IMPACT OF UV-C IRRADIATION ON ALTERNARIA LEAF SPOT DEVELOPMENT IN BLUEBERRIES

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INTRODUCTION

- South Africa is mainly **export-orientated**
- Require **high-quality** standards
- Disease **compromising** berry quality
- **Current** disease control
- **Pressure** on the use of fungicides
- **Alternative** disease management strategies

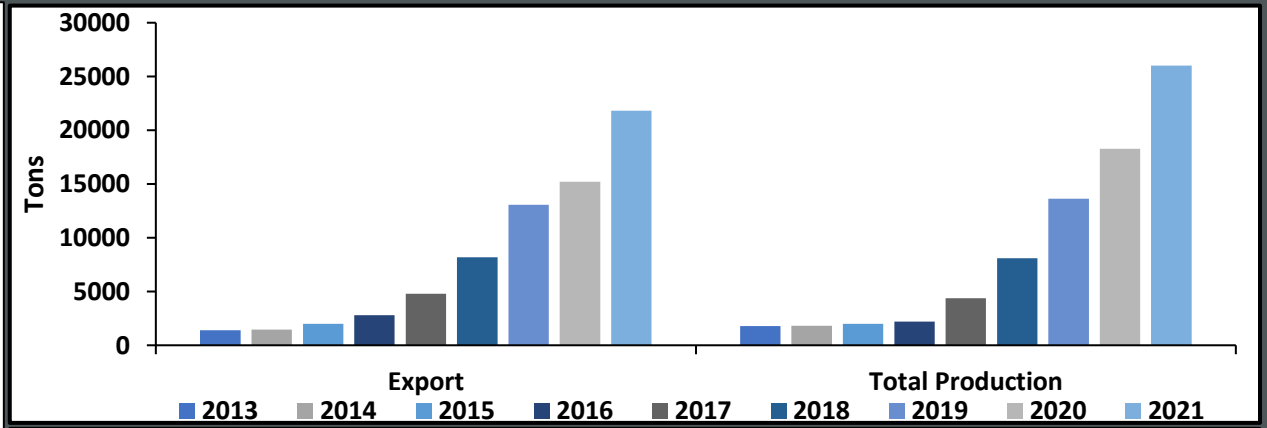


Figure 1.1: South African blueberry export vs production (IBO, 2022).

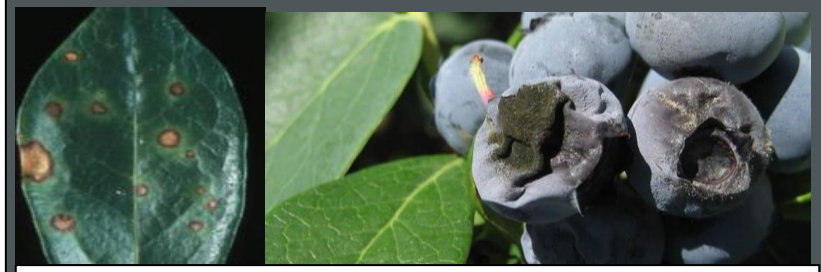


Figure 1.2: Alternaria leaf spot and fruit rot (*Alternaria alternata*).

Figure 1.3: Limiting fungicide use.

(Forney, 2008; Zhu and Xiao, 2015; Bell et al., 2021)

INTRODUCTION

What about shortwave ultraviolet (UVC) irradiation?

Extend shelf life

Reduce rots

Stimulate antioxidants

Induce defense genes

No chemical residue

(Kowalski, 2009)

AIM AND OBJECTIVES OF THE STUDY (2022)

Aim:

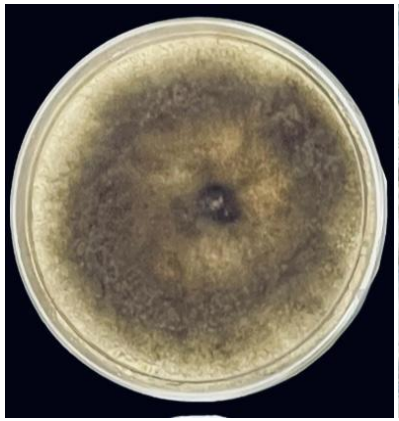
To assess the effect of the **UV-C irradiation** as an **alternative** method to prevent **Alternaria leaf spot** development in blueberries.

Objectives:

1. To investigate the effect of **UV-C irradiation** on *in vitro* **inhibition** of ***Alternaria alternata* spore germination**
2. To investigate the effect of **UV-C irradiation** on **Alternaria leaf spot development** in artificially inoculated blueberry leaves.

RESULTS OF THE STUDY (2022)

Table 3.1: Morphology and identity of pathogen isolated

		Morphological identification		Molecular identification			
				Maldi-TOF		DNA sequencing (Blastn)	
Symptom description	Lesion	Culture	Spore	Organism ID	Score	Organism ID	Percentage identity
The lesion was irregular in shape at the tip of the leaf, with slight concentric rings. The colour of the lesion was dark brown.				*Alternaria alternata*	2.66	*Alternaria alternata*	100

