

Bunch bagging and biopreservation for pre- and post-harvest protection of organic table grapes: effects on commercial and nutritional quality attributes

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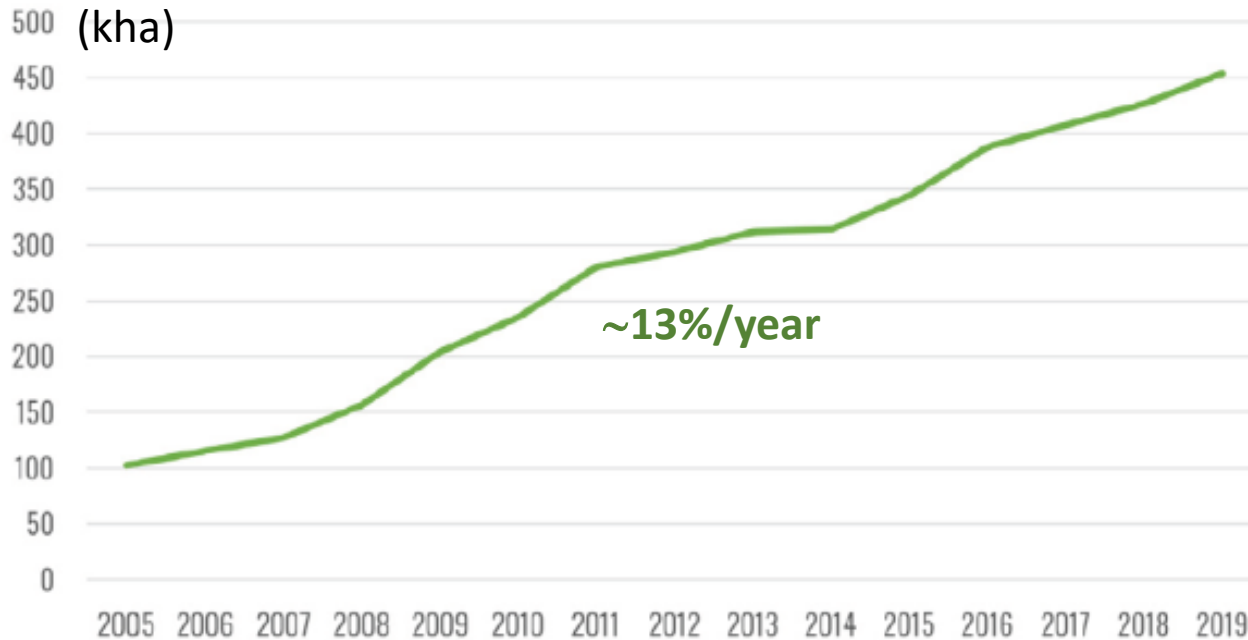
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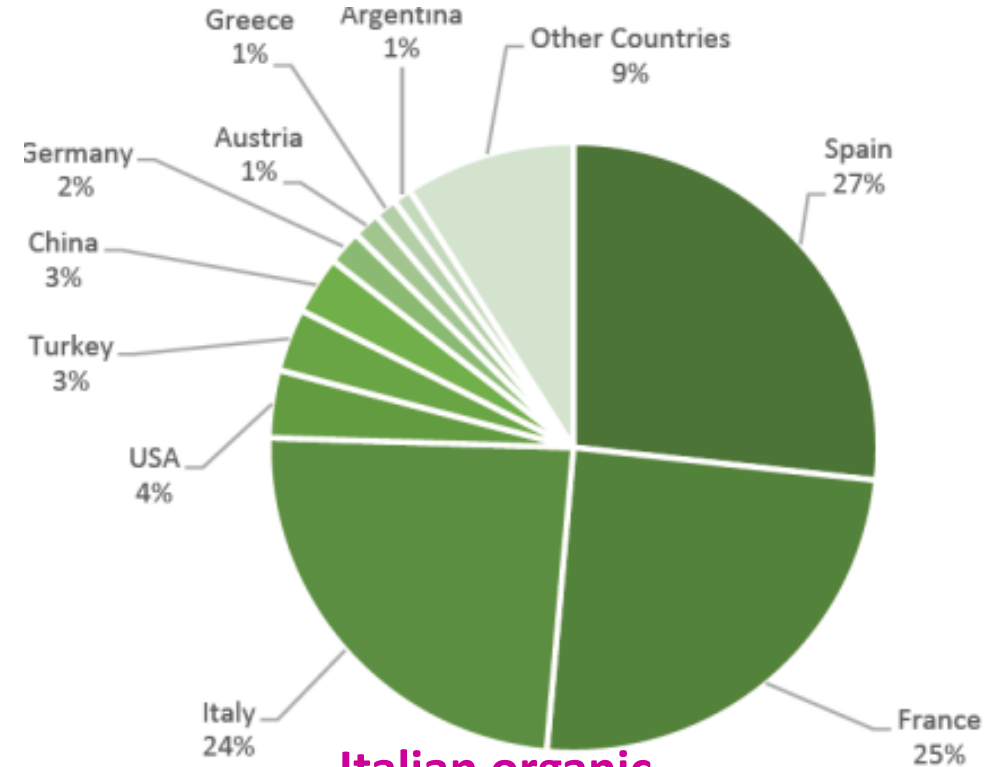


