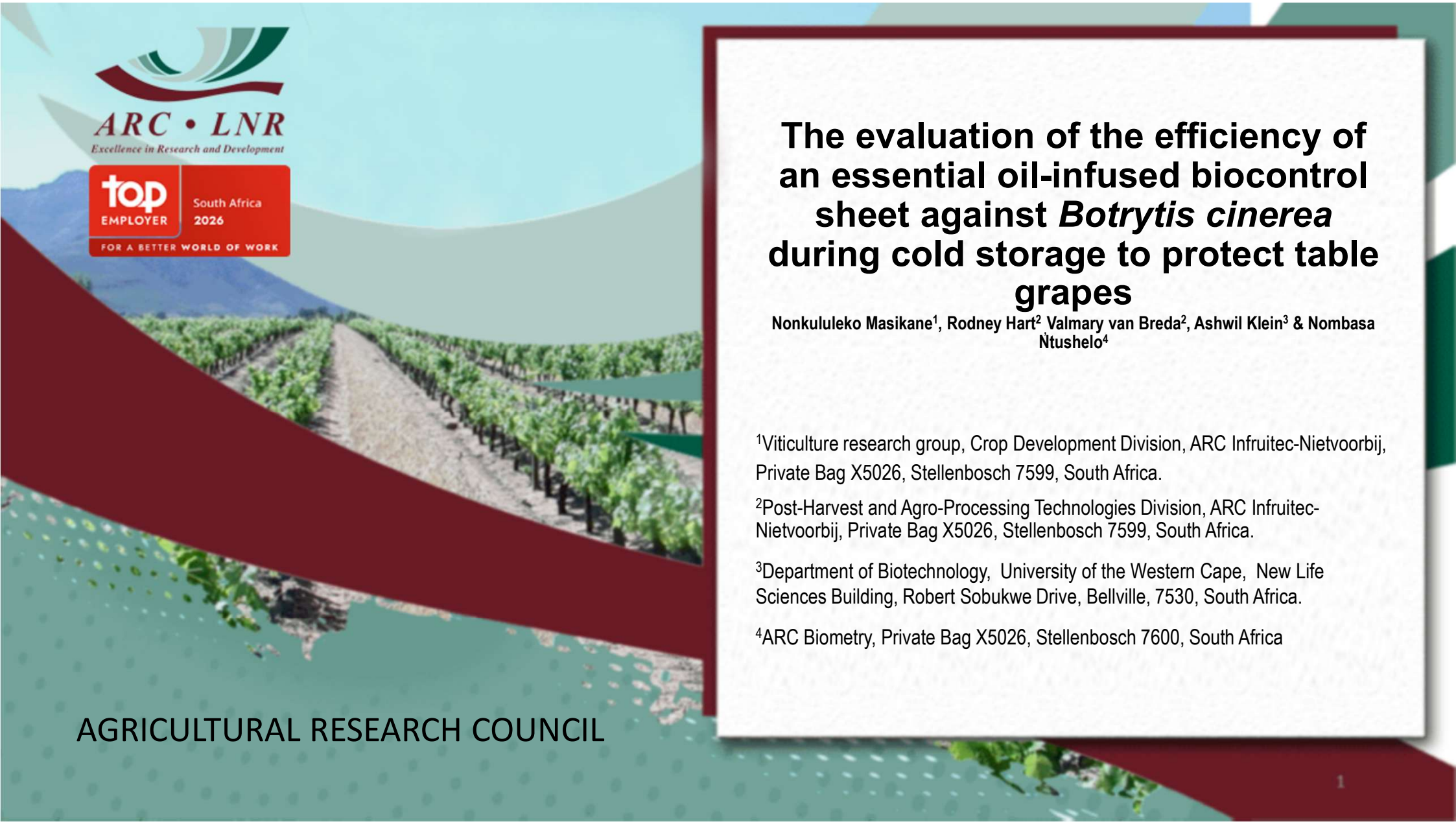


# The evaluation of the efficiency of an essential oil-infused biocontrol sheet against *Botrytis cinerea* during cold storage to protect table grapes

**Nonkululeko Masikane[1], Rodney Hart[2] Valmary van Breda[2], Ashwil Klein[3] & Nombasa Ṅtushelo[4]**

[1]Viticulture research group, Crop Development Division, ARC Infruitec-Nietvoorbij, Private Bag X5026, Stellenbosch 7599, South Africa.

[2]Post-Harvest and Agro-Processing Technologies Division, ARC Infruitec-Nietvoorbij, Private Bag X5026, Stellenbosch 7599, South Africa.

[3]Department of Biotechnology, University of the Western Cape, New Life Sciences Building, Robert Sobukwe Drive, Bellville, 7530, South Africa.

[4]ARC Biometry, Private Bag X5026, Stellenbosch 7600, South Africa

AGRICULTURAL RESEARCH COUNCIL

# Background

•The grey mould fungus caused by *Botrytis cinerea* is one of the most economically significant necrotrophic pathogens

•Table grapes are one of the species that are susceptible to grey mould that is Caused by *Botrytis cinerea*

•The Industry use $SO_2$ – releasing pads to extend the shelf life of table grapes, these pads generate Sulphur dioxide as chemical controls for fungal disease.