EFFECT OF UV-C IRRADIATION ON SPORE GERMINATION

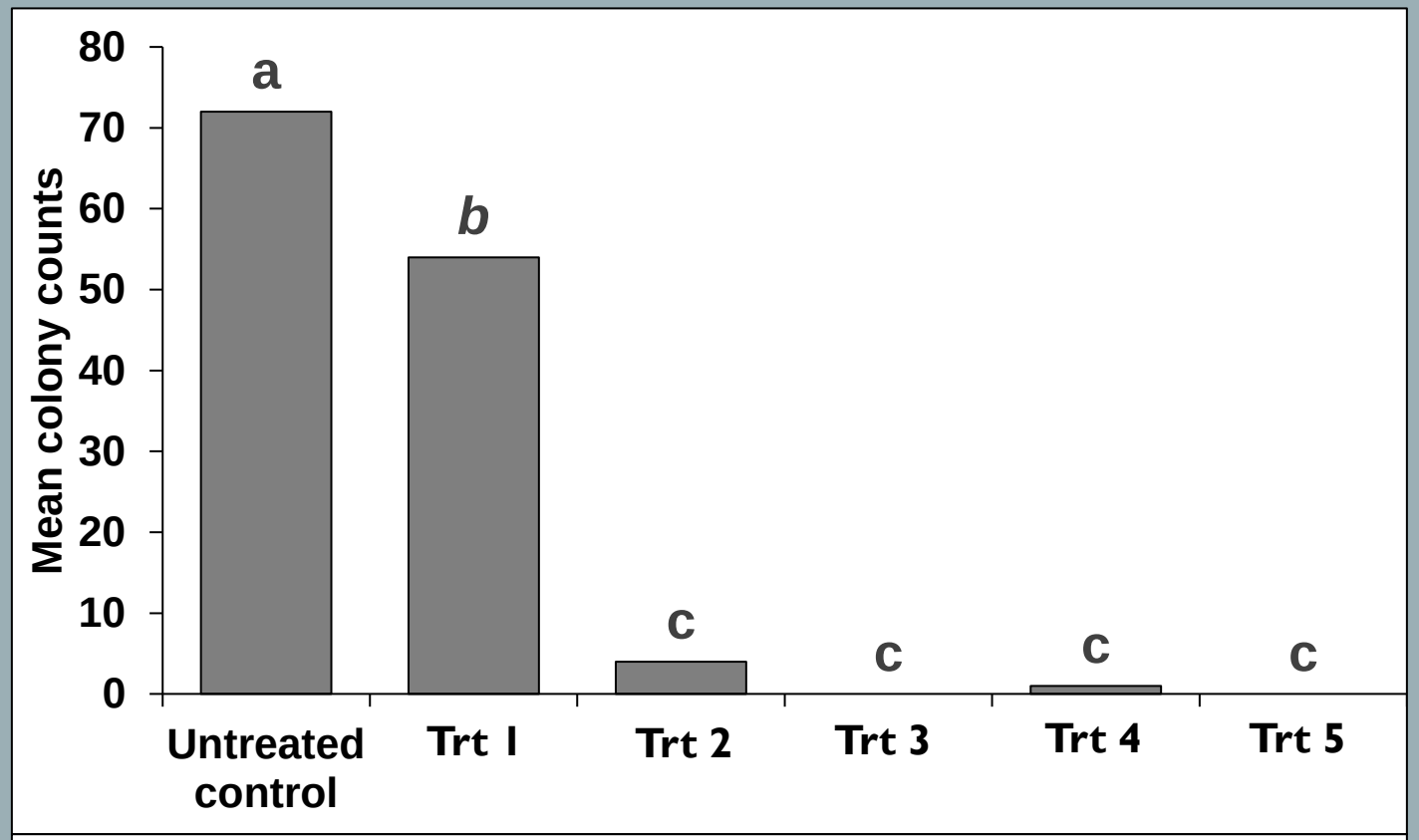
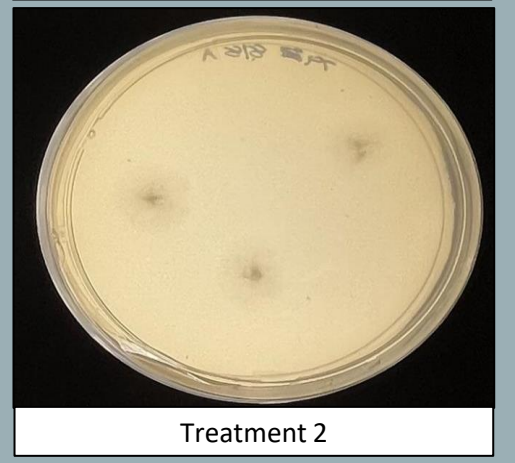


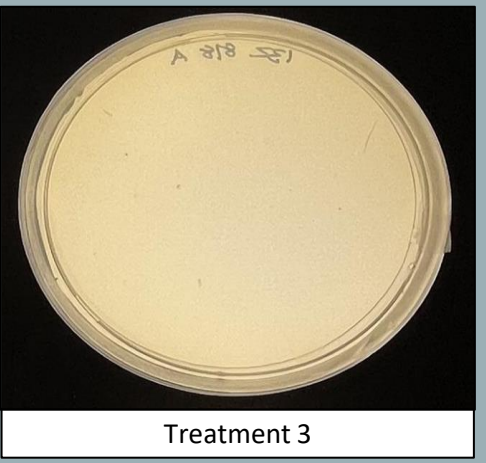
Figure 1.4: Effect of UV-C irradiation on mean colony counts.