Evolution of world area under organic vines (wine grapes + table grapes + rasins)

Certified organic vineyards



Distribution of world area under organic vines in 2019 (wine grapes + table grapes + rasins)



**Italian organic
table grape
vineyards**

Apulia 74%

Sicily 18%

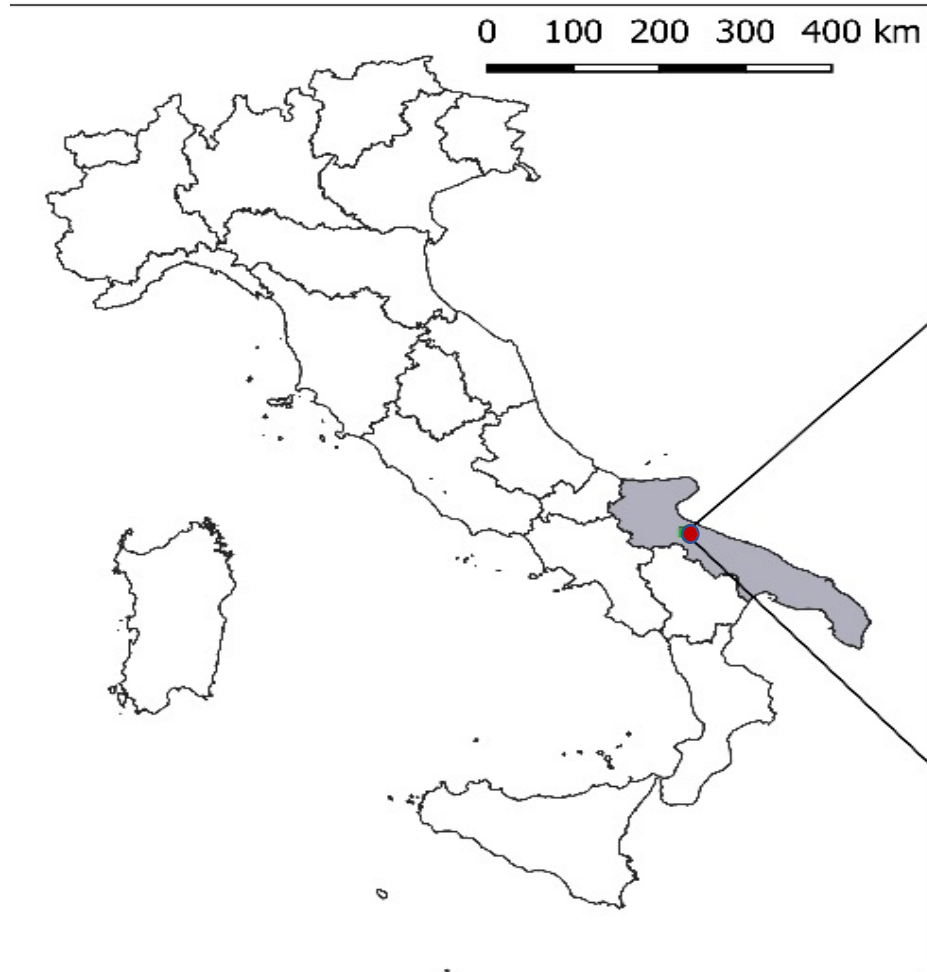


Improvements requested by “Agritalia” Famer’s Organization to produce high quality organic table grapes

