



QUALITY MANAGEMENT

THE USE OF SULFUR DIOXIDE GENERATING SHEETS ON TABLE GRAPES

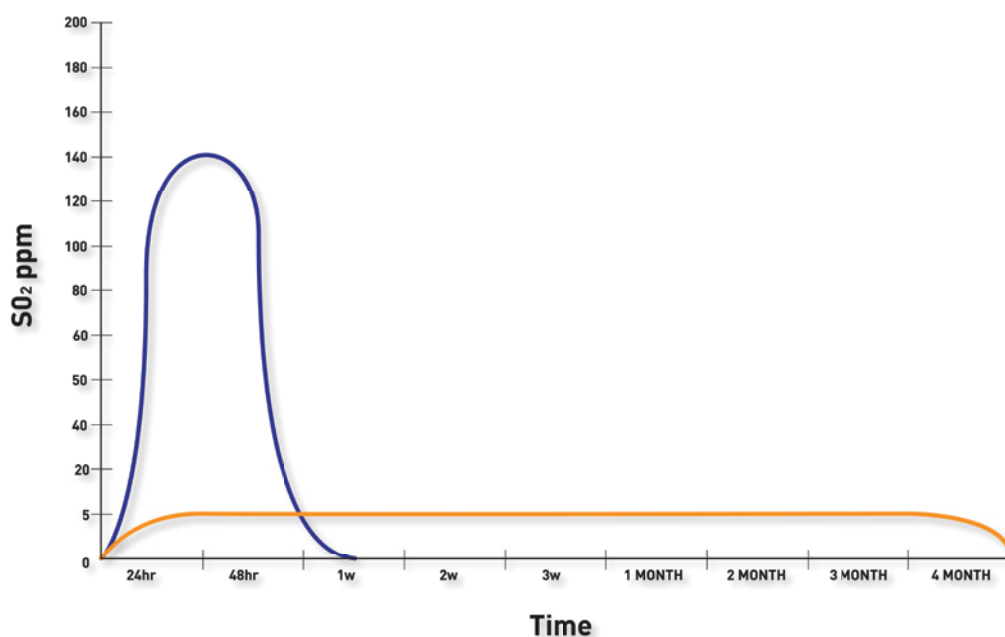
INTRODUCTION TO THE USE OF SULFUR DIOXIDE ON TABLE GRAPES

Sulfur dioxide (SO₂) fumigation was first used on wine grapes in the United States in the 1920s and has been a very effective post-harvest treatment for the prevention of *Botrytis* grey mould. Since the introduction of SO₂ generator sheets, South African table grape producers found fumigation to be unsatisfactory and have moved away from this practice.

SO₂ generator sheets contains the active ingredient sodium metabisulfite which releases SO₂ when it comes into contact with water vapour. Most SO₂ generator sheets have a dual release which means that the sheet has two release stages, namely a fast release (first stage) and slow release (second stage). A minimum concentration of 100 ppm of SO₂ gas for

one hour is required to disinfest grapes and kill the surface growth of fungi. Single release SO₂ sheets are also available for shorter storage or transport times.

Sulfur dioxide kills and prevents the growth of *Botrytis* on table grapes by inhibiting key proteins and disrupting the cell membranes of *Botrytis* cells. Sulfur dioxide also induces resistance in plants to *Botrytis* infection. SO₂ sheets cannot prevent superficial latent *Botrytis* infections that occurred during the flowering stage of the vines but can prevent the *Botrytis* from germinating and spreading to other bunches in the carton. Sulfite residues will always remain below the legal maximum residue limit of 10 ppm with use of any Uvasys product.



Graph showing dual release action of SO₂ sheets.

HOW TO USE SO₂ GENERATOR SHEETS

Use the correct SO₂ sheet for your circumstances (See Table 1)

- The choice of SO₂ sheet will depend on the *Botrytis* inoculum pressure. *Botrytis* pressure can be high after periods of rain or high humidity. Higher concentration sheets are recommended for periods of high *Botrytis* pressure.
- Use the correct SO₂ sheet for the cultivar you are packing. A SO₂ sheet with a lower SO₂ concentration should be used on thin-skinned (SO₂-sensitive) cultivars such as 'Red Globe', 'Flame Seedless', 'Starlight', 'Tawny', 'Magenta', 'Sweet Celebration', 'Allison', 'Krissy'. The more resistant cultivars are those with thicker skins.

Use the correct size SO₂ sheet for the carton type you are packing

- Aim for at least 80% coverage of your table grapes in the carton. Inadequate coverage may lead to *Botrytis* decay on the uncovered grapes.

Use the SO₂ sheet in combination with a ventilated liner bag

- A liner bag will help to contain the SO₂ in the carton.
- There is no one-size-fits-all when it comes to the type of ventilated liner bag you should use and is determined by your unique

circumstances. The correct liner bag perforation size and number of perforations is determined by factors such as your distance from a cold room facility, post-harvest handling times and the type of inner packaging used.

