, yield and quality of high-performing commercial apple orchards (S Midgley) – See Irrigation and nutrition
- Development of a best practice guideline for the construction of dwarfing rootstock support structures (W Visser) – See Farming technology
- Screening of apple rootstocks for resistance against the most prevalent *Pratylenchus* species affecting orchards in South Africa (R Knoetze) – See Nematology

PUBLICATIONS

Fresh Quarterly Mar 2022: Duvenage, E.

Dwarfing rootstocks and water stress.

Fresh Quarterly Sept 2022: Mouton, A.

Geneva rootstocks in Brazil.

GROWING SEASON CLIMATE

Of the “serious” pome fruit producers, South Africa, together with Brazil, have the production areas closest to the equator. This means higher summer temperatures and generally, altogether more plant stress and more fruit downgraded for processing compared to our major competitors.

The great inefficiency of caring for fruit that ultimately ends up in a juice bin significantly impacts the profitability of the South African industry, especially under the serious cost squeeze conditions that have been experienced during 2022. It should not be surprising that research under this theme is predominantly aimed at decreasing sunburn and internal fruit quality defects brought about by climatic stress.

Building on a project that modeled climate change into the future at a regional level, Prof Stephanie Midgley is assisting Hortgro in developing a climate change strategy. The output of the aforementioned project is currently being incorporated into an App that will assist growers and technical advisors in long-term planning and site selection for new orchards. A new project was initiated by Dr Tara Southy of TerraClim to develop high-resolution topographical and climate maps for the Ceres fruit production region, also including Tulbagh and Wolseley. This follows a previous project that compiled these maps for the EGVV region.



Dr Elke Crouch is currently investigating the link between temperature and radial internal browning in Cripps Pink and derivative apple cultivars. The project will hopefully allow us to develop an early warning internal browning prediction tool, which will allow exporters to adjust their marketing strategies according to the risk of developing this disorder.

EXPERTISE

Growing season climate workgroup

RESEARCH TEAM

Crop Production Programme Leader
Prof Wiehann Steyn

Researchers

Dr Elke Crouch

Dr Tara Southey

Prof Stephanie Midgley

Dr Esmé Louw

Dr Iwan Labuschagne

Dr Elmi Lötze

Mr Daniël Viljoen

Ms Heleen Tayler

Mr Handré Viljoen

Ms Carina Wessels

Students

Ms Anika Kock – MSc student

Ms Ineke de Jong – MSc student

Mr Tristan Dorfling – MSc student

NEW PROJECTS

- Quantification of the effect of near-harvest temperatures on pitburn and heat damage in cold stored plums and prediction method development (H Viljoen)

- Climate profiling and change analysis of the Elgin-Grabouw-Vyeboom-Villiersdorp (EGVV), Koue Bokkeveld (KBV) and Langkloof (LK) production areas specific to Pome fruit (T Southey) – See Dormancy

CURRENT PROJECTS

- Confronting climate change (C Wessels)
- Climate change response strategy for the deciduous fruit industry of South Africa (S Midgley)
- Historic and future modelling and mapping of early season temperature patterns and extremes, and impacts for pome and stone fruit production in South Africa (S Midgley)
- Internal browning of Cripps Pink apples – effect of growing region temperature on radial browning and effect of canopy position on long-term storage quality (E Crouch, H Tayler and I de Jong)
- Adaptability indexing of new pome (apple and pear) and stone fruit (plum and cherry) cultivars in diverse South African growing areas (I Labuschagne, E Louw, A Kock and T Dorfling) – see Dormancy

COMPLETED PROJECTS

- Quantifying the role of vapour pressure deficit in the development of lenticel breakdown in Braeburn apples (D Viljoen and E Lötze)

PUBLICATIONS

Fresh Quarterly Dec 2021: Bonthuys, J.

Hot of the press.

Fresh Quarterly Dec 2021: Bonthuys, J.

Climate change guidelines for growers.

Fresh Quarterly Dec 2021: Bonthuys, J.

Future-proofing fruit production.

Fresh Quarterly Dec 2021: Mouton, A.

A tool to decode climate data.

Fresh Quarterly Mar 2022: Duvenage, E.

Be realistic about water savings under nets.

Fresh Quarterly Sept 2022: Mouton, A.

Protective netting in Washington State.

SAFJ Feb/Mar 2022: Mouton, A.

Netting in the northern hemisphere: p. 51.

SAFJ Feb/Mar 2022: Mouton, A.

Sonbrand: p. 53.

SAFJ Feb/Mar 2022: Mouton, A.

The quest for greener Grannies: p. 60.

SAFJ Feb/Mar 2022: Mouton, A.

Water stress increases sunburn: p. 62.

SAFJ Jun/Jul 2022: Mouton, A.

TerraClim omskep klimaatsdata in inligting: p. 82.

EVENTS

- Langkloof Seminar – 24 November 2021
- Hortgro Technical Symposium Day 1 – 6 June 2022
- Hortgro Technical Symposium Day 2 – 7 June 2022
- Hortgro Technical Symposium Field Day – 10 June 2022



REPRODUCTIVE BIOLOGY

Research in this field is aimed at obtaining regular high yields of good quality fruit. Hence, projects tend to investigate flower initiation, pollination, fruit set, fruit thinning and alternate bearing.

The research is mostly applied and in recent years provided the stone fruit industry with a mechanical thinning option and a new chemical thinning agent that will soon be registered for use on plums, peaches and nectarines.