- Improve bunch protection from biotic/abiotic damage
 - Reduce pesticides
 - Reduce chemical residues
 - Preserve bunch from decay during cold storage without SO₂
- } Pre-harvest fruit bagging
(Kitagawa et al., 1992)
- Biopreservation
by bacteria



Apulia, Trinitapoli (BT province)



41° 18' 28 N - 41° 18' 39 E

Laporta Farm (Agritalia Farmer's Organization)

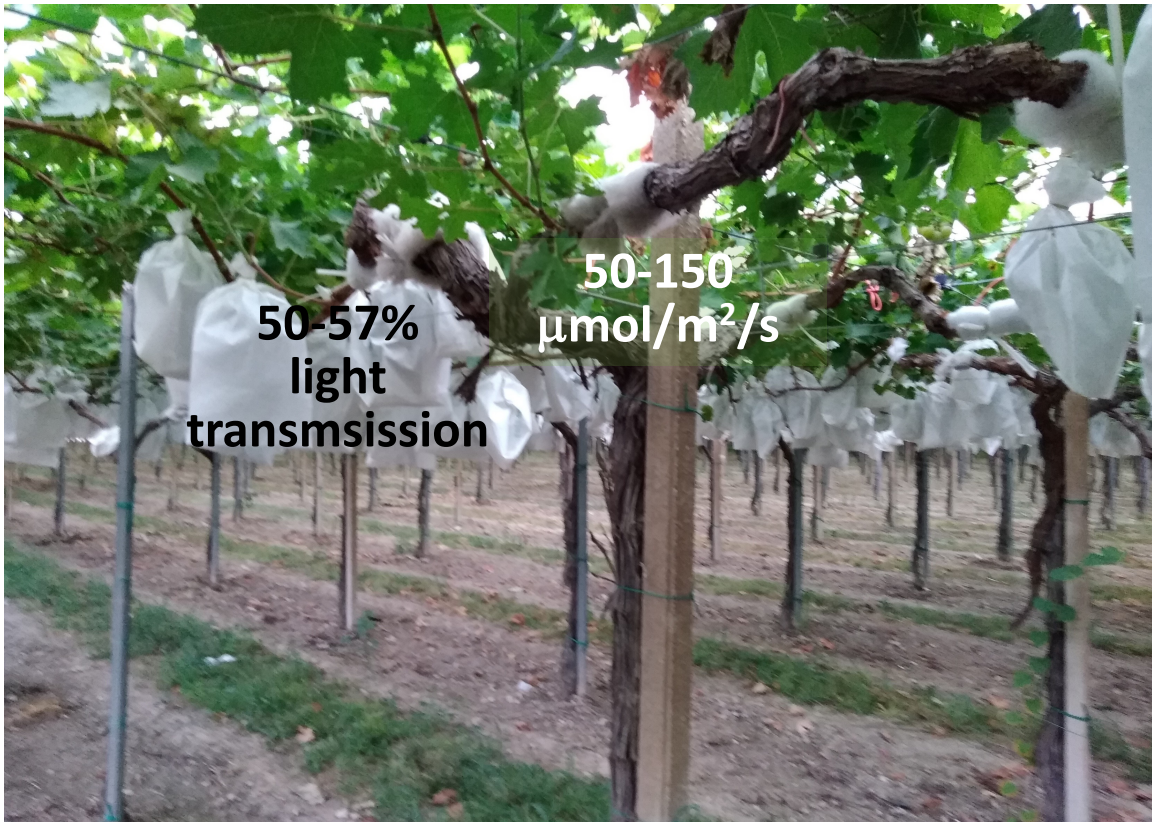
Organic vineyard cv Italia/140 Ru

Preliminary test

Bunch Paper Bagging

@ «majority of berries touching» stage
(BBCH 79)

@ Farm harvest





Lactiplantibacillus plantarum



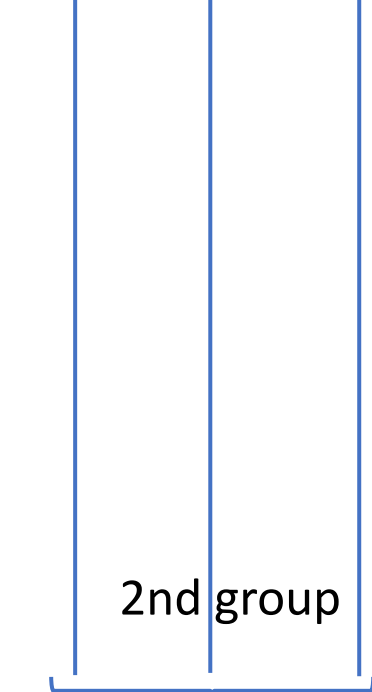
@ 3rd day control:
no surviving bacteria

