



10TH
INTERNATIONAL
TABLE GRAPE
SYMPOSIUM

26 NOV
TO
1 DEC 2023

SOMERSET WEST
SOUTH AFRICA

The effectiveness of nutritional solutions in preventing berry cracking and bunch rot in table grape.

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INTRODUCTION

Breakage of the skin – first mesocarp's layers

Primary causes - enviromental conditions/integrity in berry cell wall

- High rainfall and relative humidity
- Calcium deficiency
- Varietal susceptibility



INTRODUCTION



Hairline cracking – circular microfractures around the pedicel or longitudinal along the lateral part of the berry.

Possible preventive solutions - avoid all practices that predispose to an increase in turgor inside the berry

- Avoid excess water in the soil

Constant monitoring of the water content in the soil

Greater attention to soil management

- Agronomic practices (ring incision, ormons, etc.) + appropriate calcium nutrition

The main goal of our research activity is to evaluate the utility of two solutions, proposed by Adriatica spa, as a pre-harvest tool to mitigate both the cracking and hairline cracking

EXPERIMENTAL PROCEDURES

Year: 2020

	Phenological stage	Fertilizer	Dose (kg Ha ⁻¹)	Water (L Ha ⁻¹)
Treatments	Veraison	Dry-K30	6	500
	Bunch pre-closure	Dry-K30	6	500
	Pre-harvest	Dry-K30	6	500

Year: 2021

	Phenological stage	Fertilizer	Dose (kg Ha ⁻¹)	Water (L Ha ⁻¹)
Treatments	Peppercorn	Kamab 26	6	500
	Berry growth	Kamab 26	6	500
	Veraison	Dry-K30	6	500
	Bunch pre-closure	Dry-K30	6	500
	Pre-harvest	Dry-K30	6	500



- Cultivars: 'Italia'
- Experimental design: completely randomized with 3 repetitions/treatment
- Planting distances: 2.5 x 2.5 m
- Wine growing system: 'tunnels' covered with plastic film

Year: 2021



	Phenological stage	Fertilizer	Dose (kg Ha ⁻¹)	Water (L Ha ⁻¹)
Treatments	Peppercorn	Kamab 26	6	500
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	Veraison	Dry-K30	6	500
	Bunch pre-closure	Dry-K30	6	500
	Pre-harvest	Dry-K30	6	500

- Cultivars: 'Autumn Giant'
- Experimental design: completely randomized with 3 repetitions/treatment
- Planting distances: 2.5 x 2.5 m
- Wine growing system: 'tunnels' covered with plastic film

EXPERIMENTAL PROCEDURES

15

bunches/cultivars/treatments
/repetitions were harvested
at their commercial maturity



2 time points of postharvest:

- ✓ T1: 15 days of cold storage
- ✓ T2: 30 days of cold storage

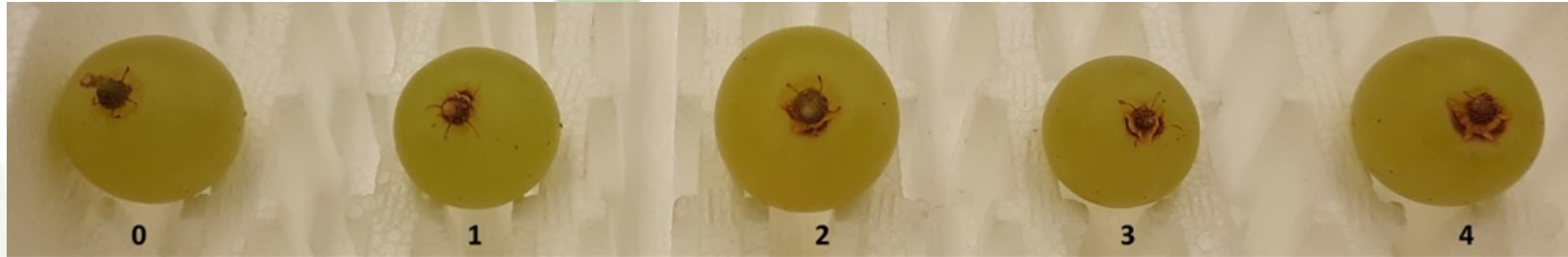
5

bunches/cultivars/treatments/
repetitions were collected for
laboratory analysis



EXPERIMENTAL PROCEDURES

Cracking



Number of affected berries

Cracking Incidence:

$$\frac{n}{N} * 100$$

Total number of berries

Number of affected berries with a specific class of severity

Cracking severity:

$$\frac{\sum_1^i (n_i \times v_i)}{N \times V} * 100$$

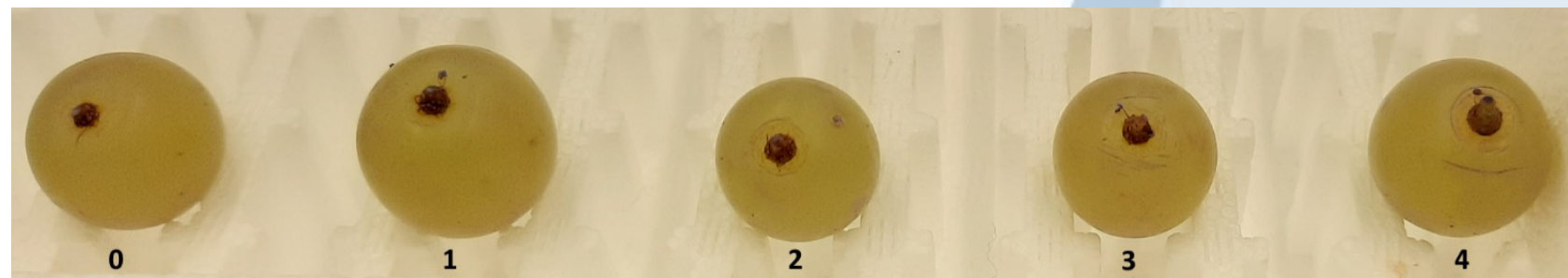
Total number of berries

Value of the class of severity

Maximum value of the considered severity class

EXPERIMENTAL PROCEDURES

Hairline Cracking



Cristal violet solution (0.33%) – 10'

Number of affected berries

Number of affected berries whit a specific class of severity

Value of the class of severity

Hairline Cracking Incidence: $\frac{n}{N} * 100$

Hairline Cracking severity: $\frac{\sum_1^i (n_i \times v_i)}{N \times V} * 100$

Total number of berries

Total number of berries

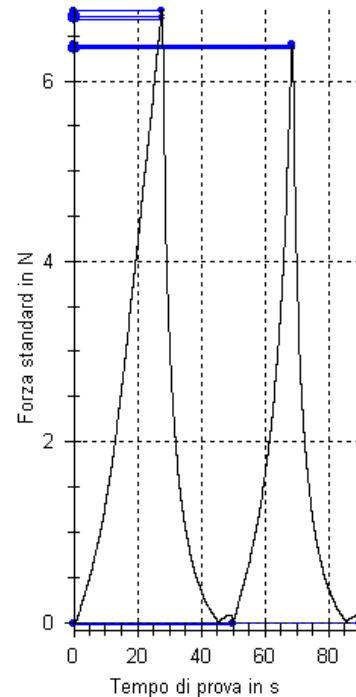
Maximum value of the considered severity class

EXPERIMENTAL PROCEDURES

Mechanical behavior measured both at harvest and after 15 and 30 days of cold storage