Control

Treatment 1



Treatment 2

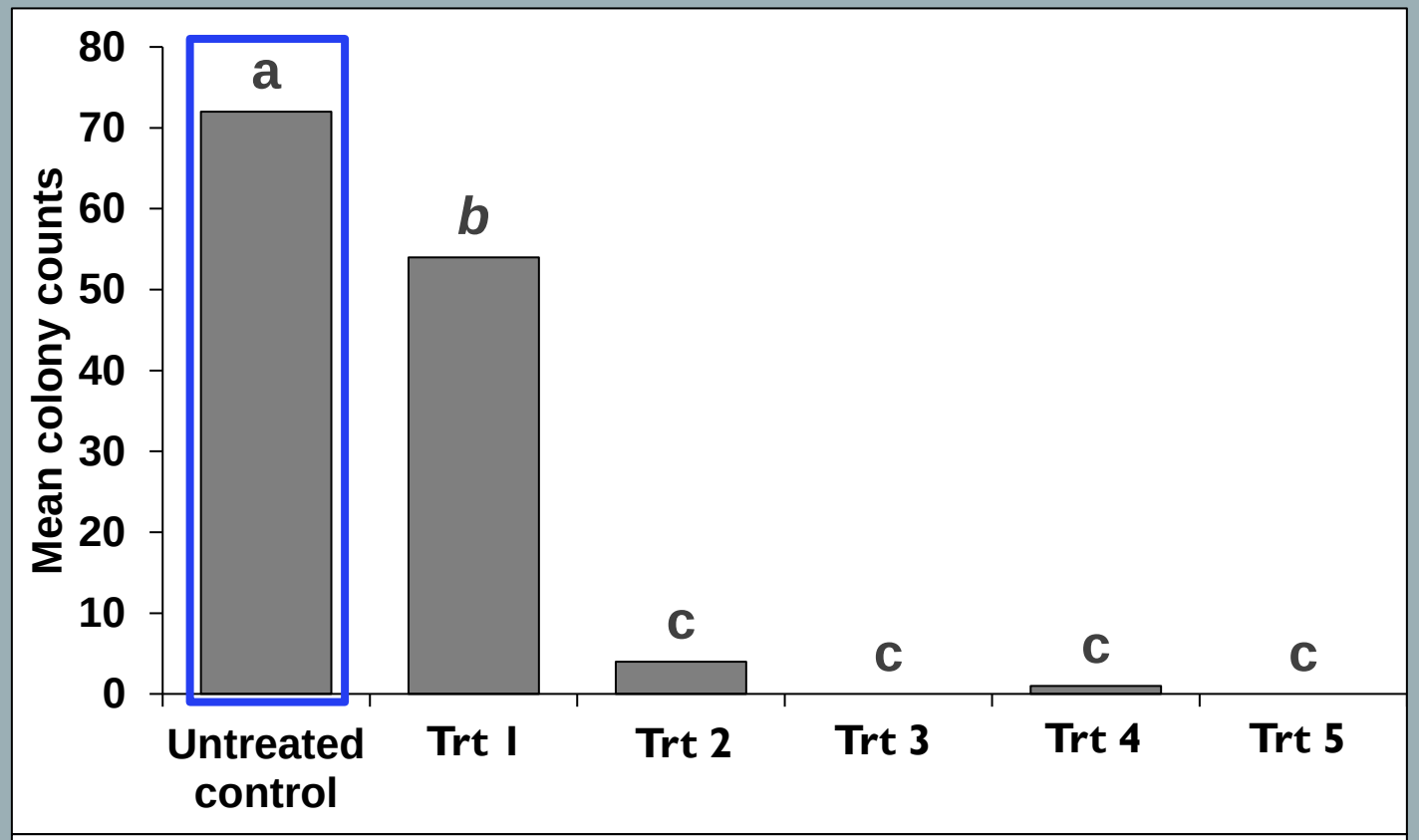


Treatment 3

Treatment 4

Treatment 5

EFFECT OF UV-C IRRADIATION ON SPORE GERMINATION



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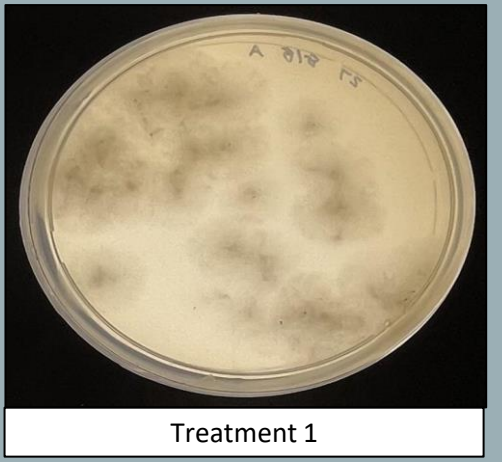
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Treatment 3


Treatment 4


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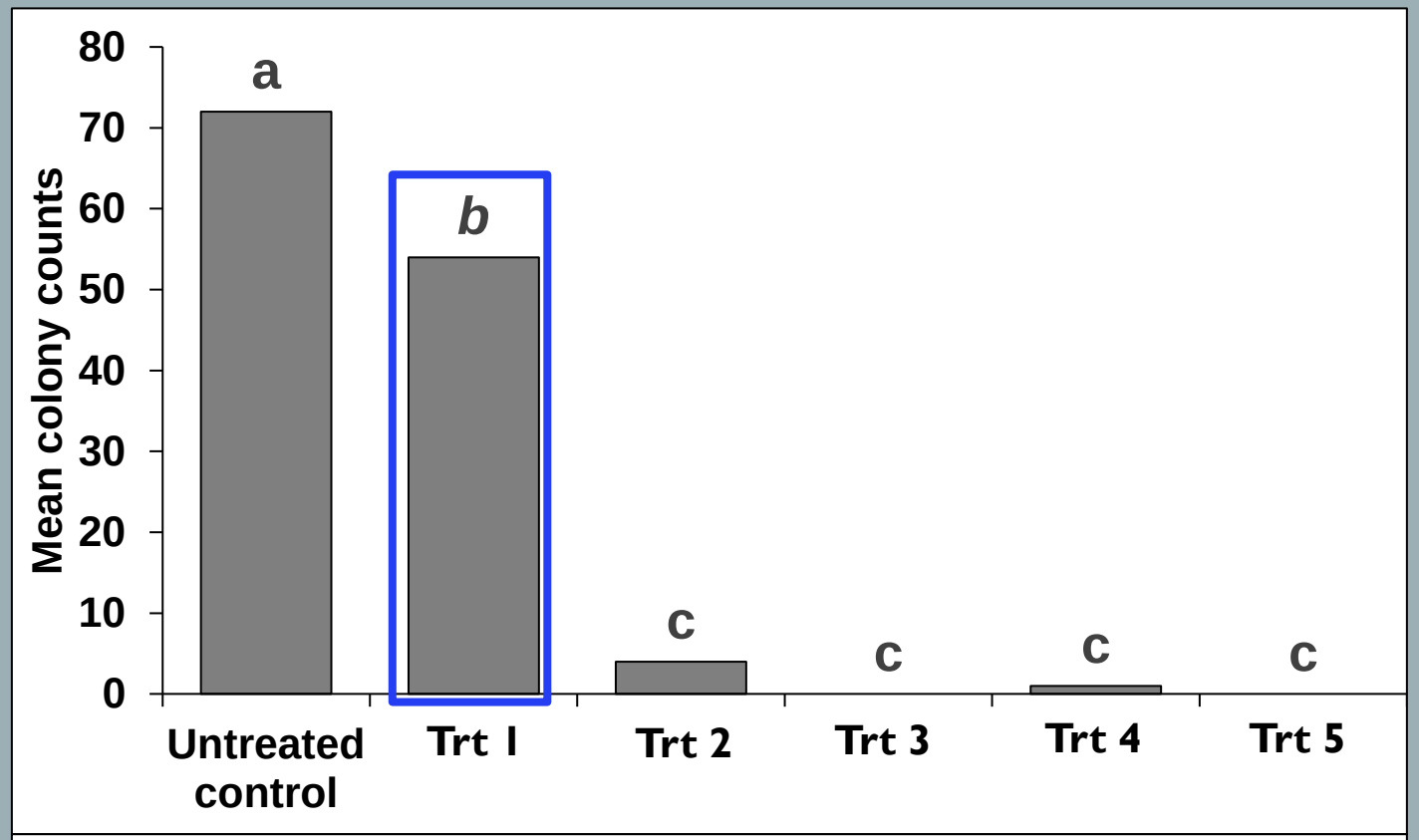