•These $SO_2$ plastic sheets are used for storage and transportation, for both export and market within the country

•However, $SO_2$ was implicated in human allergies as well as $SO_2$ damage to grape skin referred to as bleaching known to reduce organoleptic quality in, especially Red Globe berries.

•This has led to an increase of customer fears who are becoming more health conscious

# Aim & Objectives

•This study aims to evaluate the efficiency of an essential oil-infused biocontrol sheet (bioactive packaging ) against the postharvest fungal pathogen *i.e.*, *Botrytis cinerea* during cold storage to protect table grapes cultivars *i.e.*, Crimson seedless.

**The objectives are:**

- Comparative evaluation of the biocontrol sheets on the chemical and sensory parameters of Crimson seedless, compared to chemical control *i.e.*, $SO_2$ sheets.
- Comparative proteomic characterisation of the most promising table grape cultivar using gel-based proteomic tools along with LCMS prior to and after cold storage.
- Metabolomic characterisation of the most promising table grape cultivar based on chemical analyses and sensory evaluation by deploying gas chromatography coupled with mass spectrometry (GC-MS) and gas chromatography coupled to a flame ionisation detector (GC-FID).

# Methodologies

## Treatments used in this study:

- Treatment 1: Storage without generator pad (Negative Control);
- Treatment 2: Storage with film (sheet) not infused with essential oils (Control);
- Treatment 3: Storage with UVASYS® sulphur dioxide ($SO_2$) Dual release Blue generator pad (AgriMark, South Africa;
- Treatment 4: Storage with Uvasys $SO_2$ Sheet Dual Release Green pad); (Tessara, South Africa);
- Treatment 5: Storage with Sheet infused with Lemon oil (LemO) + Peppermint oil (PMint);
- Treatment 6: Storage with Sheet infused with Lemon oil (LemO) + Lemongrass oil (LemG);




**Figure 1:** Table grape treatments, (A) plain sheet, (B) Blue Uvasys $SO_2$, (C) Green uvasys $SO_2$ sheet, (D) the LE+LG sheet, (E) LE+PE sheet, (F)Boxes after applying the treatments.