- SO₂ sheets can be used on table grapes packed naked and in combination with internal packaging such as punnets (open top and clamshell), bunch bags, zip-lock and carry bags.

Minimise temperature fluctuations after the SO₂ sheet has been applied

- Changes in temperature and humidity after cooling will not only result in lower quality table grapes but could lead to SO₂ damage on the grapes due to the formation of condensation in the liner bag.
- SO₂ damage is the bleaching (white/yellow discolouration) of the grape berries and is caused by the reaction of SO₂ gas with free moisture.
- If condensation is unavoidable, use a moisture absorbing membrane (MAM) above the SO₂ sheet or an Agrishield sheet below (or above) the SO₂ sheet in the carton. MAMs and Agrishield sheets can only absorb a certain amount of water before it becomes saturated (not being able to absorb any more

water). Saturated MAMs and Agrishield sheets could worsen the formation of SO₂ damage on table grapes.

Do not cut the SO₂ sheets

- Cutting of the SO₂ sheet with a blade or scissors could lead to inadequate decay control or to SO₂ damage. Sheets that have been cut are usually smaller than the recommended size and is either used to supplement the SO₂ gas, in combination with a full sized sheet, in the carton, or the smaller sheet is used alone. Either way, this could lead to problems with decay control or SO₂ damage.

Storing SO₂ sheets

- After use, the bag containing the leftover SO₂ sheets should be thoroughly sealed with tape.
- Store the sealed SO₂ sheets in a cool (lower than 25°C), dry place (not in a cold room).
- Do not place the SO₂ sheets in direct sunlight.
- Do not handle the SO₂ sheet if you have known sulfite sensitivity.
- If you are unsure whether certain stored SO₂ sheets are emitting SO₂ gas or not, we are able to test the sheets for you, to determine whether they are still effective.



A LIST OF UVASYS SO₂ GENERATOR SHEETS FOR USE ON TABLE GRAPES

Product	SO ₂ Release	Recyclable	Sheet sizes (mm)	Packaging type	Varieties
Uvasys Dual Release Green A fast release (first stage) and slow release (second stage). Higher first stage SO ₂ emission. Recommended for use after wet periods or high <i>Botrytis</i> risk.	Dual Release Fast >48 hrs Slow >120 days	No	356 x 260	4.5 kg Carton	Seeded grapes (except Red Globe), White Seedless grapes, Crimson Seedless, Black Seedless grapes
			460 x 260	5 kg Carton	
			460 x 350	8.2 kg Carton	
			530 x 350	9 kg Carton	
Uvasys Dual Release Blue A fast release (first stage) and slow release (second stage). Slightly lower first stage SO ₂ emissions. Recommended for use on SO ₂ sensitive cultivars or when <i>Botrytis</i> risk is lower.	Dual Release Fast >48 hrs Slow >120 days	No	356 x 260	4.5 kg Carton	Red Globe and most Seedless Red Seedless varieties
			460 x 260	5 kg Carton	
			460 x 350	8.2 kg Carton	Any SO ₂ sensitive cultivars
			530 x 350	9 kg Carton	
Uvasys Dual Release Blue Recyclable (Previously Uvasys Vivo) A fast release (first stage) and slow release (second stage). The first fully recyclable plastic sheet. Slightly lower first stage SO ₂ emissions. Recommended for use on SO ₂ sensitive cultivars or when <i>Botrytis</i> risk is lower.	Dual Release Fast >48 hrs Slow >70 days	Yes	356 x 260	4.5 kg Carton	Red Globe and most Seedless Red Seedless varieties
			460 x 260	5 kg Carton	
			460 x 350	8.2 kg Carton	Any SO ₂ sensitive cultivars
			530 x 350	9 kg Carton	
Uvasys Slow Release A single stage sheet with a slow SO ₂ release. To be used on SO ₂ fumigated table grapes.	Single Release Slow >120 days	No	356 x 260	4.5 kg Carton	All varieties
			460 x 260	5 kg Carton	
			460 x 350	8.2 kg Carton	
			530 x 350	9 kg Carton	
Uvasys Fast Release Economic (Previously Uva Uno) Single stage sheet with only a fast (first stage) SO ₂ release. This product provides a maximum of 20 days cover under optimal conditions.	Single Release Fast >48 hrs	No	356 x 260	4.5 kg Carton	All varieties
			460 x 260	5 kg Carton	
			460 x 350	8.2 kg Carton	
			530 x 350	9 kg Carton	
Uvasys Fast Release Recyclable (Previously Fast Fresh) Single stage sheet with a fast SO ₂ release only. Fully recyclable plastic sheet. To be used on table grapes for very short storage or transport periods (up to 12 days).	Single Release Fast >48 hrs	Yes	356 x 260	4.5 kg Carton	All varieties



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