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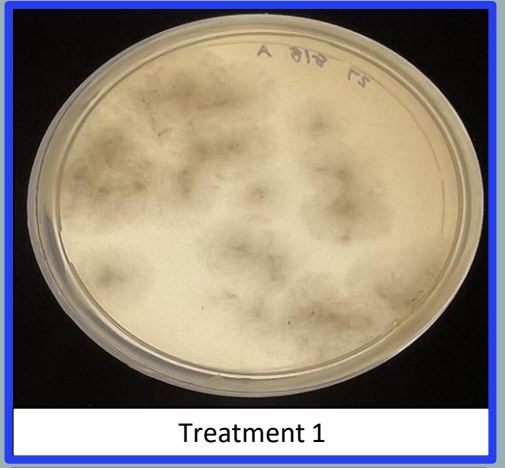
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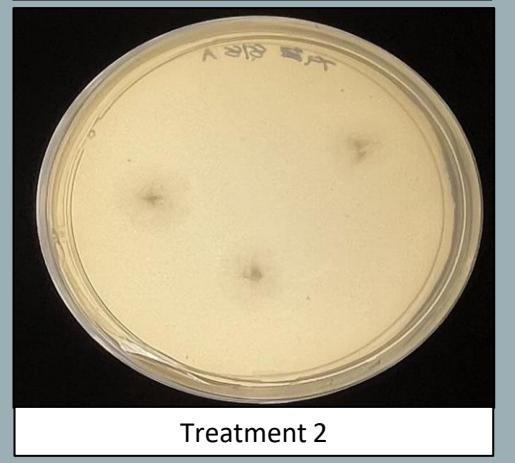
Treatment 2


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Treatment 4


Treatment 5

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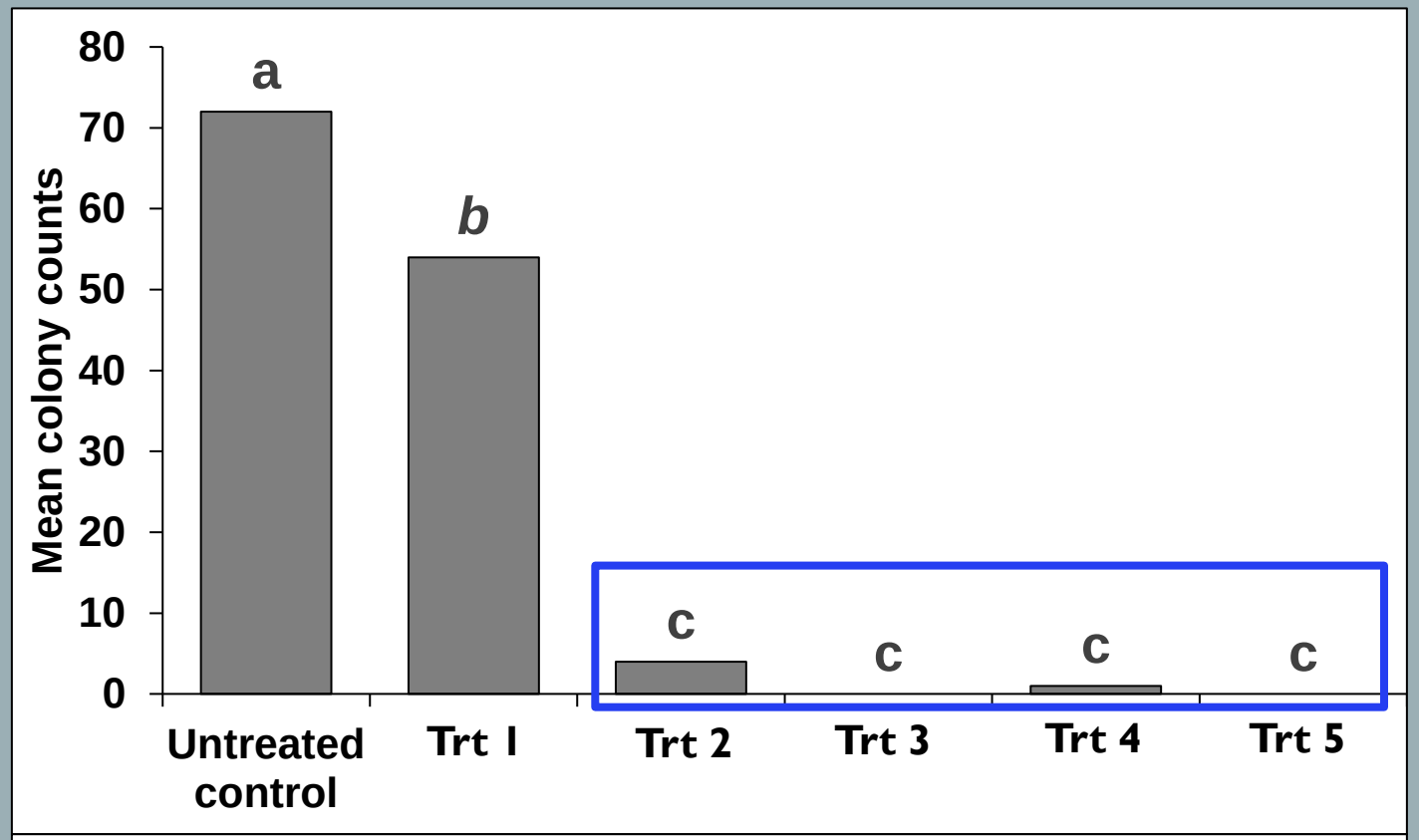

