



Active Packaging developed for Blueberries


Laminated Dual Release SO₂ Generating Sheet for use as Storage Extender & Preservative on Blueberries.

Jacobus Hartman

<https://www.tessara.co.za/products/berrisys>

1



SO₂ - WHAT ?

- Cost saving
- Storage
- Sea Freight
- Food Safety
- Phytosanitary


2

2

HOW MUCH IS 20% OF YOUR BLUEBERRY SHIPMENT WORTH?

3

3



AVERAGE RETAIL VALUE: BLUEBERRY REEFER

1 x 40ft Refrigerated Container = 24 Pallets

120 Cartons of 4.5kg Bulk Pack per Pallet


120 x 4.5kg x 24 Pallets

≈ **12,960kg**

≈ **€ 224,079**

Average Retail Prices*

€17.29 per kilo



* Benelux Online Prices @ 7 March 2020 4

4

**EVERY
1%
SAVED PER CONTAINER =
€2,240
RETAIL VALUE***

* Benelux Online Prices @ 7 March 2020 5

5

R&D TRIAL RESULTS

POTENTIAL SAVINGS IN RETAIL VALUE USING BERRISYS

Maximum Variation in Decay Loss During Shelf Life Storage Trials: **68%** (€2,240)

Maximum Variation in Decay Loss During Cold Storage Trials: **11%** (€2,240)

6

6

COMMERCIAL TRIAL RESULTS

POTENTIAL SAVINGS IN RETAIL VALUE USING BERRISYS

- South Africa to the UK
- Packed on the 28th of October 2019; received on the 27th of Dec 2019
- 3.5kg bulk pack
- 4 Varieties to test from sensitive to tough types
- **ETA: Delayed by 7 days!**

Maximum Variation in Decay Loss During Sea Freight Commercial Trials: **20%** (€4,480)

7

7


Varieties with BERRISYS

Control Varieties

8


8

Using SO₂ to reduce food risks:



Abstract: "We examined the fate of *Listeria monocytogenes*, *Escherichia coli* O157:H7, and *Salmonella enterica*..."

Result: "Standard cold storage combined with SO₂ fumigation was effective in reducing and eliminating all three pathogens..."




Effect of sulfur dioxide fumigation on survival of foodborne pathogens on table grapes under standard storage temperature. Carter MG¹, Chapman MII², Gabler P³, Brandt MT⁴.

Abstract: "The effect of ... slow release sulfur dioxide pads was determined ... on western flower thrips, *Frankliniella occidentalis* Pergande; grape mealybug, *Pseudococcus maritimus* (Ehrhorn); Pacific spider mite, *Tetranychus pacificus* McGregor; twospotted spider mite, *Tetranychus urticae* Koch; and omnivorous leafroller, *Platynota stultana* Walshingham.


Result: "Western flower thrips was completely controlled. Grape mealybug mortality was ... 100% after a 6-wk exposure in basic tests. Pacific spider mite and two-spotted spider mite mortality was 98.0 and 99.6%, respectively, an 8-wk exposure to ... slow release sulfur dioxide pads resulted in 100% mortality of western flower thrips, two-spotted spider mite, and omnivorous leafroller."

Pest Response in Packed Table Grapes to Low Temperature Storage Combined with Slow-Release Sulfur Dioxide Pads in Basic and Large-Scale Tests
Victoria Y. Yokoyama¹, Gina T. Miller², Carlos H. Crisosto³






9

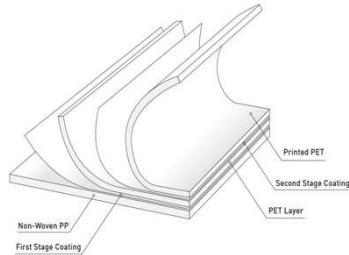
What is Berrisys?