It became apparent in the 2018 season that high temperatures during the bloom period can have a dramatic impact on the set of plums. Louisa Blomerus is investigating the effective pollination period of various plum cultivars. These results should allow plum producers to assess the potential risk of poor set with various cultivars during heat wave conditions and maybe thereby inform cultivar selection.

A new project was initiated by Matthew Addison to study various aspects of bee pollination.

EXPERTISE

Reproductive biology workgroup

RESEARCH TEAM

Crop Production Programme Leader
Prof Wiehann Steyn

Researchers

Dr Xolani Sibozza

Mr Matthew Addison

Ms Louisa Blomerus

Mr Marnes Gouws

Students

Mr Aldo Horne – MSc student

NEW PROJECTS

- Study on the effect of dry matter content on storability and eating quality of Bigbucks and Cripps Red apples to facilitate better postharvest decision making (M Gouws)
- Evaluation of managed bees and pollination efficiency in the pome and stone fruit industry in the South Western Cape, South Africa (M Addison)

CURRENT PROJECTS

- Reproductive Biology: Screening mainstream plum cultivars for the duration of the effective pollination period and other factors influencing successful fruit set (L Blomerus)
- The effect of prohexadione-Ca application on regrowth, crop load and yield alternation in Fuji apple (X Sibozza and A Horne)

PUBLICATIONS

Fresh Quarterly Sept 2022: Mouton, A.

Exploit physiology to transform yields.

Fresh Notes 190 – 5 November 2021:

Vruguitdunning 2022 steenvrugseisoen.

EVENTS

- Hortgro Technical Symposium Day 2 – 7 June 2022

IRRIGATION AND NUTRITION

Water availability was identified as one of the top five risks facing our industry in the future.

The Western and Eastern Cape provinces are water scarce; climate change is driving a drying trend and competition for water is increasing.

The crop production water strategy involves determining how much water highly productive deciduous fruit trees use, conducting research on various water-saving technologies and conducting research to show growers the negative effects of over-irrigation on production and quality.

We are currently co-funding two projects with the Water Research Commission. These projects are investigating the effect of fixed and draped nets on the water use of apples and the water requirements of high-yielding plum orchards. A new co-funded project will assess the water requirements of high-yielding pear orchards.

EXPERTISE

Irrigation and nutrition workgroup

RESEARCH TEAM

Crop Production Programme Leader

Prof Wiehann Steyn

Researchers

Prof Stephanie Midgley

Prof Nebo Jovanovic

Dr Johan van Zyl

Dr Eduard Hoffman

Dr Sebinasi Dziki

Dr Elmi Lötze

Mr Daniël Viljoen

Students

Mr Edward Lulane – PhD student

Ms Lindsay Muchena – PhD student

Mr Stephen Jordaan – MSc student

Mr Ubaidullah Mathews – MSc student

NEW PROJECTS

- Response of apple tree performance and root development to low-flow drip irrigation (J van Zyl and E Hoffman)

CURRENT PROJECTS

- Investigating the potential of fixed and draped netting technology for increasing water productivity and water savings in full-bearing apple orchards under micro-irrigation (S Midgley, S Dziki, E Lötze, E Lulane and S Jordaan)
- The effect of a water deficit on fruit tree phenology, fruit production, fruit quality and storability of Fuji and Cripps Pink apples (D Viljoen) – See Quality management
- Water use of high-performing full-bearing Japanese plum (*Prunus salicina*) in two major production regions of the Western Cape, South Africa (N Jovanovic and U Mathews)
- Sensitivity of various apple rootstocks to water stress (S Midgley and L Muchena) – see Rootstock and nursery tree quality

PUBLICATIONS

Fresh Quarterly Mar 2022: Mouton, A.

How Hortgro helps with water.

Fresh Quarterly Mar 2022: Mouton, A.

How much water do orchards use.

Fresh Quarterly Mar 2022: Mouton, A.

Water productivity in practice.

Fresh Quarterly Mar 2022: Mouton, A.

Rising to the challenge.

Fresh Quarterly Mar 2022: Mouton, A.

Technology for irrigation scheduling.

Fresh Quarterly Mar 2022: Duvenage, E.

The Water Research Commission.

Fresh Quarterly Mar 2022: Duvenage, E.

Orchards water use relates to leaf area.

Fresh Quarterly Mar 2022: Duvenage, E.

Water use in plums.

Fresh Quarterly Mar 2022: Duvenage, E.

Be realistic about water savings under nets.

Fresh Quarterly Mar 2022: Duvenage, E.

Dwarfing rootstocks and water stress.

Fresh Quarterly Mar 2022: Duvenage, E.

Low flow drip irrigation in apples.

Fresh Quarterly Mar 2022: Duvenage, E.

New study on water needs of pears.

Fresh Quarterly Mar 2022: Mouton, A.

Groundwater.

Fresh Quarterly Mar 2022: Mouton, A.

World leaders in water management.

EVENTS

- Langkloof Seminar – 24 November 2021

FARMING TECHNOLOGY

Research in this theme focuses on orchard mechanisation and technology drivers such as big data, remote sensing, robotics, and GIS that will all contribute to changing the way we produce our fruit in our orchards of the future.