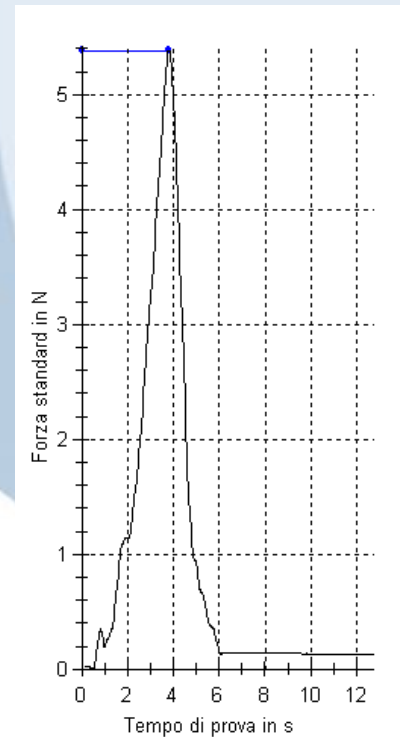
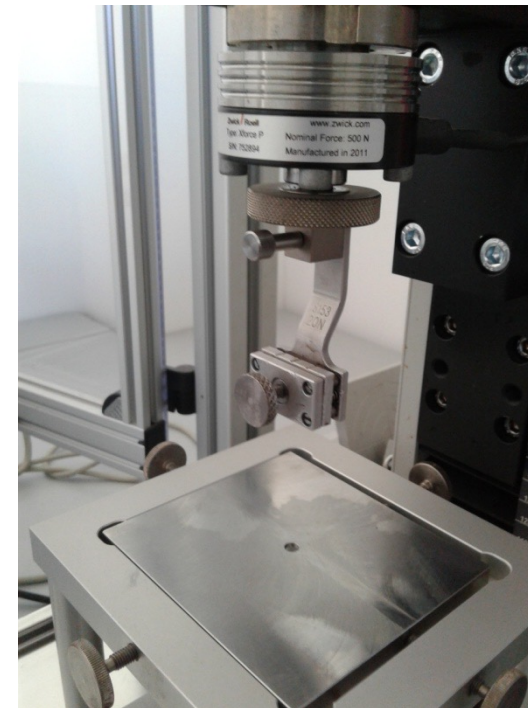
Texture Profile Analysis (TPA)

Double compression test



**Hardness, springiness,
gumminess and
chewiness**

Fruit Detachment Force (FDF)



**Force needed to
remove the pedicel
from the berry**

Cultivar Italia: Effect of DRY K30 alone in controlling both Cracking and Hairline cracking phenomena

Tempo	Cracking		Hairline cracking	
	Incidence	Severity	Incidence	Severity
Harvest	- 41.4%*	- 40.8%*	-	-
T1	n.s.r.	n.s.r.	- 83.1%*	- 84.1%*
T2	- 11.8%	- 4.4%	- 36.2%	- 36.2%

Time	FDP	SPRIN	GUMM	CHEW	CHOE	HARDN
Harvest	n.s.r.	n.s.r.	21.6*	17.2	n.s.r.	32.3*
T1	- 19.0	n.s.r.	10.2	n.s.r.	n.s.r.	22.2*
T2	- 22.6*	n.s.r.	26.3*	23.4*	n.s.r.	32.7*

TREATED



CONTROL



- ✓ **FDP**: Necessary Force for the Detachment of Pedicel (N)
- ✓ **SPRIN**: Elacicity
- ✓ **GUMM**: Gommosity (N)
- ✓ **CHEW**: Chewness (N)
- ✓ **CHOE**: Choesiveness
- ✓ **HARDN**: Hardness (N)

Cultivar Italia: Effect of DRY K30 alone in controlling both Cracking and Hairline cracking phenomena

	GUMM	HARDN	HCI	HCS
GUMM		Spearman's index: 0.97 <i>p-value</i> : < 0.0001***	Spearman's index: - 0.58 <i>p-value</i> : 0.0108*	Spearman's index: -0,57 <i>p-value</i> : 0.0128*
HARDN	Spearman's index: 0.97 <i>p-value</i> : < 0.0001***		Spearman's index: - 0.51 <i>p-value</i> : 0.0290*	Spearman's index: -0.50 <i>p-value</i> : 0.0335*
HCI	Spearman's index: - 0.58 <i>p-value</i> : 0.0108*	Spearman's index: - 0.51 <i>p-value</i> : 0.0290*		Spearman's index: 1.00 <i>p-value</i> : < 0.0001***
HCS	Spearman's index: -0,57 <i>p-value</i> : 0.0128*	Spearman's index: -0.50 <i>p-value</i> : 0.0335*	Spearman's index: 1.00 <i>p-value</i> : < 0.0001***	

Cultivar Italia: Effect of DRY K30+Kamab 26 in controlling both Cracking and Hairline cracking phenomena