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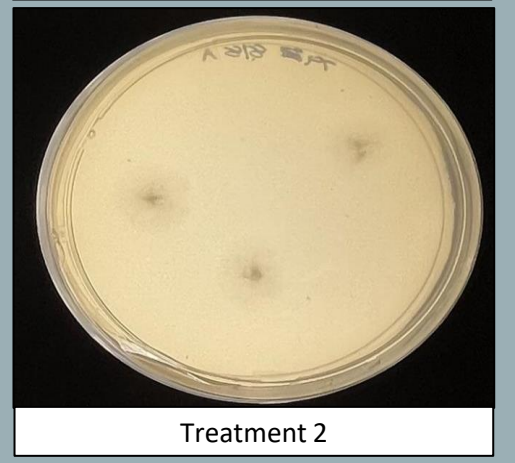
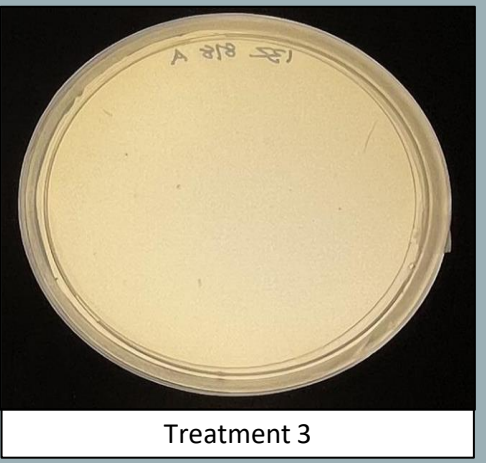

Treatment 2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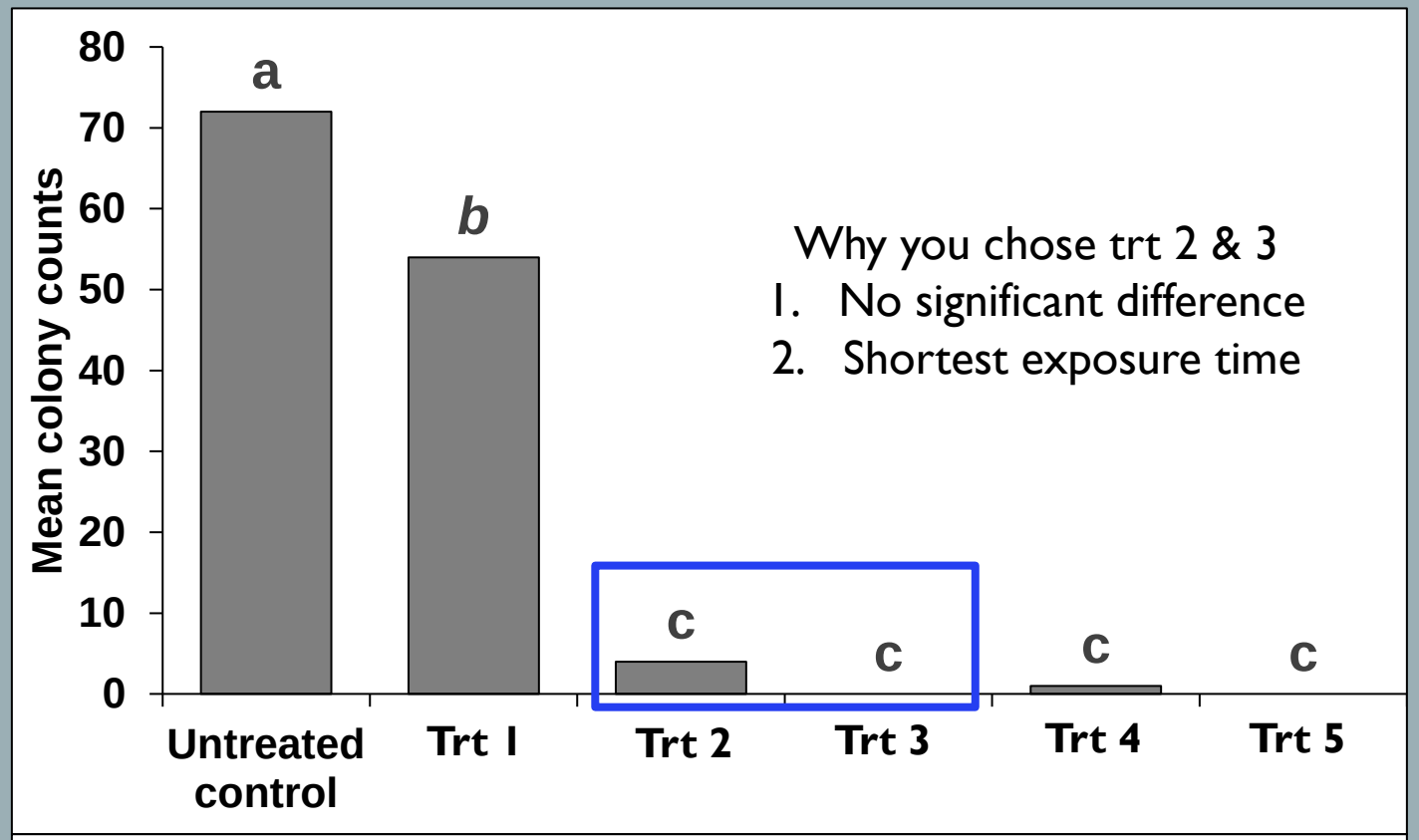
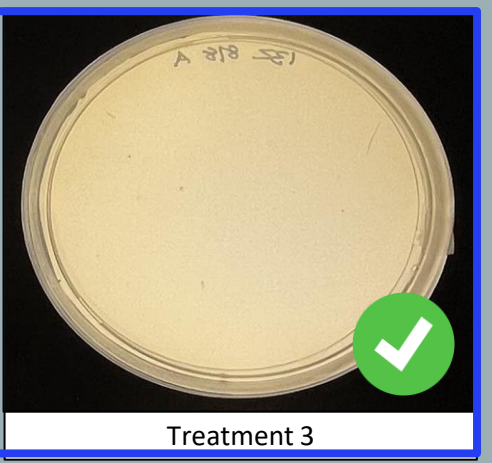