EXPERTISE

Farming technology workgroup

RESEARCH TEAM

Crop Production Programme Leader
Prof Wiehann Steyn

Research implementation manager in charge
of the orchard of the future programme
Mr Marno van der Westhuizen

Researchers

Mr Mico Stander
Prof Adriaan van Niekerk
Dr I Labuschagne
Dr Willem Hoffmann
Mr Wouter Visser

Students

Ms Mareze Smit - MSc student

NEW PROJECTS

An economic analysis focused on income or loss to the fruit producer related to new deciduous fruit cultivar choice (W Hoffmann, I Labuschagne and M Smit)

COMPLETED PROJECTS

- Development of a best practice guideline for the construction of dwarfing root-stock support structures (W Visser) – See Rootstocks and nursery tree quality

- Quantifying and visualizing inter-tree variability in orchards using satellite and drone imagery (A van Niekerk and M Stander)

PUBLICATIONS

Fresh Quarterly Sep 2022: Mouton, A.
Who is going to eat South African apples?

Fresh Quarterly Sep 2022: Mouton, A.
Escape the cost-income wedge.

Fresh Quarterly Sep 2022: Mouton, A.
Fruit quality underpins profits.

Fresh Quarterly Sep 2022: Mouton, A.
Design and manage for fruit quality.

Fresh Quarterly Sep 2022: Mouton, A.
Smart Orchard 2.0.

EVENTS

- Hortgro Technical Symposium Day 2 – 7 June 2022
- Hortgro Technical Symposium Field Day – 9 June 2022

Crop Protection Research Programme

The crop protection programme includes both applied and basic research on nematology, entomology and plant pathology. The crop protection technical advisory committee assesses research outputs and research priorities. Entomology and pathology peer workgroups assess proposed and current research projects and provide guidance to the researchers involved in the programme. Various workgroups including groups dealing with current crop protection issues aid in identifying research needs and prioritising research projects.

Ensuring the sustainability of the fruit production process is a critical aspect of crop protection research and emphasis is placed on biological control, orchard ecology, phytosanitary threats and precision agriculture.

Crop protection research during this season has again been challenging with various logistic issues. A number of important projects were completed, and the phytosanitary research facility (PHYLA) is nearing completion. Research on polyphagous shot hole borer was initiated and a multidisciplinary programme spanning several disciplines has been proposed and instituted in part.

PHYTOSANITARY AND MARKET ACCESS

The threat posed by phytosanitary issues to market access is significant and ongoing. The current management of oriental fruit fly and the concerns regarding false codling moth are relevant examples. The current research projects address a number of issues including applied research on fumigation using novel materials. The research programme is aimed at ensuring the effective management of phytosanitary pests and diseases and ensuring access to markets. The completion of the phytosanitary facility is a significant development.

EXPERTISE

- Phytosanitary and biosecurity workgroup
- Integrated pest management group

RESEARCH TEAM

Crop Protection Programme Leader

Matthew Addison

Researchers

Dr Renate Smit

Dr Julia Meitz-Hopkins

Dr T Ware

Prof Pia Addison





Dr Shelley Johnson
Prof Gerhard Pietersen
Dr Annika Pienaar
Dr Marelize de Villiers
Technical Assistance
Mr Terence Asia

Students

Mr Nicolas Basson – Msc
Dr Leigh Steyn – Postdoc

NEW PROJECTS

- Survey for viruses of phytosanitary importance in pome fruit (G Pietersen)
- Postharvest cold treatments to control *Thaumetobia leucotreta* (false codling moth) in stone fruit (R Smit)
- Postharvest treatment using an ultra-low oxygen environment to control external pests in pome and stone fruit (R Smit)
- Ethyl formate as a post-harvest treatment to control banded fruit weevil and red spider mites on pome fruit (R Smit)
- Etiology and management of black rot on 'Forelle' pears (J Meitz-Hopkins)

CURRENT PROJECTS

- Upscale and customise ethyl formate fumigation from shipping container to cold room capacity for the control of key phytosanitary pests (S Johnson and R Smit)
- Updating the quick identification guide for phytosanitary pests of South African deciduous fruit (S Johnson)

- Academic support for the development of a pest diagnostic company (P Addison and L Steyn)
- Improving integrated control measures against the grain chinch bug, *Macchiademus diplopterus* (S Johnson)
- Rearing technology and taxonomy of the Cape fly *Ceratitis quilicii* (P Addison and N Basson)

PUBLICATIONS

Fresh Quarterly Jun 2022: Mouton, A.

Overcoming phytosanitary obstacles.

Fresh Quarterly Jun 2022: Mouton, A.

Managing market access.

Fresh Quarterly Jun 2022: Mouton, A.

The big five invasives.

Fresh Quarterly Jun 2022: Duvenage, E.

PHYLA.

Fresh Quarterly Sep 2022: van der Berg, K.

South African agriculture and the European Green Deal.

Fresh Quarterly Sep 2022: Duvenage, E.

Phytosanitary impacts on markets.

Fresh Quarterly Sep 2022: Duvenage, E.

Systems approach proves its worth.

EVENTS

- Hortgro Technical Symposium
Day 3 – 8 June 2022

NEMATOLOGY

The research programme on nematodes is scaling down. The development of several potential biological control agents has resulted in private investment in developing the commercial production of entomopathogenic

nematodes. Applied research on the mass production of EPN's was completed. Negotiations are underway regarding the supply of the agents and the registration thereof.

Both plant parasitic and entomopathogenic nematodes are being researched. The research on the integration of entomopathogenic fungi continued and is nearing completion. For example the completed research on entomopathogenic nematodes and fungi on mealybug and fruit weevils.