Laminated plastic, dual release, sulfur dioxide generating sheet





10

How to use it:




- Step 1: Slice the punnet with a sharp knife.
- Step 2: Fill punnet with berries.
- Step 3: Place Berrisys Lite sheet on top of berries. Fit into side slots. Pull up corners.
- Step 4: Place Berrisys Lite on top.
- Step 5: Close punnet.





Berrisys LITE is a laminated plastic, dual release, sulfur dioxide generating sheet **designed to protect loose packed (bulk) blueberries or open top punnet packed blueberries.**

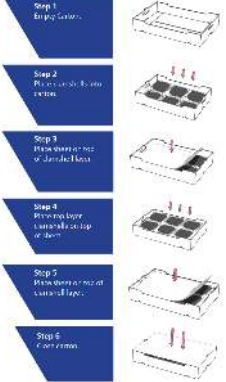


11


How to use it:

- Step 1: Empty punnet.
- Step 2: Place berries in punnet.
- Step 3: Place Berrisys Lite sheet on top of berries.
- Step 4: Press down Berrisys Lite sheet into slots of punnet.
- Step 5: Place Berrisys Lite sheet on top of punnet.
- Step 6: Close punnet.



Berrisys is a laminated plastic, dual release, sulfur dioxide generating sheet **designed to protect blueberries already packed in sealed units such as clamshell or heat sealed punnets.**



12

How does it work?

1. $\text{Na}_2\text{S}_2\text{O}_5 + \text{H}_2\text{O} \rightarrow 2\text{NaHSO}_3$ (intermediate product)
 $\rightarrow \text{Na}_2\text{SO}_3 + \text{SO}_2$ (gas) + H_2O [Reaction 1]

2. $2\text{Na}_2\text{SO}_3 + \text{O}_2 \rightarrow 2\text{Na}_2\text{SO}_4$ [Reaction 2]

TESSARA logo and a small table of data are also present.

13

How does it work:

- Triggered @ 70% RH
- Reaction is Autocatalytic

• First stage: > 100 ppm / Hr; 24 hrs and dropping to 0 within 48 hrs

• Second stage: Sustained SO_2 average 3-5pp; 60 days +

* Release curves are temperature and humidity sensitive. This slide discusses an average theoretical visualisation.

TESSARA logo and a photo of a blueberry tray are also present.

14

What it does:

[Reaction 1]:
 $\text{Na}_2\text{S}_2\text{O}_5 + \text{H}_2\text{O} \rightarrow 2\text{NaHSO}_3$ (intermediate product) $\rightarrow \text{Na}_2\text{SO}_3 + \text{SO}_2$ (gas) + H_2O

$\text{SO}_2 + \text{H}_2\text{O} \rightleftharpoons \text{H}_2\text{SO}_3$ [Reaction 3]

$2\text{H}_2\text{SO}_3 + \text{O}_2 \rightarrow 2\text{H}_2\text{SO}_4$ [Reaction 4]

Proof of Concept: 2016

TESSARA logo is present.

15

What it does:

#1: STERILISER

#2: PRESERVATIVE

#3: Botrytis Control

Proof of Concept: 2016


TESSARA logo is present.

16

Postharvest Decay types:

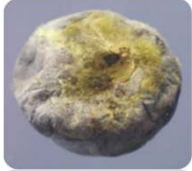
• Most **COMMON** fungal pathogens

Anthracose rot



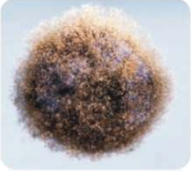
Orange masses of fungal spores

Alternaria rot




Grey green mass of fungal growth

Botrytis rot



Grey mass of fluffy fungal growth



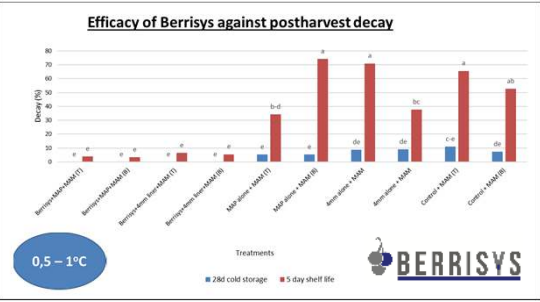
Homer:
"pest averting sulphur"
circa 1000 BC