Present test

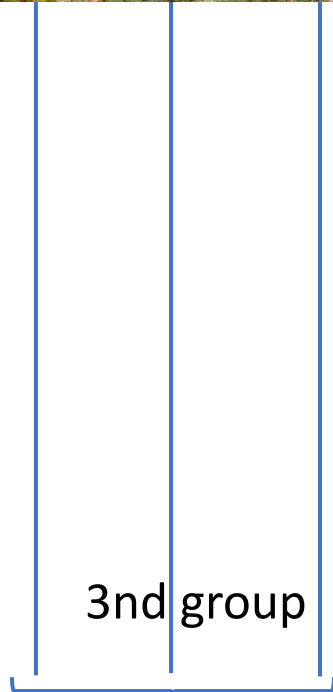
Bunch Paper Bagging @ veraison



1st group
Bunch-bagged rows



2nd group
Non bunch-bagged rows



3rd group
Bunch-bagged rows



@ Farm harvest (mid-September)

Paper-bag removal
& bunch spray with adapted
Bifidobacterium animalis
subsp. *lactis*

20 vines of central row/group
No spray on
unbagged bunches

Paper-bag removal &
Bunch spray with
distilled water





0 °C, 90% RH x 30 dd.



Non bagged grapes:
SO₂ pad

Treatments

@ Farm harvest

N = Non bagged bunches

B = Bagged bunches



@ End cold storage (30 dd.)

NS = Non bagged bunches + SO₂

BB = Bagged bunches + *Bifidobacterium*

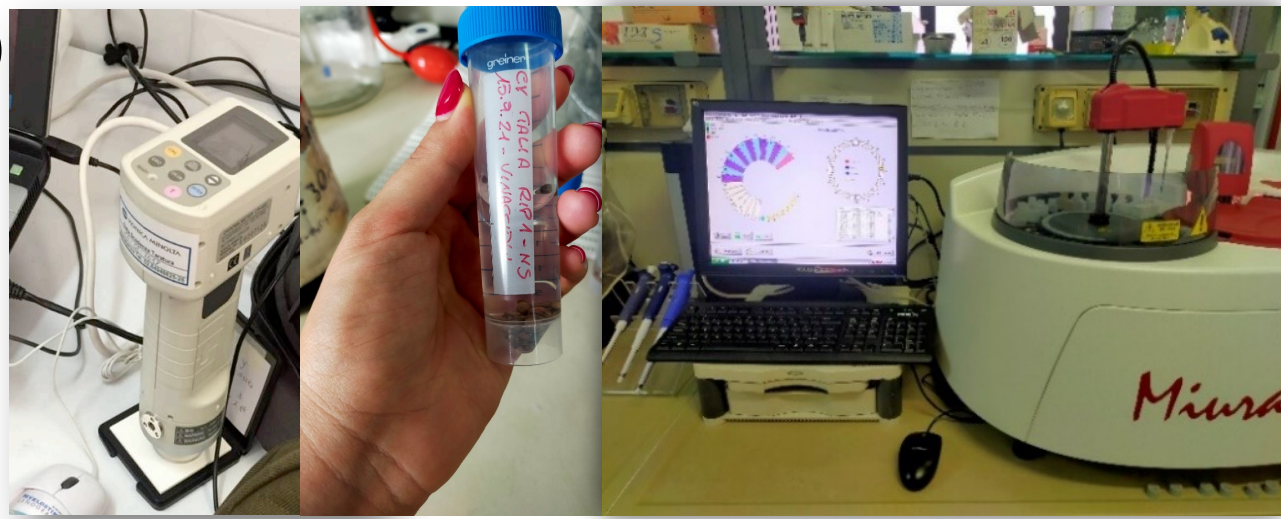
BH = Bagged bunches + H₂O

Physical analyses

- Berry weight
- Skin resistance 2.5 mm tip (digital penetrometer Turoni)
- Berry skin color (CIE L*a*b* C*H°, CR 400 Minolta)