EXPERTISE

- Integrated pest management group
- Soil health workgroup

RESEARCH TEAM

Crop Protection Programme Leader

Matthew Addison

Researchers

Prof Antoinette Malan

Dr Nomakholwe Stokwe

Dr Rinus Knoetze

Mr Sonwabo Boo

Dr Annika Pienaar

Ms Caro Kapp

Students

Mr Louis Fourie – MSc student

Ms Letodi Mathulwe – MSc student

Mr Murray Dunn – PhD student

NEW PROJECTS

- Investigating the use of marigolds, *Tagetes* spp., and brassicaceous cover crops as a tool for the management of lesion nematodes in apple orchards. Phase I – Pot trials (R Knoetze and L Fourie)
- A survey to determine the occurrence, diversity and pathogenicity of



Pratylenchus species in South African stone fruit orchards (R Knoetze)

- Dorylaimid nematodes as a vector for stony pit virus in pear nurseries and orchards in South Africa (C Kapp)
- The potential of organic soil amendments for the management of plant-parasitic nematodes and woolly apple aphid in apple orchards (N Stokwe)

CURRENT PROJECTS

- Control of the mealybug, *Pseudococcus viburni*, using entomopathogenic fungi in deciduous fruit orchards (N Stokwe and L Mathulwe)
- Ring nematode, *Criconemoides xenoplax*, resistance of South African-bred rootstock selections in potted plant trials and high-pH soils (S Boo
- Mass culture and formulation of entomopathogenic nematodes for improved field application against key insect pests (A Malan and M Dunn)
- Evaluating the ability of entomopathogenic nematodes (EPNs) for their ability to control populations of the obscure mealybug, *Pseudococcus viburni*, on apple foliage in field conditions (A Pienaar)

COMPLETED PROJECTS

- Screening of apple rootstocks for resistance against the most prevalent *Pratylenchus* species affecting orchards in South Africa (R Knoetze)



- Identification and characterisation of naturally suppressive soils specific to ring nematodes, *Criconeimoides xenoplax*, (R Knoetze)

EVENTS

- Hortgro Technical Symposium Day 3 – 8 June 2022

ORCHARD FLOOR ECOLOGY

Research on soil health and orchard floor ecology remains an emerging theme in agriculture. Current research is focused on cover crops and mulches and their effects on soils, soil biota and fruit production. Research of the effects on plant diversity in cover crops and its effects on soil biology is complete as is research on the host status of cover crop plant species for plant parasitic nematodes.

EXPERTISE

Soil health workgroup
Integrated pest management group

RESEARCH TEAM

Crop protection Programme Leader
Matthew Addison

Researchers

Dr Charlene Janion-Scheepers
Mr Matthew Addison

Students

Ms Ansuli Theron – MSc student
Mr Abdul Jacobs – MSc student

NEW PROJECTS

- Integrated use of organic mulches in pome fruit orchards in the South Western Cape, South Africa (M Addison)

CURRENT PROJECTS

- Soil health in orchards; the role of Collembola as key indicators (C Janion-Scheepers and A Jacobs)

COMPLETED PROJECTS

- Orchard floor management and soil health in deciduous fruit orchards (M Addison and A Theron)

PUBLICATIONS

SAFJ Dec/Jan 2022: Mouton, A.

No-till cover crop management: p. 83.

SAFJ Dec/Jan 2022: Mouton, A.

Organiese materiaal: p. 85.

SAFJ Dec/Jan 2022: Mouton, A.

Die nuwe lanbouevolusie: p. 89.

SAFJ Dec/Jan 2022: Mouton, A.

Dekgewasse in boorde: p. 94.

EVENTS

- Hortgro Technical Symposium Day 2 – 7 June 2022

PLANT PATHOLOGY

The plant pathology research programme continues to address several important industry issues. Ongoing research on the incidence and distribution of fungal pathogens in young trees is highly relevant, and research was completed on the integrated management of apple scab and post-harvest rots. Apple replant disease and various aspects of post-harvest pathology, including the development of alternative fungicides, are also receiving attention.

EXPERTISE

Pre- and postharvest pathology workgroup
Integrated pest management group

PRE-HARVEST PATHOLOGY

RESEARCH TEAM

Crop Protection Programme Leader
Matthew Addison

Researchers

Prof Lizél Mostert
Prof Adele McLeod
Dr Ian Crouch
Dr Rachelle Bester
Dr Pieter Louw
Dr Iwan Labuschagne
Dr Yolanda Petersen
Dr Xolani Sibozza

Students

Ms Rochelle Janse van Rensburg – PhD student
Dr Lindani Moyo – Postdoc
Mr Vernon Jacobs – MSc student
Ms Reshika Kallideen – PhD student
Ms Elzane Froneman – PhD student

NEW PROJECTS

- Compilation of a photographic compendium of deciduous fruit diseases in a South African context (I Crouch)

CURRENT PROJECTS

- The effect of organic amendments on the severity of apple replant diseases in subsequent apple orchard replantings (A McLeod and R Janse van Rensburg)