Tempo	Cracking		Hairline cracking	
	Incidence	Severity	Incidence	Severity
Harvest	n.s.r.	n.s.r.	-	-
T1	- 27.7*	- 23.0*	- 58.2*	- 60.3*
T2	- 33.0*	- 28.9*	- 81.3*	- 84.6*

Time	FDP	SPRIN	GUMM	CHEW	CHOE	HARDN
Harvest	n.s.r.	26.6*	19.0*	55.9*	n.s.r.	n.s.r.
T1	14.4	n.s.r.	n.s.r.	n.s.r.	n.s.r.	n.s.r.
T2	23.0	n.s.r.	n.s.r.	n.s.r.	n.s.r.	n.s.r.

- ✓ **FDP**: Necessary Force for the Detachment of Pedicel (N)
- ✓ **SPRIN**: Elasticity
- ✓ **GUMM**: Gommosity (N)
- ✓ **CHEW**: Chewness (N)
- ✓ **CHOE**: Choesiveness
- ✓ **HARDN**: Hardness (N)

TREATED



CONTROL



Cultivar Italia: Effect of DRY K30+Kamab 26 alone in controlling both Cracking and Hairline cracking phenomena

	SPRIN	GUMM	CHEW	HCI	HCS
SPRIN		Spearman's index: 0.83 <i>p-value</i> : < 0.0001***	Spearman's index: 0.97 <i>p-value</i> : < 0.0001***	Spearman's index: -0.36 <i>p-value</i> : 0.01407*	Spearman's index: -0.34 <i>p-value</i> : 0.01716*
GUMM	Spearman's index: 0.83 <i>p-value</i> : < 0.0001***		Spearman's index: 0.93 <i>p-value</i> : < 0.0001***	Spearman's index: -0.55 <i>p-value</i> : 0.0191*	Spearman's index: -0,54 <i>p-value</i> : 0.0210*
CHEW	Spearman's index: 0.97 <i>p-value</i> : < 0.0001***	Spearman's index: 0.93 <i>p-value</i> : < 0.0001***		Spearman's index: -0.43 <i>p-value</i> : 0.01739*	Spearman's index: -0.41 <i>p-value</i> : 0.01903*
HCI	Spearman's index: -0.36 <i>p-value</i> : 0.01407*	Spearman's index: -0.55 <i>p-value</i> : 0.0191*	Spearman's index: -0.43 <i>p-value</i> : 0.01739*		Spearman's index: 1.00 <i>p-value</i> : < 0.0001***
HCS	Spearman's index: -0.34 <i>p-value</i> : 0.01716*	Spearman's index: -0,54 <i>p-value</i> : 0.0210*	Spearman's index: -0.41 <i>p-value</i> : 0.01903*	Spearman's index: 1.00 <i>p-value</i> : < 0.0001***	

Cultivar Autumn Giant: Effect of DRY K30+Kamab 26 in controlling both Cracking and Hairline cracking phenomena

Tempo	Cracking		Hairline cracking	
	Incidence	Severity	Incidence	Severity
Harvest	- 23.8*	- 24.0*	-	-
T1	- 23.4*	n.s.r.	- 10.8*	-12.8*
T2	+ 61.9*	+ 98.3*	-15.8*	- 5.8*

Time	FDP	SPRIN	GUMM	CHEW	CHOE	HARDN
Harvest	n.s.r.	n.s.r.	n.s.r.	n.s.r.	n.s.r.	n.s.r.
T1	n.s.r.	n.s.r.	n.s.r.	n.s.r.	n.s.r.	n.s.r.
T2	37.3	n.s.r.	n.s.r.	n.s.r.	n.s.r.	n.s.r.