# Results: Bunch Quality



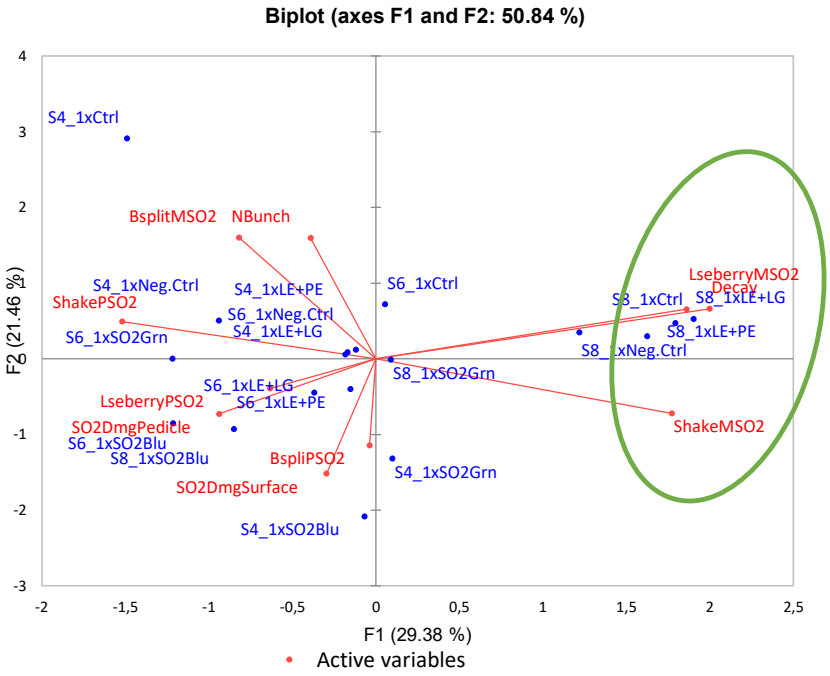
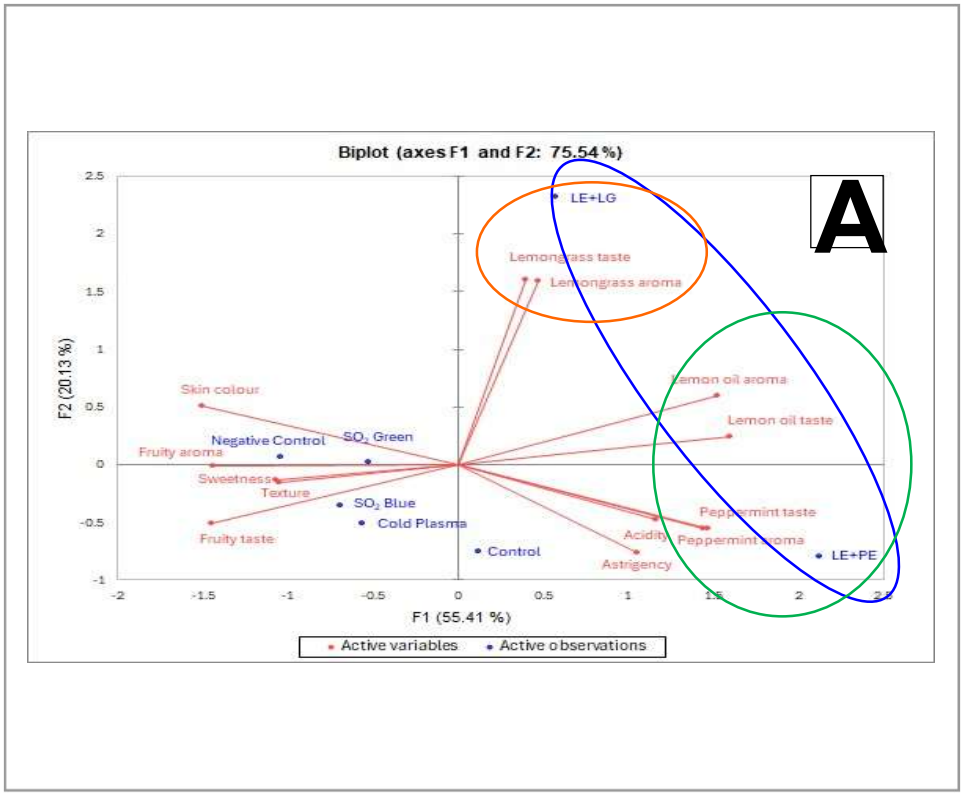
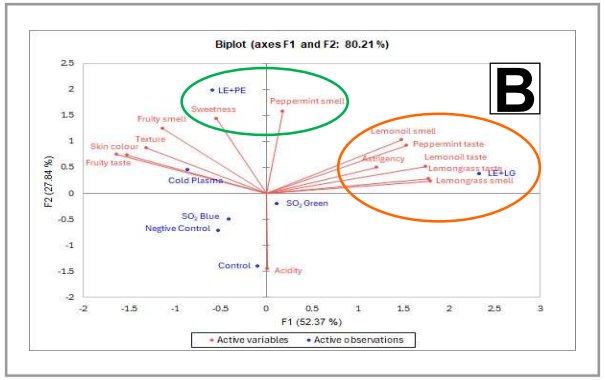
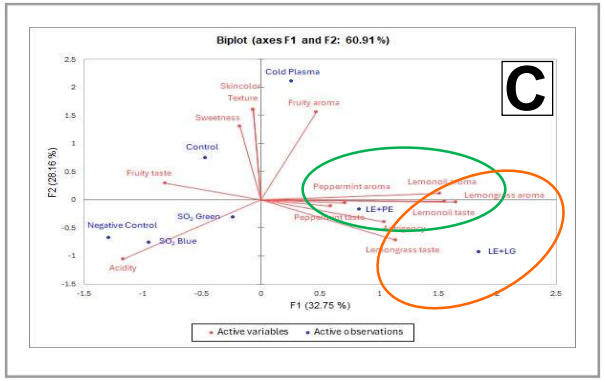




**Figure 3: Illustration of bunch conditions after 4 weeks of cold Storage (-0.5° C) + 1 week (2.5° C) and at 6 weeks**. Biocontrol sheets (C) showed a positive effect like the SO2 sheets (A) on the inhibition of the fungal growth as not fungal growth was observed after 5 weeks of cold storage, and the there was no discoloration of the stems(D).

# Sensory Evaluation




Graph of perceived essential aroma (smell) and flavour (taste) by the sensory panel of 12 judges (students and staff members) who regularly consume table grapes following **a)** four (4) weeks of cold storage (-0.5°C) and one (1) week at 2.5°C; **b)** six (6) weeks of cold storage (-0.5°C) and one (1) week at 2.5°C; and **c)** eight (8) weeks of cold storage (-0.5°C) and one (1) week at 2.5°C, respectively.



# Conclusion

- Both $SO_2$ sheets and biocontrol sheets inhibited the fungal growth
- At week 9 (8 weeks +1) , LE+PE showed a little bit of rot, and the $SO_2$ sheets still had no rot, but the $SO_2$ bleaching was observed.
- Table grapes that were stored with biocontrol sheets (LE+LG and LE+PE), showed the aromas and flavours of these essential oils but they were not overpowering
- Therefore, the biocontrol sheets look promising  but Still needs to be tested on other cultivars

# Acknowledgments


Dr Hart- PhD supervisor (Agricultural Research Council)

Prof Klein- PhD co- supervisor (University of the Western Cape)

Xolela Kahla-Viticulture research group, Crop Development.

Dr Van Breda- Post-Harvest and Agro-Processing Technology research group.