Chemical analyses

- Total Soluble Solids (Digital wine VM-7 Atago)
- Titratable acidity (NaOH neutralization)
- Glucose; Glucose+Fructose
Tartaric, Malic, Citric acids } enzymatic method
- Skin total polyphenols (protocol Di Stefano & Cravero, 1991)
- Antioxidant acticity (ABTS, Re et al., 1999)



10 replicates/teatment (3 bunches/replicate)
 Statistics: one way ANOVA, Dunnet test





Berry weight, skin resistance and ripeness parameters **at farm harvest**



¹ Treatments	Berry weight (g)	Skin Color					Berry skin resistance (kg)	Ripeness parameters		
		L*	a*	b*	C*	H°		TSS (°Brix)	TA (g/L ac. tart.)	TSS:TA
N	9.46	40.90	-5.29	11.79	12.95	155.51	0.23	18.46	4.62	40.60
B	10.59	41.32	-5.20	11.90	12.98	156.47	0.24	18.83	4.64	40.90
² Sign.	*	ns	ns	ns	ns	ns	ns	ns	ns	ns

¹N = no bagged bunches

B = bagged bunches.

²* = significant difference at $p < 0,05$

ns = not significant difference

Berry weight, skin resistance and ripeness parameters after 30 days of cold storage

TREATMENTS	Berry weight (g)	Color					Skin resistance (kg)	Ripeness parameter		
		L*	a*	b*	C*	H°		TSS (°Brix)	TA (g/L ac. tart.)	TSS:TA
NS	9.30 b	35.31 a	-4.88 a	11.05 a	12.08 a	156.12 a	0.18 a	19.54 a	4.47 a	43.80 a
BH	10.21 a	35.27 a	-4.76 a	10,96 a	11.95 a	156.51 a	0.17 a	19.09 a	4.39 a	43.80 a
BB	10.12 a	35.43 a	-4,85 a	11.20 a	11.18 a	156.56 a	0.15 a	19.36 a	4.19 a	46.60 a

¹ NS = non bagged bunches + SO₂

BH = bagged bunches + H₂O

BB = bagged bungenes + *Bifidobacterium*

Mean separation (in the column) by Dunnet test at p<0.05

Reduction in bacterial load
1.5-1.7 log ufc/g

Main sugar and acid concentration in berry juice at farm harvest

¹ TREATMENTS	Sugars		Organic acids			
	Glucose (g/L)	Glucose+ Fructose (g/L)	Malic (g/L)	Tartaric (g/L)	Citric (g/L)	Ascorbic (mg/L)
N	85.93	185.2	2.04	5.10	0.21	589.30
B	86.96	188.6	1.97	5.45	0.19	599.30
² Sign.	ns	ns	ns	ns	ns	ns

¹ N = non bagged bunches

B = bagged bunches.

² * = significant difference at p < 0.05

ns = not significant difference

Main sugar and acid concentration in berry juice after 30 days of cold storage

¹ TREATMENTS	Sugars		Organic acids			
	Glucose (g/L)	Glucose+ Fructose (g/L)	Malic (g/L)	Tartaric (g/L)	Citric (g/L)	Ascorbic (mg/L)
NS	63.87 b -26%	140.7 b -24%	1.6 a	4.72 a	0.19 a	827.0 a +80%
BH	71.93 b -17%	150.1 b -20%	1.67 a	4.24 a	0.18 a	654.8 b +10%
BB	83.63 a -3%	183.6 a -3%	1.89 a	4.43 a	0.18 a	641.0 b +6%

¹ NS = non bagged bunches + SO₂

BH = bagged bunches + H₂O

BB = bagged bunches + *Bifidobacterium*

Mean separation (in the column) by Dunnet test at p < 0.05

Index of total polyphenol content & antioxidant activity at farm harvest

¹ TREATMENTS	Skin total polyphenols (mg (+)catechin/kg grape)	Antioxidant activity ABTS ^{•+} (inhibition %)
N	163.50	19.43
B	115.40	13.59
² Sign.	*	*

¹N = non bagged bunches

B = bagged bunches.

