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10TH  
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TABLE GRAPE  
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SOMERSET WEST  
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# SO<sub>2</sub>-generating pads before packaging and during cold storage to extend the conservation of 'Italia' table grapes

M. T. Higushi<sup>a</sup>, **S. R. Roberto**<sup>a</sup>, A. C. de Aguiar<sup>a</sup>, L. S. A. Gonçalves<sup>a</sup>, K. Youssef<sup>b</sup>

<sup>1</sup> State University of Londrina, Agricultural Research Center, Londrina, PR. Brazil.

<sup>2</sup> Agricultural Research Center. Plant Pathology Research Institute, Giza, Egypt.



## **'Italia'**

*(Vitis vinifera L.):*

A typical seeded and crunchy grape. The large consistently sized fruit is a lovely golden-yellow color, and the fruit has a delicate, pleasant musky flavor.

# 1. INTRODUCTION

- 'Italia': one of the most traditional white seeded grape grown in Brazilian southern subtropical areas.
- Gray mold (*Botrytis cinerea*) can cause significant damage to grapes even when bunches are cold stored.
- SO<sub>2</sub>-generating pads during cold storage: prevent the development of gray mold and maintain the freshness of the stem.
- In some high altitudes areas, the disease is recurrent.
- **Field ultrafast SO<sub>2</sub>-generating pad**: to be used few hours before packaging the grapes to eradicate spores of fungi.





Contents lists available at ScienceDirect

## Postharvest Biology and Technology

journal homepage: [www.elsevier.com/locate/postharvbio](http://www.elsevier.com/locate/postharvbio)



### Bio-based and SO<sub>2</sub>-generating plastic liners to extend the shelf life of 'Benitaka' table grapes

Aline Cristina de Aguiar<sup>a</sup>, Maíra Tiaki Higuchi<sup>a</sup>, Luana Tainá Machado Ribeiro<sup>a</sup>,  
Nathalia Rodrigues Leles<sup>a</sup>, Bruna Evelisse Caetano Bosso<sup>a</sup>, Gabriel Danilo Shimizu<sup>a</sup>,  
Marlon Jocimar Rodrigues da Silva<sup>b</sup>, Viviani Vieira Marques<sup>a</sup>, Fábio Yamashita<sup>a</sup>,  
Khamis Youssef<sup>c</sup>, Sergio Ruffo Roberto<sup>a,\*</sup>

<sup>a</sup> Agricultural Research Center, State University of Londrina, Celso Garcia Cid Road, km 380, P.O. Box 10.011, ZIP 86057-970 Londrina, Brazil

<sup>b</sup> Agronomic Sciences School, São Paulo State University, Dr. José Barbosa de Barros St., Jardim Paraíso, ZIP 18610-307 Botucatu, SP, Brazil

<sup>c</sup> Agricultural Research Center, Plant Pathology Research Institute, 9 Gamaa St., 12619 Giza, Egypt

#### ARTICLE INFO

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#### ABSTRACT

This study evaluates a bio-based laser-perforated and recyclable SO<sub>2</sub>-generating liners, alone or in combination with ultra-fast SO<sub>2</sub>-generating before packaging, to extend the shelf life of 'Benitaka' table grapes (*Vitis vinifera* L.). Grape bunches were harvested from a commercial vineyard in Parana, southern Brazil, in 2020 and 2021, and packaged in clamshells organized in cardboard boxes (10 clamshells per box). Boxes were sealed with liners and were stored at 1.0 ± 1 °C and at 70–80% relative humidity. The presence of gray mold was assessed 30 d and 45 d after cold storage, and after 3 additional days at room temperature (22 ± 1 °C); bunch weight loss, stem browning, shattered berries, and bleaching were assessed. Bio-based and SO<sub>2</sub>-generating liners, in combination with ultra-fast SO<sub>2</sub>-generating pads applied before packaging 'Benitaka' table grapes, were effective in controlling the incidence of gray mold at 45 d of cold storage (< 0.4%) and at 3 d of room temperature (< 0.8%); this extended the shelf life of grapes, with low weight loss, fewer shattered berries, and the maintenance of stem freshness. The bio-based liner alone does not control gray mold effectively, but it has no adverse effect on the physicochemical qualities of 'Benitaka' grapes and is an eco-friendly packaging material. Using compostable bio-based or recyclable SO<sub>2</sub>-generating perforated plastic liners to control gray mold and other postharvest diseases may promote the near future use of sustainable materials in the food industry.