Figure 1.4: Effect of UV-C irradiation on mean colony counts.


Control


Treatment 1

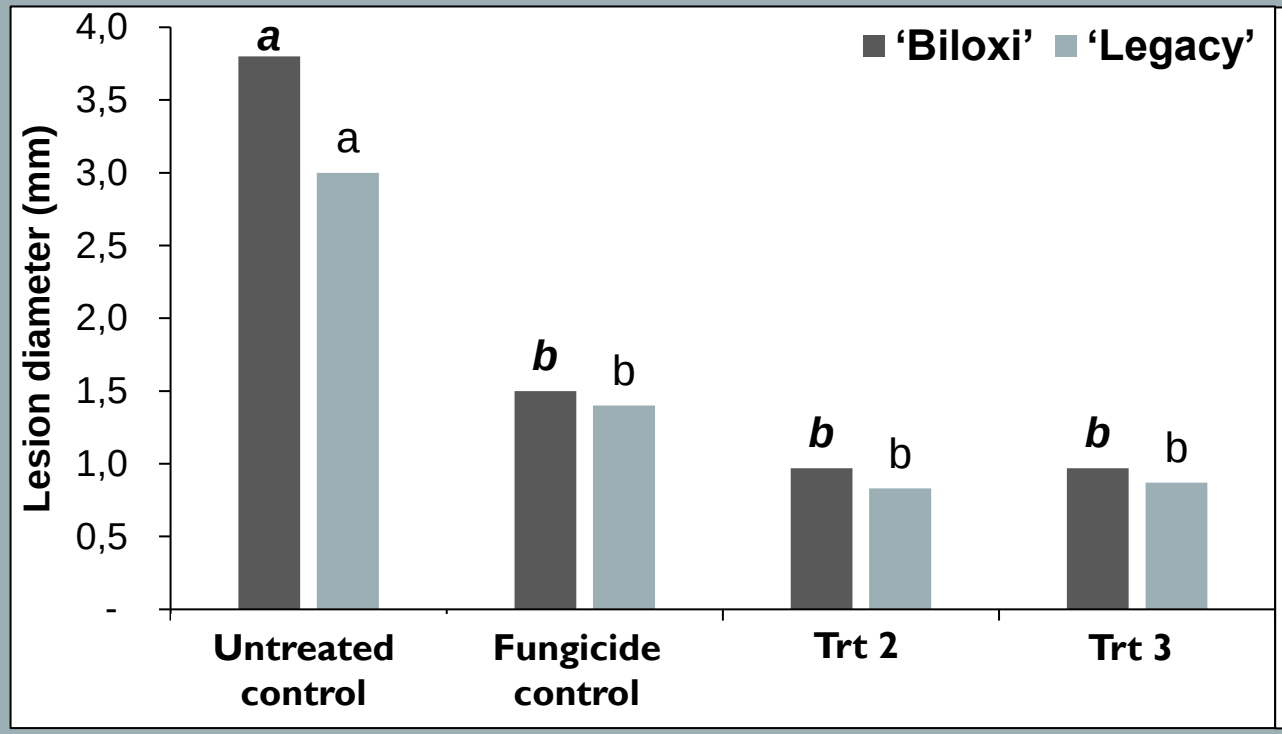

Treatment 2


Treatment 3

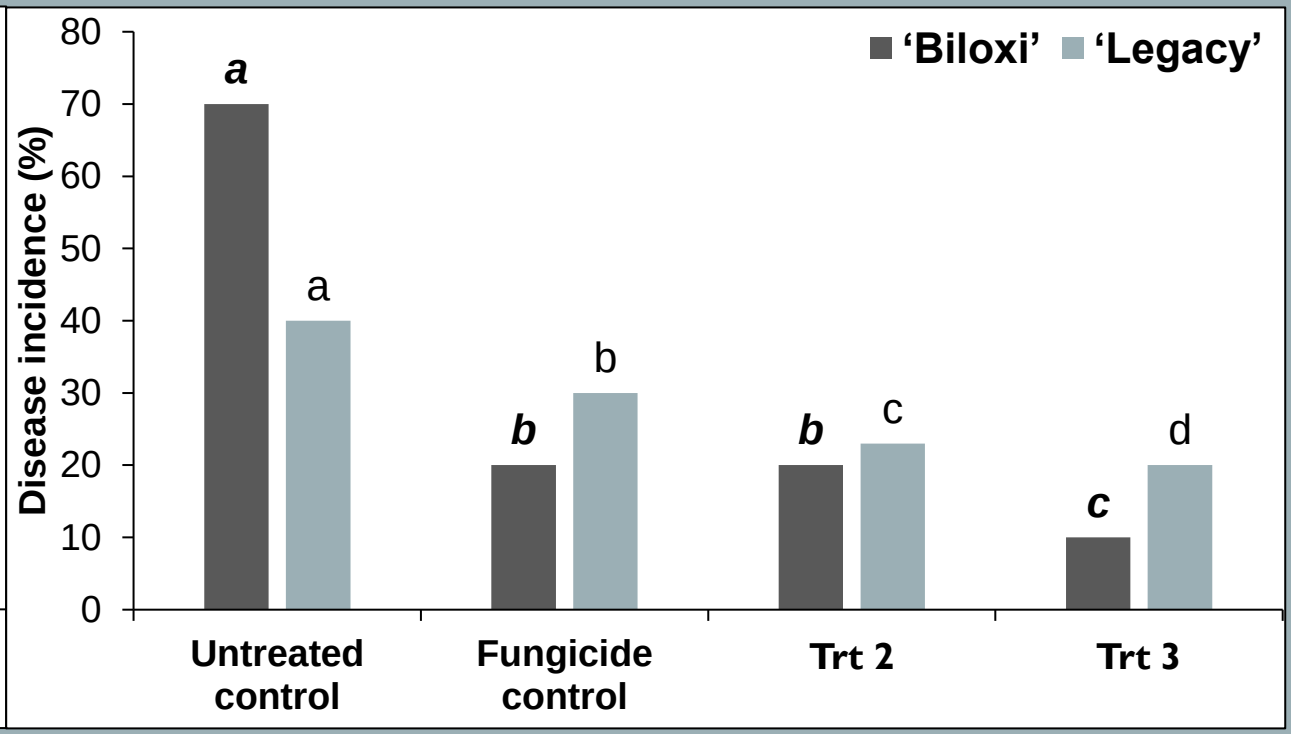

Treatment 4


Treatment 5

EFFECT OF UV-C IRRADIATION ON DISEASE DEVELOPMENT



Effect of UV-C irradiation on lesion diameter (mm) in two blueberry cultivars 'Biloxi' and 'Legacy'



Effect of UV-C irradiation on disease incidence (%) in two blueberry cultivars 'Biloxi' and 'Legacy'

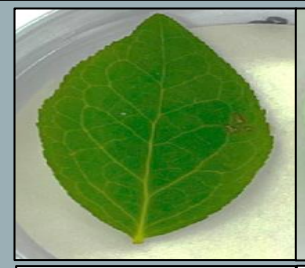
'Biloxi'

'Legacy'

Control

Fungicide

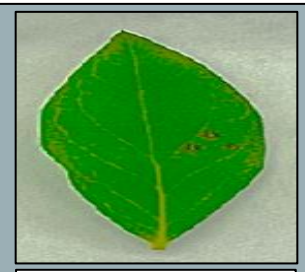
Trt 2



Trt 3

Control

Fungicide



Trt 2

Trt 3

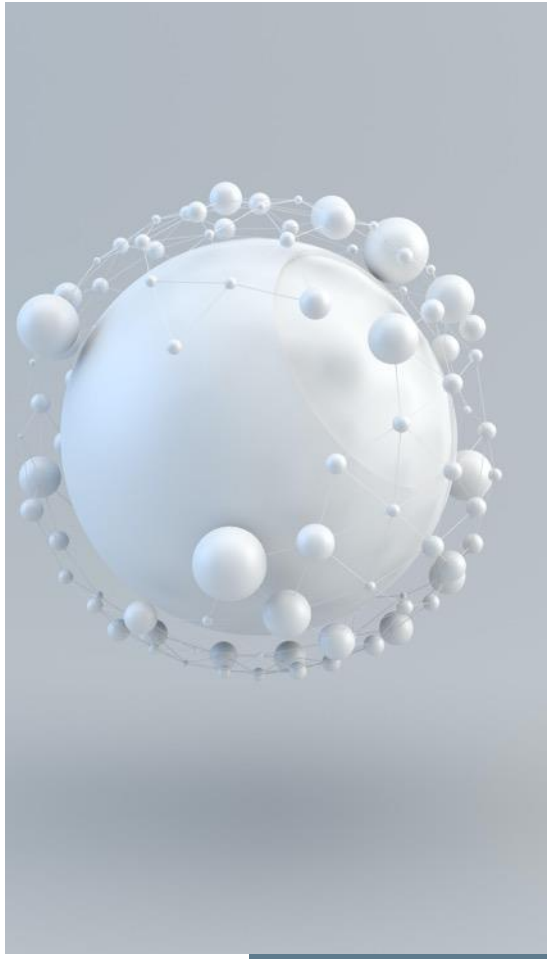
CONCLUSION

- The **first report** in **SA** on the use of **UV-C irradiation** treatments on **blueberries**.
- UV-C irradiation is effective in **inhibiting the germination of *Alternaria alternata* spores**.
- UV-C irradiation significantly **reduced Alternaria leaf spot disease development** in both 'Biloxi' and 'Legacy' blueberry cultivars.

FUTURE WORK

- **Field** and **packhouse** applications of the technology in blueberries
- **Defense mechanisms** induced by UV-C irradiation
- Including the latest blueberry **cultivars**

Impact of UV-C irradiation on stimulated induced defense mechanisms for the control of green and grey mould in blueberries