- Evaluation of apple rootstocks tolerance against specific apple replant disease (SARD) (I Labuschagne, A McLeod and X Sibozza)
- Bacterial disease survey of major pome fruit production areas in South Africa (Y Petersen)
- Determining the risk of mulches in the spread of canker pathogens in apple orchards (L Mostert, V Jacobs and R Kallideen)
- Characterisation of the association of apple stem pitting virus (ASPV) with pear stony pit disease (R Bester)
- Confirm the involvement of *Alternaria* sp., as a possible causal agent of fruit spot on apples in South Africa, and identify potential control strategies, by investigating disease phytopathometry (P Louw)
- Tolerance of apple rootstocks against Phytophthora root rot (A McLeod and L Moyo)
- Effect of mulching, compost and rootstock genotype on white root rot of apple (A McLeod)
- Thermal and non-thermal treatments of stone and pome fruit: Towards efficient phytosanitary measures (Z Belay)

COMPLETED PROJECTS

- The influence of climatically different seasons on the reproductive strategy of *Venturia inequalis* and the RIMpro disease forecasting model (A McLeod and E Froneman)
- Determine the occurrence of fungicide resistance against pyrimethanil and fludioxonil in *Monolinia laxa* and *Botrytis*

cinerea populations from stone fruit orchards (P Louw)

- Evaluating the effect of yeast-extract, other compounds and treatment combinations as an alternative to chemical control of *Venturia inaequalis* on apples (P Louw)

PUBLICATIONS

Fresh Quarterly Dec 2021: Mouton, A.

Post-harvest disease.

Fresh Quarterly Dec 2021: Mouton, A.

Seven steps to dodge decay.

Fresh Quarterly Dec 2021: Mouton, A.

Decay control in the pack house.

Fresh Quarterly Dec 2021: Mouton, A.

A European perspective on post-harvest diseases in pome fruit.

Fresh Quarterly Jun 2022: Mouton, A.

Apple scab 101.

Fresh Quarterly Jun 2022: Mouton, A.

Fifty years of apple scab research.

Fresh Quarterly Jun 2022: Duvenage, E.

Are mancozeb formulations rainfast.

Fresh Quarterly Jun 2022: Duvenage, E.

Can RIMpro work in South Africa.

Fresh Quarterly Sep 2022: Mouton, A.

The enigma of pear stony pit.

SAFJ Dec/Jan 2022: Mouton, A.

Appelherplantsiekte: p. 100.

SAFJ Aug/Sep 2022: Mouton, A.

Six viruses and a viroid: p. 60.

SAFJ Aug/Sep 2022: Mouton, A.

Viral economics: p. 64.

SAFJ Aug/Sep 2022: Mouton, A.

Test methods demystified: p. 66.

Fresh Notes 195 – 18 May 2022:

Apple rootstocks exhibiting abnormal gall-like growths.

Fresh Notes 197 – 19 July 2022:

Galls in apple: What do and don't we know?

EVENTS

- Langkloof Seminar – 24 November 2021
- Hortgro Technical Symposium Day 2 – 7 June 2022
- Hortgro Technical Symposium Day 3 – 8 June 2022

POST-HARVEST PATHOLOGY

RESEARCH TEAM

Crop Protection Programme Leader

Matthew Addison

Researchers

Dr Cheryl Lennox

Dr Julia Meitz-Hopkins

Dr Robbie Pott

Dr Pieter Louw

Dr Zinash Belay

Dr Ian Crouch

Students

Ms Sinovuyo Magwebu – MSc student

Ms Inge Block – MSc student

Ms Miche Kotze – MSc student

NEW PROJECTS

- Compilation of a photographic compendium of deciduous fruit diseases in a South African context (I Crouch)
- Atmospheric cold plasma (CP) treatment as an alternative non-thermal fruit surface decontamination (Z Belay)

CURRENT PROJECTS

- Continued pursuit of sanitiser products for potential use in the apple and pear industry (P Louw)
- Emerging postharvest diseases of pears (J Meitz-Hopkins and M Kotze)
- Post-harvest mould of pome fruit stems and calyx sepals – an investigation into the incidence, cause and management (C Lennox and I Block)

COMPLETED PROJECTS

- Lipopeptides Fengycin and Iturin A as a post-harvest fungicide on pome fruit (C Lennox, J Meitz-Hopkins and S Magwebu)

INTEGRATED PEST MANAGEMENT

The IPM research programme deals with a wide variety of crop protection issues. The basic research aim is to ensure the sustainable control of pests and diseases. Invasive insects and phytosanitary concerns have influenced the research programme significantly during the year. Invasive polyphagous shot-hole borer research is seen as a priority. Various research projects are nearing completion including applied research on fruit weevils and the application of biological control agents.



EXPERTISE

Integrated pest management workgroup

RESEARCH TEAM

Crop Protection Programme Leader

Matthew Addison

Researchers

Prof Pia Addison

Prof Robbie Pott

Prof John Terblanche

Prof Francois Roets

Dr Shelley Johnson

Dr Minette Karsten

Dr Karel Kruger

Prof Adriaan van Niekerk

Technical Assistant

Mr Terence Asia

Students

Mr Francis du Preez – PhD student

Ms Mignon de Jager – MSc student

Mr Steffan Hansen – MSc student

NEW PROJECTS

- Bio-fermentation of an insect chemical attractant (R Pott)
- Establishing a barcoding database of local pests of deciduous fruit (P Addison)
- Developing a centralised industry-driven industry/area-wide geographic database supporting the information needs of the pome & stone fruit industries (M Addison, A van Niekerk and K Kruger)