## 2. OBJECTIVE

Is it possible to extend the postharvest conservation of 'Italia' table grapes up to 90 days by using the field ultrafast SO<sub>2</sub>-generating pads before packaging, associated with the slow- or dual-phase SO<sub>2</sub>-generating pads during cold storage?



### 3. MATERIAL AND METHODS

- Freshly 'Italia' grapes harvested from a commercial vineyard located in Cambira, Brazil (Cfa climate; elevation of 1,050 m a.s.l.; around 1,500 mm of rain).
- Area with recurrent history of gray mold.
- Overhead trellis system, vines spaced at 3.0 × 6.0 m.
- Two consecutive seasons, 2020 and 2021.
- Corrugated cardboard boxes containing clamshell-packaged bunches (0.5kg) lined with perforated plastic liners (0.3% V.A.).

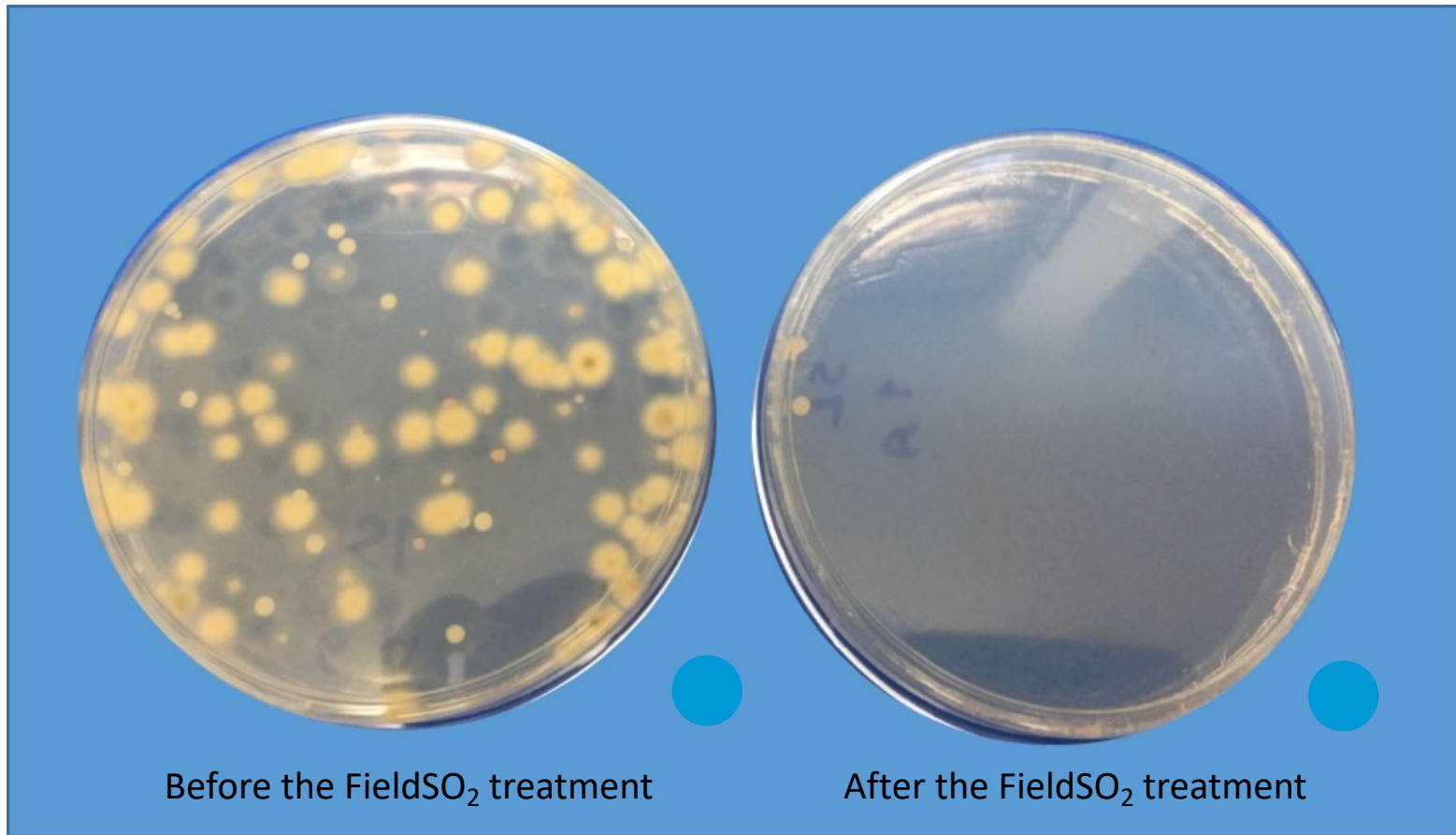
### 3.1. Treatments:



- a) Control (without SO<sub>2</sub>-generating pads);
  - b) Field ultrafast SO<sub>2</sub> pad (1.4 g) before packaging + Slow SO<sub>2</sub> pad (4.0 g) during cold storage;
  - c) Field ultrafast SO<sub>2</sub> pad (1.4 g) before packaging + Dual SO<sub>2</sub> pad (1.0 g+4.0 g) during cold storage.
- Packaging materials were provided by Suragra S.A. (Chile).
  - The completely randomized design was used with 5 replications; each plot consisted of 1 corrugated cardboard box (60 × 40 × 10 cm) containing 10 plastic clamshells.

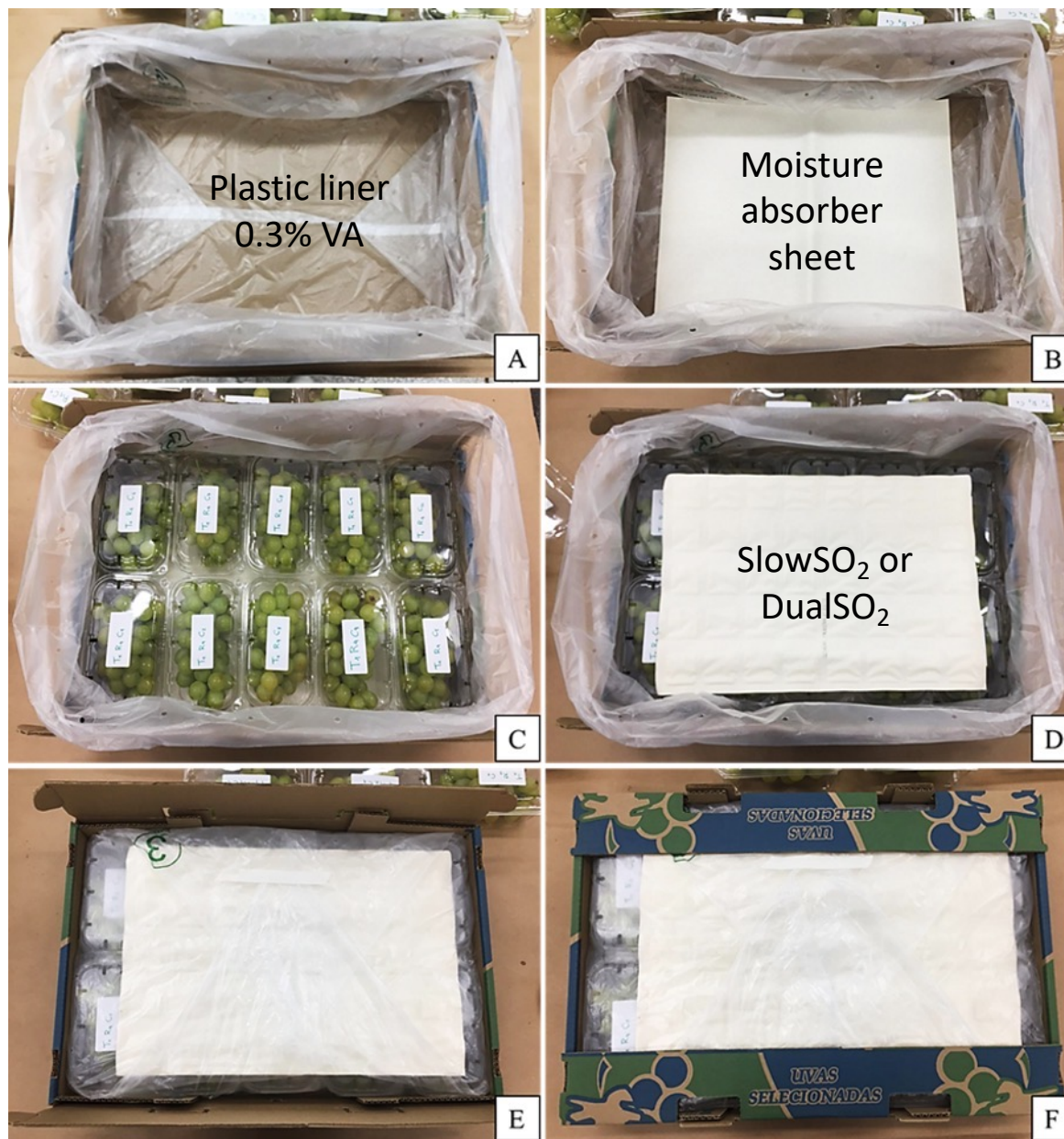


**Fig. 1.** Freshly harvested 'Italia' table grapes subjected to field ultra-fast SO<sub>2</sub>-generating pad before packaging. A: an impact absorbing sheet placed in the bottom of the harvest box of 20-kg capacity; B: harvest box lined with a perforated plastic liner of 0.3 % of ventilation area; C: grape bunches placed in the harvest box; D: SO<sub>2</sub> dosimeter (Gastec Passive Dosi-Tube) to quantify the amount of gas released by the field ultra-fast SO<sub>2</sub>-generating pad; E: placement of the field ultra-fast SO<sub>2</sub>-generating pad on top of the bunches; F: sealing of the perforated plastic liner.



**Fig. 2.** Filamentous fungi population on berry skin of 'Italia' table grape, before (A) and after (B) bunches being subjected to the treatment with the field ultra-fast SO<sub>2</sub>-generating pad before packaging.





**Fig. 3.** Packaged 'Italia' table grapes for cold storage. A: corrugated card box lined with a perforated plastic liner; B: a humidity absorbing sheet placed in the bottom of the card box; C: clamshell-packaged bunches in card box; D: SO<sub>2</sub>-generating pad placed on top of the clamshells; E: sealing of the perforated plastic liner; F: packaged grape bunches ready to be cold stored.