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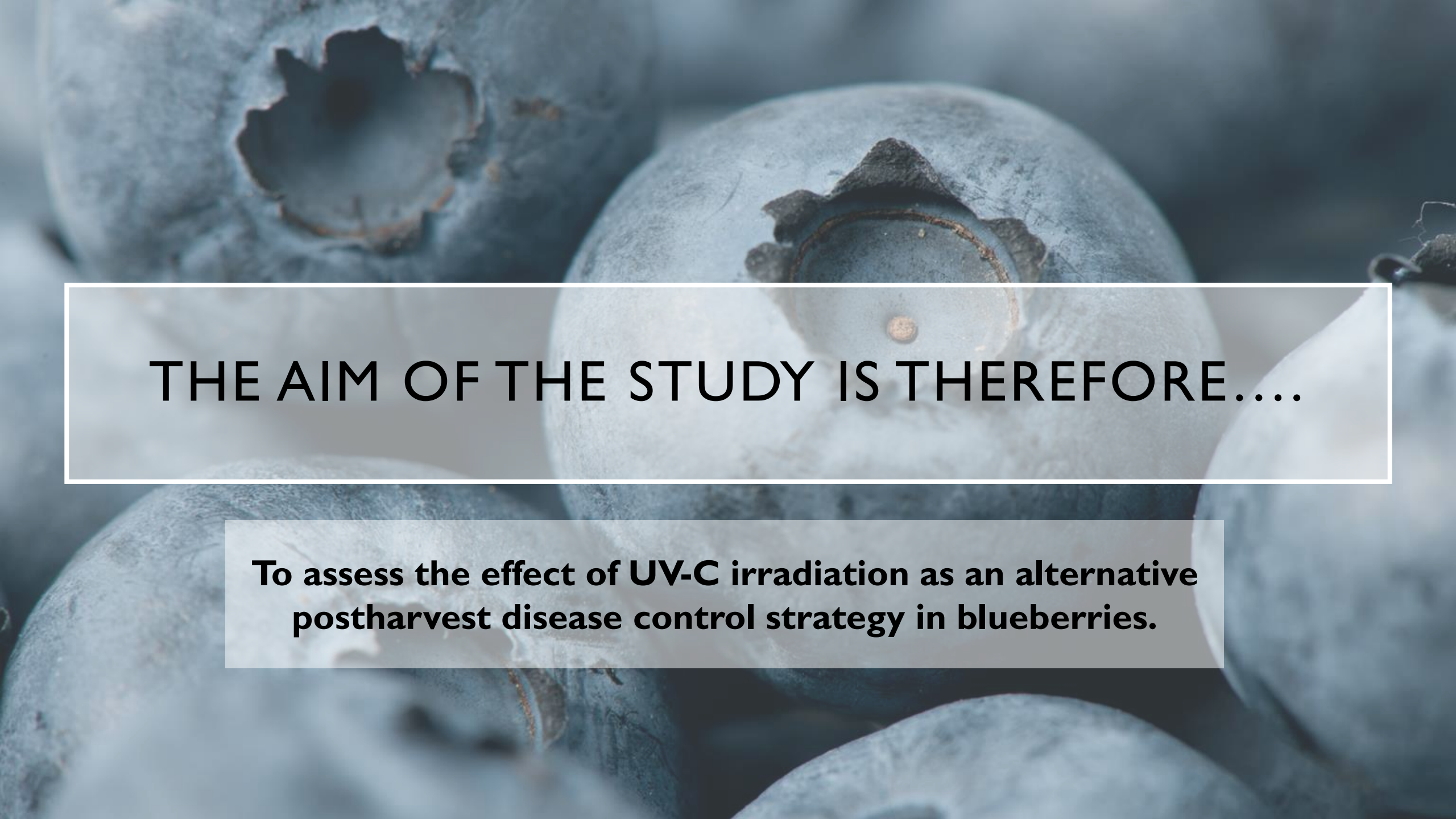


THE AIM OF THE STUDY IS THEREFORE….

To assess the effect of UV-C irradiation as an alternative postharvest disease control strategy in blueberries.

OBJECTIVES

Spore germination → Disease development → Induced defense genes → Phytochemicals → Fruit microbiome

To investigate the effect of **UV-C** irradiation treatment on *in vitro* inhibition of spore germination of the isolated ***A. alternata*** **and** ***B. cinerea***.

OBJECTIVES

Spore germination → **Disease development** → Induced defense genes → Phytochemicals → Fruit microbiome

To evaluate the **efficacy** of UV-C irradiation treatment to **reduce disease development** in artificially inoculated blueberries.

OBJECTIVES

Spore germination → Disease development → **Induced defense genes** → Phytochemicals → Fruit microbiome

To investigate the **residual effect** of UV-C irradiation on **induced defense** and **antioxidant systems** on **latent** infections of *A. alternata* and *B. cinerea* in the tissue of the blueberries.

OBJECTIVES

Spore germination → Disease development → Induced defense genes → **Phytochemicals** → Fruit microbiome

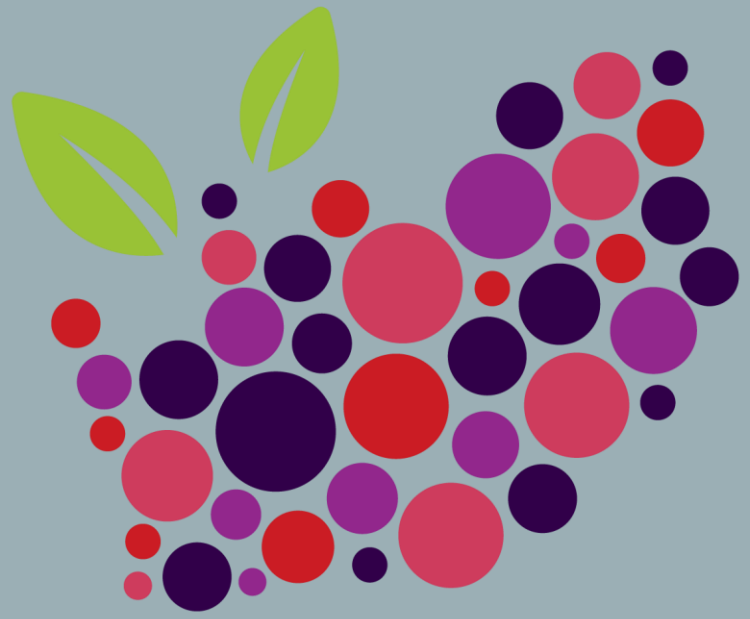
To investigate the effect of UV-C irradiation treatment on the **phytochemical content** of blueberries at the market-end of the berry.

OBJECTIVES

Spore germination → Disease development → Induced defense genes → Phytochemicals → **Fruit microbiome**

To investigate the **non-target** effect of UV-C irradiation on the blueberry **microbiome.**

ACKNOWLEDGEMENTS



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THANK YOU