- Phylogeny and biological control of weevils, *Curculionidae*, in the Western Cape Province (S Johnson)
- Evaluation of managed bees and pollination efficiency in the pome and stone fruit industry in the South Western Cape, South Africa (M Addison)

CURRENT PROJECTS

- Maintaining and rearing insect cultures (M Addison and T Asia)
- Implementation of biological control options against false codling moth in laboratory and field trials (P Addison and F du Preez)
- Trophic ecology of predaceous mites in apple and pear orchards (J Terblanche and M Karsten)
- *Phlyctinus callosus* species complex and post-harvest control (S Johnson)

COMPLETED PROJECTS

- False codling moth population genetics: gene flow in agricultural environments (J Terblanche and M Karsten)
- Sequencing the genome and transcriptome of false codling moth, *Thaumatotibia leucotreta*, for pest management (J Terblanche and M Karsten)
- Assessment of management methods against pome fruit mites (P Addison)
- Assessing the threat of the Polyphagous Shot Hole Borer beetle (PSHB), *Euwallacea whitfordi*, and its



symbiotic fungus (*Fusarium euwallaceae*) to deciduous fruit trees in the Western Cape Province of South Africa (F Roets and M de Jager)

- *Phlyctinus callosus* taxonomy and field management (P Addison and S Hansen)

PUBLICATIONS

Fresh Quarterly Jun 2022: Mouton, A.

The big five invasives.

Fresh Quarterly Jun 2022: Duvenage, E.

Stopping grain chinch bugs.

Fresh Quarterly Sep 2022: Duvenage, E.

Fruit-fly management in Europe.

Fresh Quarterly Sep 2022: Duvenage, E.

Beware of this tiny beetle.

Fresh Quarterly Sep 2022: Mouton, A.

Integrated pest management.

EVENTS

- Hortgro Technical Symposium Day 2 – 7 June 2022
- Hortgro Technical Symposium Day 3 – 8 June 2022
- Polyphagous Shot Hole Borer Field Day – 10 and 12 August 2022

PRECISION AGRICULTURE

The development and application of new technology in the industry are vital. Aspects such as the development of more efficient spray application and evaluation methods are central to pest and disease control. Coupled with this is the use of artificial intelligence and advanced analytical methods. Current research addresses a number of these issues and new technologies are emerging.

The integration of industry data into an industry-wide database is an example of this.

EXPERTISE

Spray application workgroup

Integrated pest management group

Database group

RESEARCH TEAM

Crop protection programme leader

Matthew Addison

Researchers

Dr Pia Addison

Dr Gideon van Zyl

Dr Francois Bekker

Students

Mr Quintus Deacon – MSc student

NEW PROJECTS

- Evaluating the influence of drape netting on spray deposition and disease control in apple orchards using apple scab as a model pathogen (G van Zyl)

CURRENT PROJECTS

- Evaluation of spray application techniques on pome and stone fruit trees for improved spray deposition parameters for the control of late-season red spider mite (G van Zyl)

COMPLETED PROJECTS

- Artificial intelligence for managing economic fruit pest efficiently (P Addison, F Bekker and Q Deacon)

PUBLICATIONS

SAFJ Oct/Nov 2021: Mouton, A.

40 Jaar se veranderinge in bespuitingstechnologie: p. 88.

SAFJ Oct/Nov 2021: Mouton, A.

Bespuiting in boorde met drapeurnette: p. 93.

SAFJ Oct/Nov 2021: Mouton, A.

Beskerm jou oes met effektiewe bespuiting: p. 98.

SAFJ Oct/Nov 2021: Mouton, A. **Hoe word dosisse bepaal:** p. 101.

SAFJ Oct/Nov 2021: Mouton, A.

Tyd is geld – waarom optimale trekkerspoed tel: p. 102.

SAFJ Oct/Nov 2021: Mouton, A.

Berekende bespuiting: p. 105.

EVENTS

- Hortgro Technical Symposium Day 2 – 7 June 2022



Postharvest Research Programme

Postharvest supports and enhances the processes throughout the supply chain critical to ensuring that intrinsic product integrity is maintained and that a quality product is available to the end-consumer in local and distant global markets. Postharvest covers producers, packhouses, marketing coordination, logistics and shipping, receivers/wholesalers and end-consumers.

The postharvest research programme is structured into four themes, namely quality management, physiological defects, storage techniques and packaging and logistics.

The research strategy for each theme is determined by a workgroup (one workgroup per theme) consisting of exporters, pre- and postharvest technical specialists, industry consultants and researchers. Additional workgroups are formed as and when needed. When considering research strategy, the workgroups always keep in mind the objectives of the postharvest research programme, which are the following:

- To increase the marketable tons of fruit delivered per ton of fruit loaded
- To present clients all along the post-harvest value chain extending up to the

consumer with a safe product of reliable, good quality

- To reduce wastage and losses from defects and pathogens (see the crop protection programme for postharvest pathology research)
- To increase efficiencies throughout the postharvest value chain
- To increase the sustainability of postharvest practices
- To reduce risk within the postharvest value chain.

Research needs relating to pre-harvest factors that affect postharvest quality and storability are addressed within the crop production programme. The postharvest and crop production programmes share a programme manager with the effect that research is very well integrated between the two programmes.