²* = significant difference at $p < 0.05$

ns = not significant difference

Index of total phenols content & antioxidant activity after 30 days of cold storage

¹ TREATMENTS	Skin total polyphenols (mg (+)catechin/kg grape)	Antioxidant activity ABTS ^{•+} (inhibition %)
NS	97.10 a	21.82 a
BH	117.20 a	14.8 b
BB	93.70 a	16.59 b

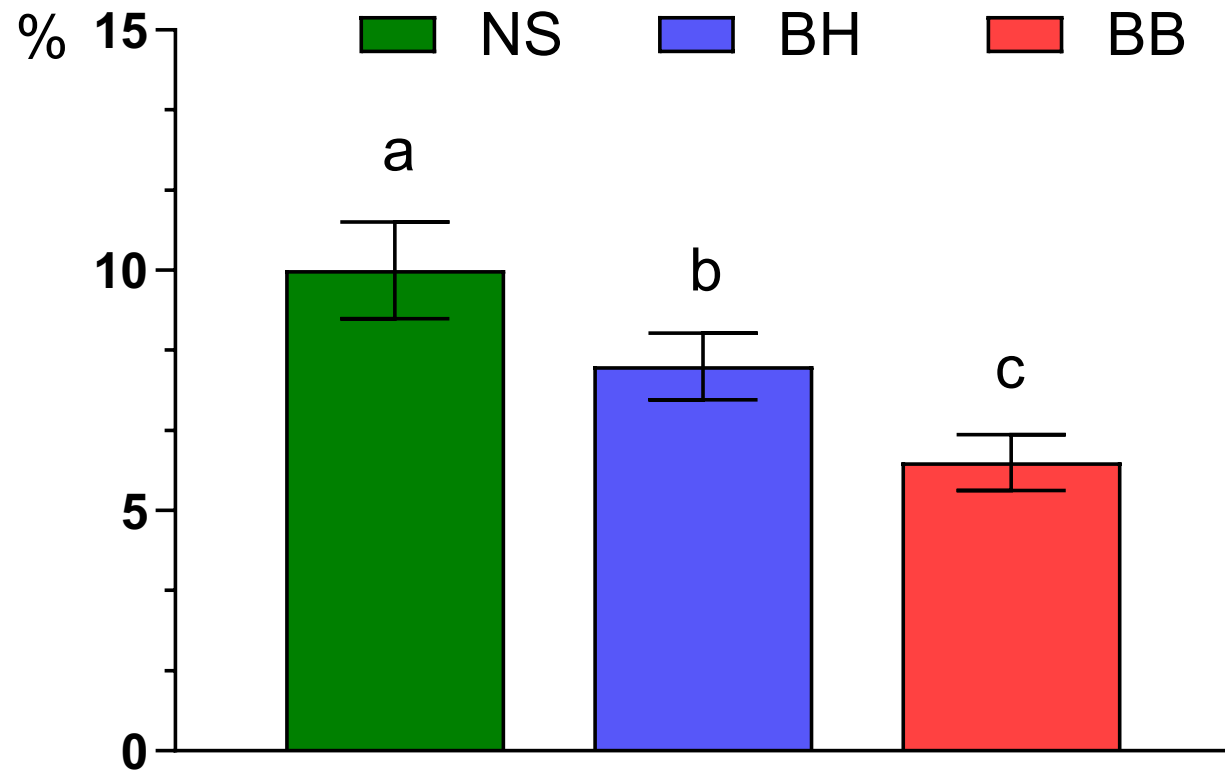
¹NS = non bagged bunches + SO₂

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BB = bagged bunches + *Bifidobacterium*

Mean separation (in the column) by Dunnet test at $p < 0.05$

Percentage of spoiled berries per bunch after 30 days of cold storage



NS = non bagged bunches + SO₂

BH = bagged bunches + H₂O

BB = bagged bunches + *Bifidobacterium*



Summary remarks

Protect bunches → achieve high quality grapes

- combining physical and biological methods
present case study: bunch bagging + microorganisms
 - adapted antagonistic bacteria: valid method to be developed to protect organic grapes during cold-storage
- } selecting appropriate conditions



10TH
INTERNATIONAL
TABLE GRAPE
SYMPOSIUM

26 NOV
TO
1 DEC 2023

SOMERSET WEST
SOUTH AFRICA



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Viticulturist

Dr. Francesco Laporta
Laporta Farm



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Technician



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