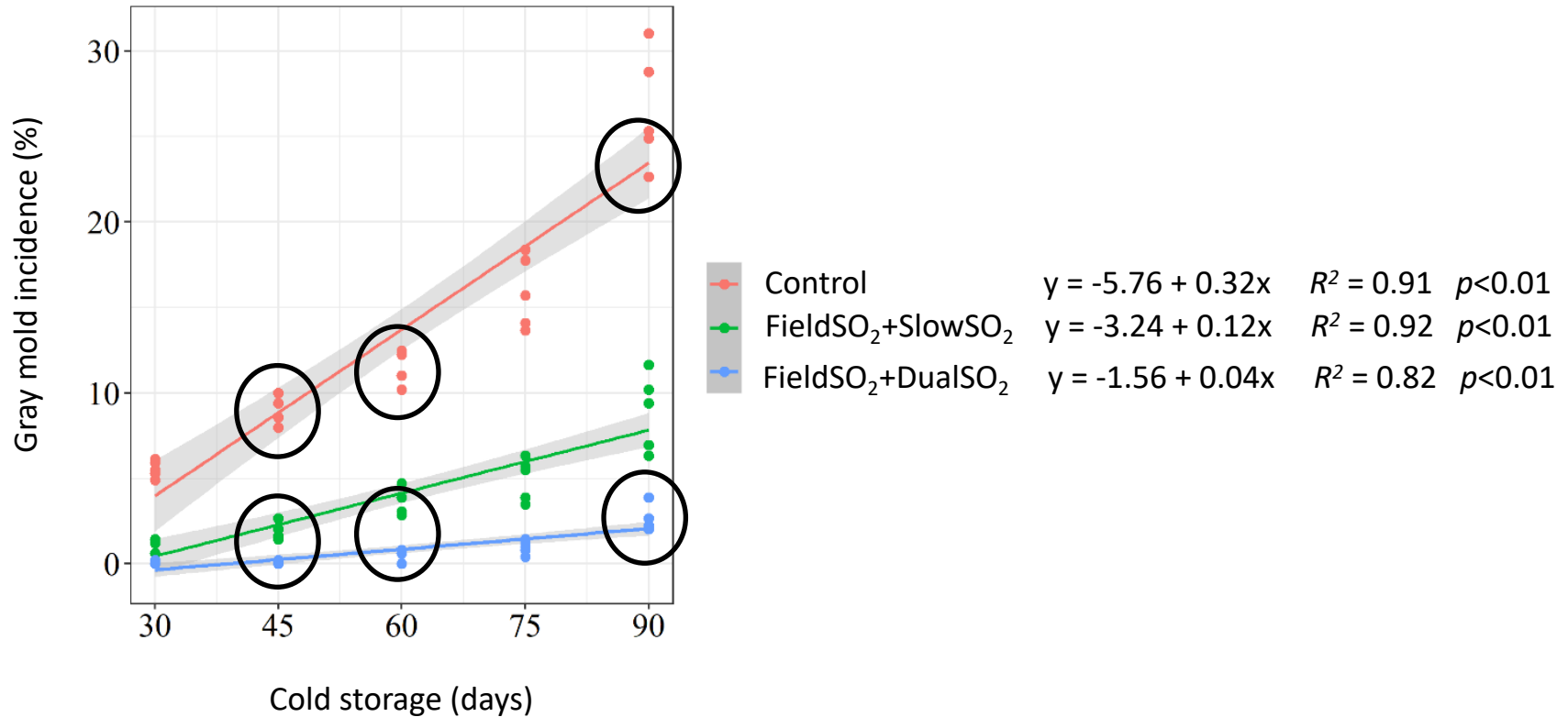
Cold storage  
1.0°C; 95% RH

## 3.2. Assessments:

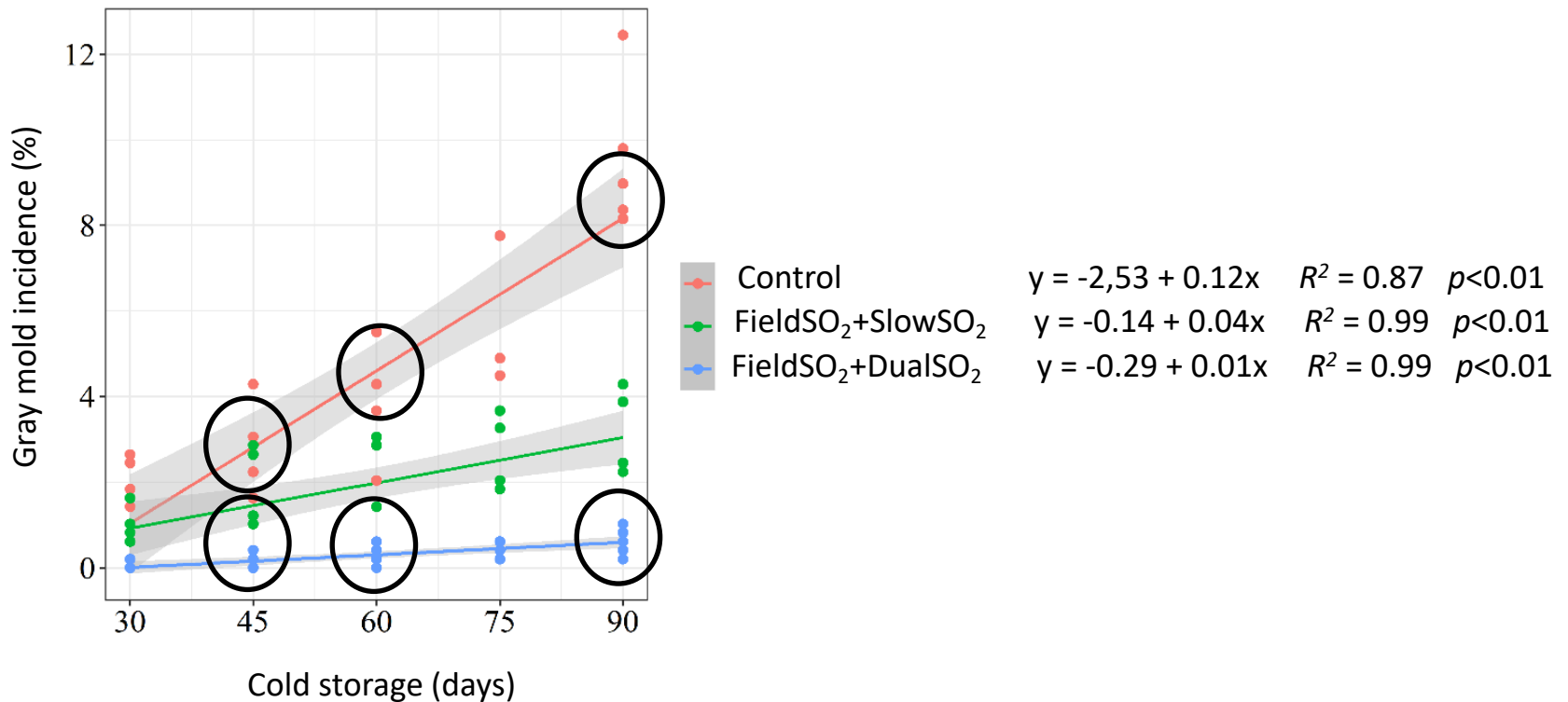
- After 30, 45, 60, 75 and 90 days of cold storage, the incidence of gray mold, mass loss, shattered berries and stem browning were assessed.
- The population of filamentous fungi on berry skin was assessed before and after the treatment application.
- The data set was analyzed in a two-way analysis of variance involving treatments in a split plot array in time (days) to allow the assessment of the significance of the main effects (R Core Team).



## 4. RESULTS



**Fig. 4.** Regression analysis of the gray mold development (% of diseased berries) of 'Italia' grape at 30, 45, 60, 75 and 90 days of cold storage at  $1.0 \pm 1.0^\circ\text{C}$ , individually packaged in plastic clamshells, and treated with SO<sub>2</sub>-generating pads before packaging and during cold storage. Season of 2020.



**Fig. 5.** Regression analysis of the gray mold development (% of diseased berries) of 'Italia' grape at 30, 45, 60, 75 and 90 days of cold storage at  $1.0 \pm 1.0^\circ\text{C}$ , individually packaged in plastic clamshells, and treated with SO<sub>2</sub>-generating pads before packaging and during cold storage. Season of 2021.