QUALITY MANAGEMENT

Quality management refers to maintaining quality throughout the logistical chain to the end consumer. With reference to stone fruit, shrivel due to moisture loss is the main

postharvest defect and therefore the key research focus area. Prof Olaniyi Fawole has been conducting very interesting research on the use of edible coatings to prevent moisture loss and maintain fruit-keeping quality. During the last season of research, he showed that the commercial implementation of the technology will require some more thought and further experimentation.

Pome fruit projects are aimed at optimising the Forelle Early Market Access (FEMA) programme in terms of release criteria and marketing protocol. Daniël Viljoen found that pears from FEMA-designated orchards that are harvested two to three weeks after normal release but do not qualify for FEMA release can be treated with FEMA rate 1-MCP. This will avoid excessive ripening during storage. The fruit should be cold stored for 12 weeks as part of the normal Forelle postharvest programme.

EXPERTISE

Quality management workgroup

RESEARCH TEAM

Postharvest programme leader

Prof Wiehann Steyn

Researchers

Ms Anél Botes

Mr Daniël Viljoen

Dr Elke Crouch

Dr Ian Crouch

Mr Marnes Gouws

Mr Handré Viljoen

Dr Olaniyi Fawole

Ms Heleen Tayler

Dr Alemayehu Tsige

Dr Zinash Belay



Students

Ms Shannon Riva – MSc student

Ms Taongashe Majoni – MSc student

Ms Makiwe Nkohla – MEng student

POME FRUIT

NEW PROJECTS

- Development of a simple replacement for standard industry colour charts for pome fruit using the NIX colour sensor (I Crouch)
- Assessment of the use of the DA meter to increase the rigour of fruit sampling for release date determination in strip-picked orchards and to generate additional information for packhouses on the maturity of select pick fruit (M Gouws)
- The use of edible coatings as a viable replacement for plastic liners to maintain pome fruit quality (H Tayler)

CURRENT PROJECTS

- Integrated postharvest ethylene management along the value chain (Z Belay and M Nkohla)
- Moisture loss studies in pears (A Botes and E Crouch)
- Artificial intelligence-based quality monitoring in the pome fruit cold chain management (A Tsige)
- The effect of relative humidity during cold storage on water loss and lenticel damage incidence of apples (D Viljoen)



COMPLETED PROJECTS

- The use of Harvista (pre-harvest 1-MCP) application to prevent green colour loss and reduce blush of Granny Smith apples (D Viljoen)
- To assess the minimum acceptable malic acid equivalents level for Forelle pear destined for the FEMA programme (D Viljoen)
- Evaluation of logistic alternatives in container transport of apples and pears (A Tsige)

STONE FRUIT

NEW PROJECTS

- Scanning plum cultivars for CO₂ sensitivity and the effect of closed vents in shipping containers on relative humidity and CO₂ levels (H Viljoen)
- The impact of relative humidity in commercial cold rooms during accumulation of pallets for shipping on shrivel with plums (H Viljoen)

COMPLETED PROJECTS

- Effect of irradiation as a mitigation treatment on storage quality of early peaches and nectarines for airfreight consignments (H Viljoen)
- Technology testing for the ability to control shrivel in cold-stored plums and nectarines (H Viljoen)
- Profiling sugar metabolism and accumulation in plums as related to maturity, cultivar difference and post-harvest storage regimes (O Fawole and T Majoni)



- Application of postharvest edible coatings to alleviate shrivel in plums and nectarines (O Fawole and S Riva)

PUBLICATIONS

Fresh Quarterly Dec 2021: Mouton, A.

Temperature and humidity.

SAFJ Apr/May 2022: Mouton, A.

A futuristic view of in-line sorting: p. 91.

PHYSIOLOGICAL DEFECTS

The main internal quality defects receiving research attention are heat damage in plums and lenticel breakdown, mealiness, superficial scald and internal browning in apples and pears. Research is aimed at understanding the underlying causative factors (both pre- and postharvest) and biochemistry of these defects to allow the development of technology to limit or prevent their occurrence. In this regard, an ambitious new project by Dr Elke Crouch is studying the climate factors during early fruit development that give rise to radial internal browning in Cripps Pink apples and cultivars derived from it.

Other aims are to generate best practice guidelines for handling fruit both pre- and postharvest and to develop indicators to predict the risk of various defects in each season.

EXPERTISE

Physiological defects workgroup

RESEARCH TEAM

Postharvest programme leader

Prof Wiehann Steyn

Researchers

Dr Elke Crouch

Dr Elmi Lötze

Dr Ian Crouch

Dr Ashwil Klein

Ms Anél Botes

Mr Daniël Viljoen

Students

Ms Nolubabalo Mzizi - MSc student

Mr Alone Hlungwani - PhD student

Ms Monja Gerber - PhD student

Dr Thirupathi Pandian - Postdoctoral research fellow

POME FRUIT

CURRENT PROJECTS

- Superficial scald on Granny Smith - understanding the mechanisms and limitations of the storage protocols used by industry and assess risk indicators in storage for scald development (E Crouch, A Botes, A Klein, D Viljoen, T Pandian, M Gerber and A Hlungwani)
- Assessment of fruit density as an indicator for internal browning susceptibility in Fuji apples (D Viljoen)
- Assessment of a lenticel breakdown prediction method for the South African pome industry (D Viljoen)
- Influence of fruit micro-structure on gas exchange and tissue damage (E Crouch)



COMPLETED PROJECTS

- Compilation of a database of high-quality images of pome fruit disorders from South African growing and storage conditions to contribute to the further development of software-based determination (APP) for the detection and reduction of bearing damage in fruit (I Crouch)
- Quantifying the role of vapour pressure deficit in the development of lenticel breakdown in Braeburn apples. (E Lötze, D Viljoen and N Mzizi)

STONE FRUIT

NEW PROJECTS

- Compilation of a photographic compendium of stone fruit disorders in a South African context (I Crouch)

PUBLICATIONS

SAFJ Feb/Mar 2022: Mouton, A.