- ✓ **FDP**: Necessary Force for the Detachment of Pedicel (N)
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- ✓ **CHOE**: Choesiveness
- ✓ **HARDN**: Hardness (N)

TREATED



CONTROL



CONCLUSIONS

The two tested nutritional protocol can represent a valid solution to mitigate both the cracking and the hairline cracking at harvest and during post-harvest period

These protective effects can be correlated with significant increases in rheological parameters such as berry's hardness, gumminess and chewiness

The significantly higher values in rheological parameters, suggest the presence of a more stable and less degradable cell walls in berries treated with two nutritional protocols, probably due to an enrichment in calcium in the tissues of berries

CONCLUSIONS

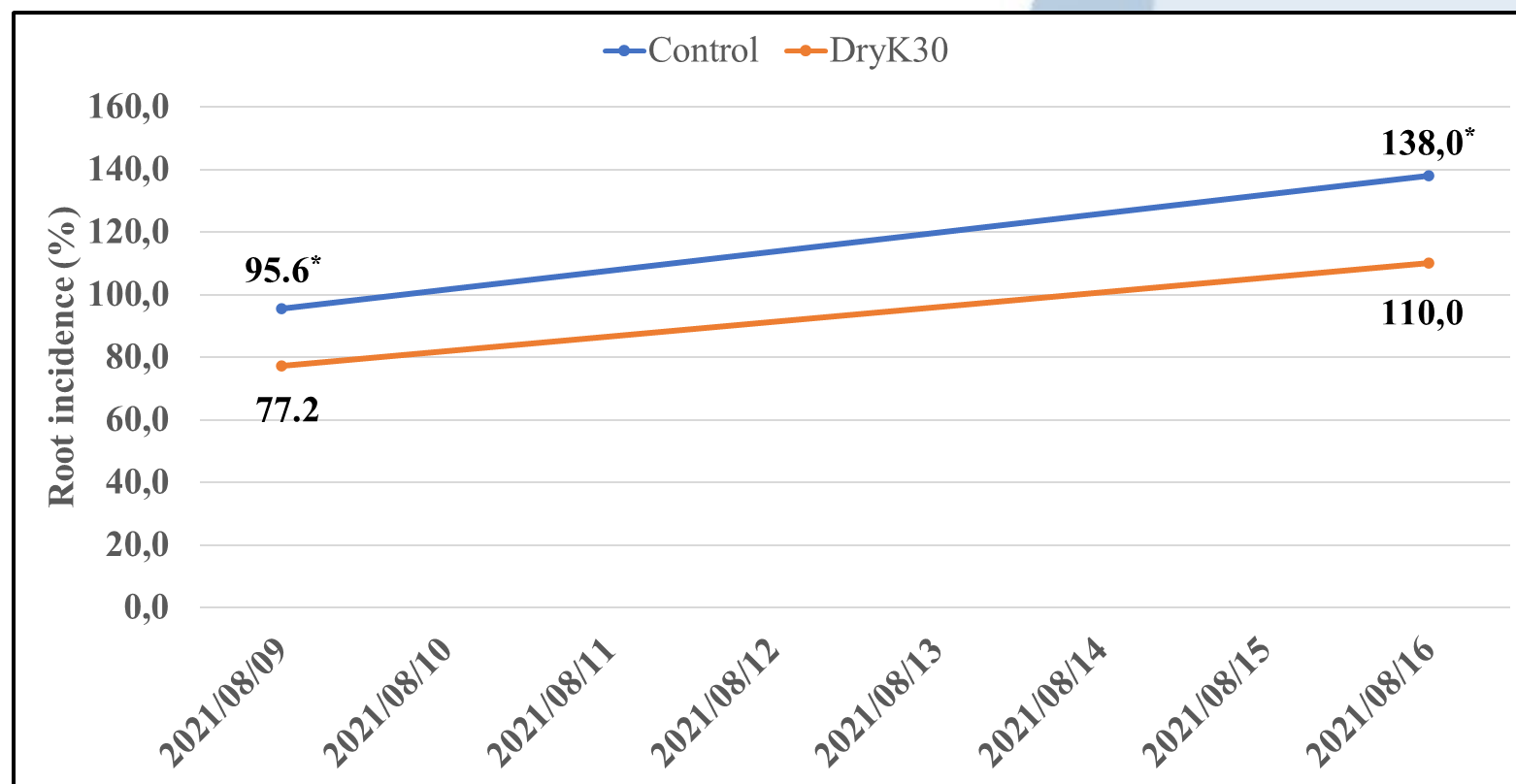
DryK30 showed a good protective action against rot, which naturally develops following the cracking phenomenon.



DryK30



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**Thank you for
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