17

17

Key Results: Conclusive Botrytis Reduction

Efficacy of Berrisyss against postharvest decay



0.5 – 1°C

Treatments: ■ 28d cold storage ■ 5 day shelf life

BERRISYS

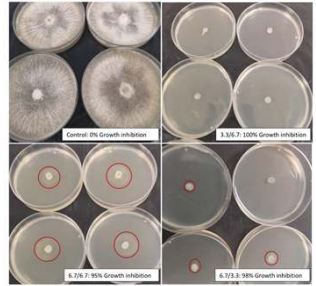


Figure 8: Photos of four of the six petri dishes for each treatment

18

18

EU Approval for SO₂ use as Food Additive:


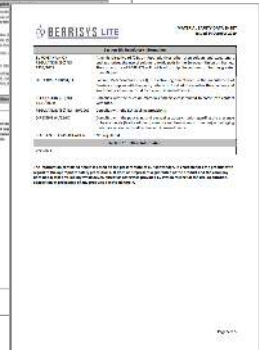
EUROPEAN UNION: REGULATION (EC) NO 1333/2008,
Amends Directive 95/2/EC on food additives other than colours and sweeteners and authorises the use of sulphur dioxide pads in the European Union on berries. The correct use of BERRISYS will not lead to sulphite residues on berries greater than 10ppm.

DIRECTIVE 2008/84/EC: Sodium Metabisulphite (E223),
The active ingredient used in the manufacture of Berrisyss, complies with the purity criteria on food additives other than colours and sweeteners set out in this directive and its amendments.

REGULATION (EC) NO 1935/2004:
Complies with the rules on materials and articles intended to come into contact with food.

REGULATION (EC) NO 450/2009:
Complies with the EU labelling provisions.

DIRECTIVE 94/62/EC:
Complies with the packaging and packaging waste criteria regarding the presence of heavy metals (lead, cadmium, mercury and hexavalent chromium) in packaging materials set out in this directive and its amendments.






19

19

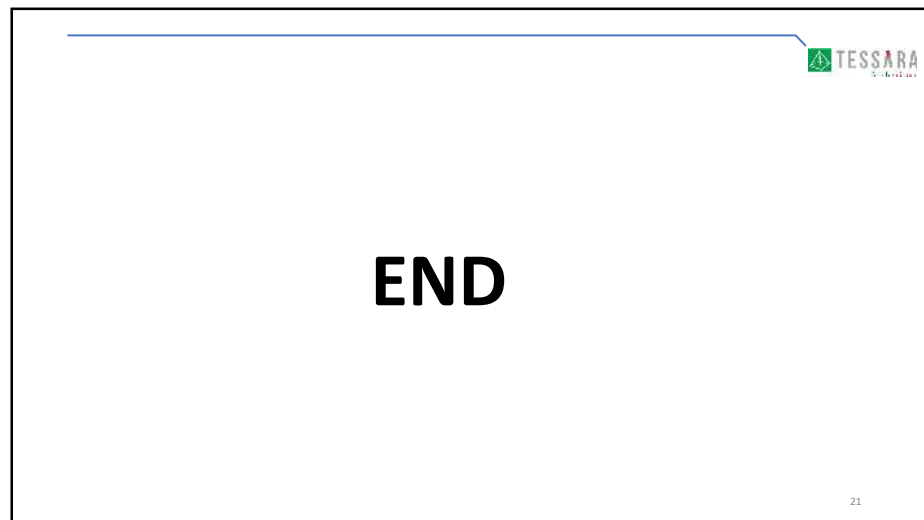
Our Network & Partners:



20

20



TESSARA
A Division of

END

21