Control



FieldSO<sub>2</sub> + SlowSO<sub>2</sub>



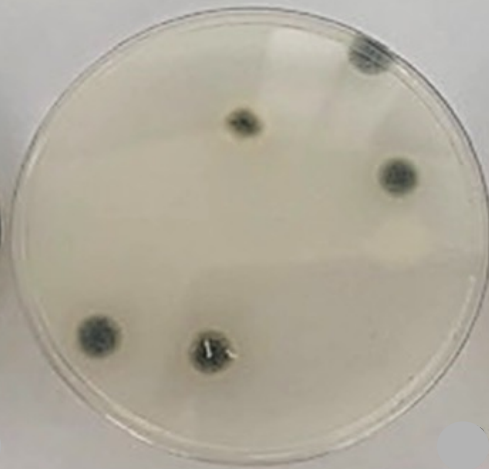
FieldSO<sub>2</sub> + DualSO<sub>2</sub>

**Fig. 6**  
clamsl

Population of filamentous fungi from berry skin



Control

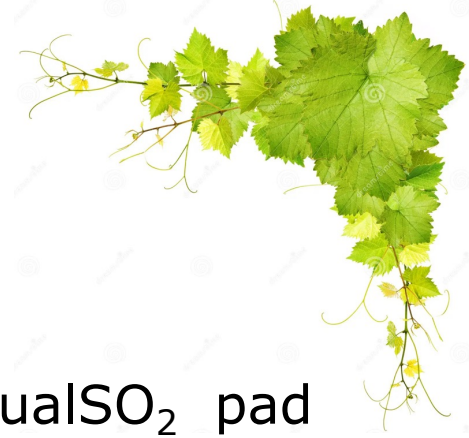


FieldSO<sub>2</sub> + SlowSO<sub>2</sub>



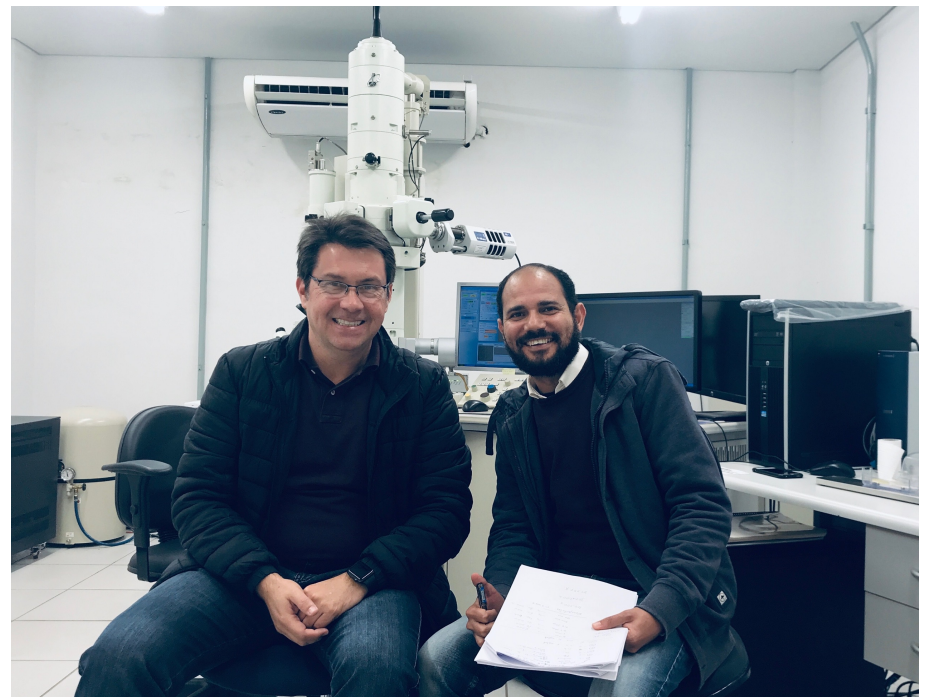
FieldSO<sub>2</sub> + DualSO<sub>2</sub>

plastic



## 5. CONCLUSIONS

- The FieldSO<sub>2</sub> pad before packaging + the DualSO<sub>2</sub> pad during cold storage, are highly effective in controlling the gray mold up to 90 days of cold storage.
- This treatment result in low shattered berries and bunch mass loss, and good stem freshness.



## Acknowledgments:





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# Dankie!

*Sergio Ruffo ROBERTO*, Associate Professor  
Agricultural Research Center, Food Research Institute  
State University of Londrina, BRAZIL  
Member of the Subcomission of Table Grapes - OIV  
e-mail: [sroberto@uel.br](mailto:sroberto@uel.br)