Internal heat damage in Laetitia: p. 58.

SAFJ Apr/May 2022: Mouton, A.

Interne verbruining in Cripps Pink: p. 76.

SAFJ Apr/May 2022: Mouton, A.

Wat leer ons uit navorsing: p. 78.

SAFJ Apr/May 2022: Mouton, A.

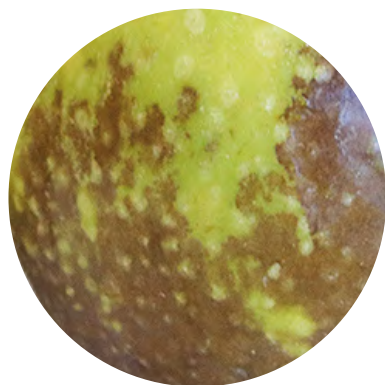
Die beste praktyke vir Cripps Pink: p. 80.

SAFJ Apr/May 2022: Mouton, A.

Internal browning in Fuji: p. 84.

SAFJ Apr/May 2022: Mouton, A.

Die beste praktyke vir Fuji: p. 86.



SAFJ Apr/May 2022: Mouton, A.

Interne verbruining vanuit die pakhuisperspektief: p. 88.

EVENTS

- Hortgro Technical Symposium Day 3 – 8 June 2022

STORAGE TECHNIQUES

Non-chemical scald control and prevention of internal browning are major focuses of the evaluation of storage technologies and protocols. A major outcome of research on this theme is the development of protocols to prevent or reduce the incidence of disorders and to maintain fruit quality.

EXPERTISE

Controlled atmosphere storage group

RESEARCH TEAM

Postharvest programme leader
Prof Wiehann Steyn



Researchers

Ms Anél Botes

Ms Feroza October

Mr Daniël Viljoen

Ms Heleen Tayler

Dr Elke Crouch

Students

Mr Jason Ladegourdie – MSc student

Ms Anmari Kriegler – MSc student

Ms Ineke de Jong – MSc student

POME FRUIT

NEW PROJECTS

- An impact study of the sulphur dioxide usage within the South African dried fruit industry (F October)
- Effect of humidity control, using bin liners and bin lids, on fruit quality during long-term storage of apples and pears (D Viljoen)
- Influence of harvest maturity, storage temperature and duration and 1-MCP on postharvest physiological disorders (with special reference to internal browning) and fruit quality of the new Cripps' Pink apple strains; Lady in Red (H Tayler)
- The effect of different postharvest technologies on the quality of Golden Delicious apple (A Botes)

CURRENT PROJECTS

- Investigate the effect of step-wise cooling on internal browning in apples (A Botes, E Crouch and A Kriegler)
- Soft scald development in new apple cultivars (A Botes, E Crouch and J Ladegourdie)
- Internal browning of 'Cripps Pink' apples

- DCA-CF and long-term storage with best practice protocol (E Crouch and I de Jong)

DRIED TREE FRUIT

NEW PROJECTS

An impact study of the sulphur dioxide usage within the South African Dried Fruit Industry (F October)

PACKAGING / LOGISTICS

Logistics projects focus on the optimisation of shipping container space utilisation while packaging projects are aimed at reducing plastic packaging or finding alternatives to non-recyclable, single-use plastics without jeopardising fruit quality or the structural integrity of the packaging. The plastic workgroup of the pack house action

group provides direction in terms of where the industry needs to go regarding plastic packaging.

EXPERTISE

- Packhouse action group
- Plastics workgroup

RESEARCH TEAM

Postharvest programme leader
Prof Wiehann Steyn

Researchers

Ms Anél Botes

Mr Daniël Viljoen

POME FRUIT

CURRENT PROJECTS

- Evaluating the effects of different plastic liners and pallet shrouds on the internal and external quality of pome fruit (A Botes and D Viljoen)



The Hortgo Science Team

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CROP PRODUCTION PROGRAMME MANAGER
POST-HARVEST PROGRAMME MANAGER

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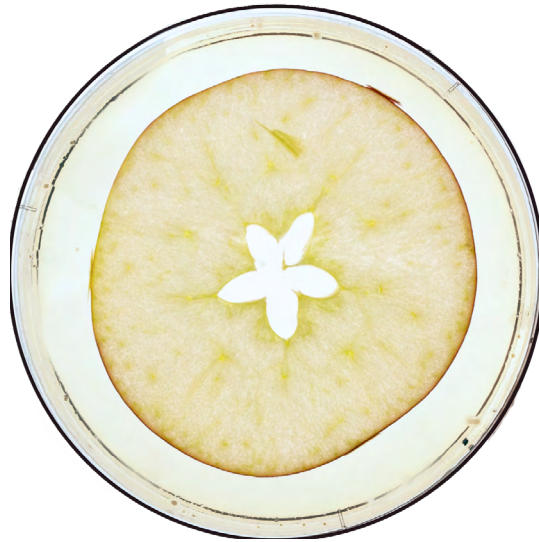
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