VALENT BIOSCIENCES CORPORATION

ProTone®
PLANT GROWTH REGULATOR

EVALUATION OF TABLE GRAPE COLORATION PROGRAMS IN GLOBAL PRODUCTION AREAS

ROBERT FRITTS, JR., SCHALK REYNOLDS, GONZALO MATURANA, FRANCISCO CASANOVA, JOHAN PIENAAR
AND JOZSEF RACSKO

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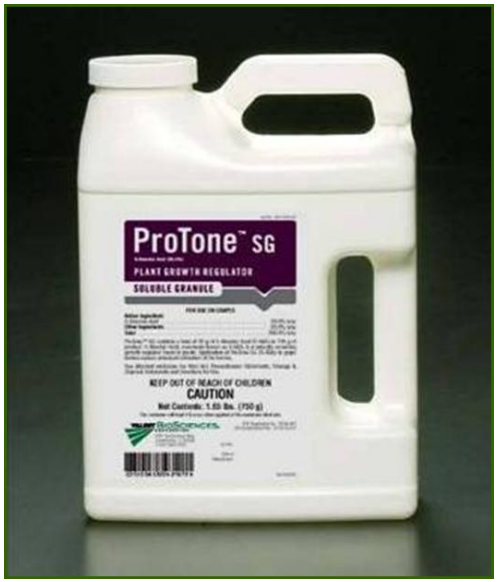
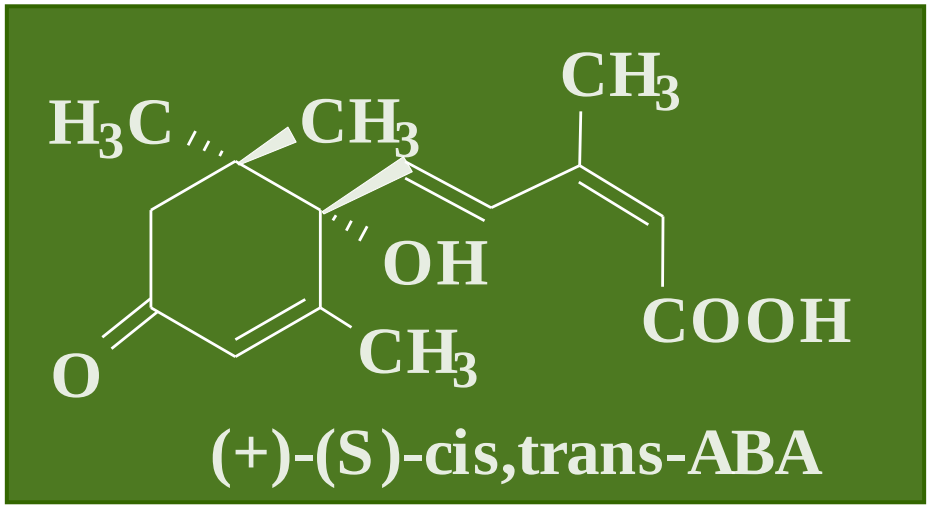
WHAT IS PROTONE®?

- New commercial plant growth regulator
- Active ingredient: *S*-Abscisic acid (*S*-ABA)
- Formulation:
  - 20% Soluble Granule
  - 10% Soluble Liquid



WHAT IS *PROTONE*?

- Chemical structure first proposed by Okhuma et al. in 1965



- Two forms of ABA, *S*- and *R*-
- *S*- is physiologically active (*ProTone*)

WHAT IS *PROTONE*?

- Abscisic Acid (*S*-ABA) is classified as one of the five major plant hormones, along with:
  - auxin
  - cytokinin
  - ethylene
  - gibberellin
- Found in all vascular plants

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SAFETY PROFILE OF *PROTONE*

- Produced by fermentation
- REI - 4 hours
- PHI - 0 days
- Exempt from requirement of a tolerance
  - No MRL issues
- Certified for use in organic production in the US

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GLOBAL MARKETS

Country	Registration
Chile	November 2009
US	EPA - March 2010; California - April 2010
South Africa	April 2010
Israel	May 2010
Peru	September 2010
Australia	November 2010
Spain	May 2011 – EUP (200 ha); Annual permit
Egypt	September 2011
Mexico	February 2012

Additional Countries in Development: **Italy, Brazil, Greece, and Lebanon**

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TABLE GRAPE COLORING

- Management of table grape color requires a "***program approach***"
- No single tool or cultural practice is effective

  - Cultivar
  - Rootstock
  - Fertilizer
  - Irrigation
  - Crop Load
  - Canopy management / Light Exposure
  - Weather
  - Plant Growth Regulators (PGRs)

PRIMARY VARIABLE - TEMPERATURE

- In grapes, high temperatures inhibit berry anthocyanin development, or color
- *S*-ABA stimulates an enzyme (UFGT*) which enhances anthocyanin and fruit color
- *ProTone* supplements the natural levels of *S*-ABA in the berry

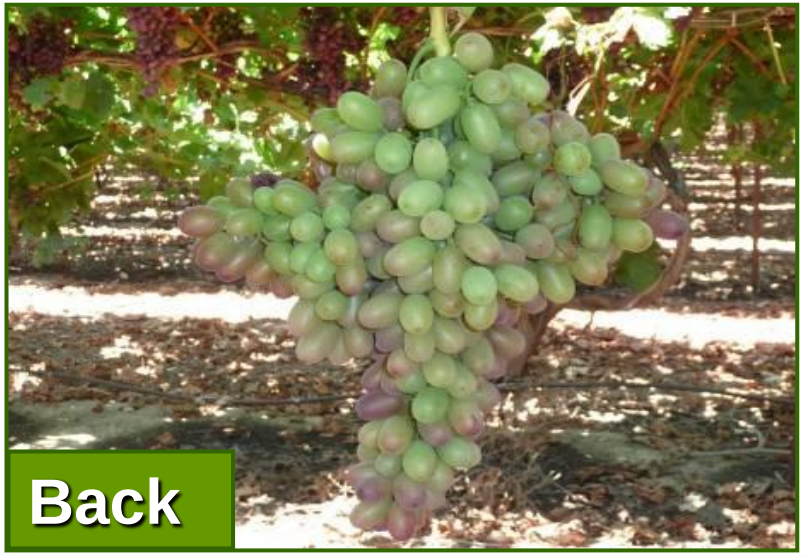
* UDP-glucose:flavonoid 3-*O*-glucosyltransferase

PRIMARY VARIABLE - TEMPERATURE

- The difference between day and night temperatures is not as important as the minimum daily temperature
  - Berry coloring is slowed at temperatures above 23ºC (73ºF)
  - Anthocyanin degrades above 30ºC (86ºF)
- If the temperatures at night remain above 23ºC (73ºF), berry coloring is not achieved

APPLICATION GUIDELINES

- Thorough and complete coverage of the fruiting zone
- Leaf removal to open the fruiting zone
- *ProTone* is not translocated
  - if only one side of a cluster is wetted, the other side will not color



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APPLICATION GUIDELINES - EQUIPMENT

- Both high volume and electrostatic spraying are effective.

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APPLICATION GUIDELINES - TIMING

- Berry softening is the easiest parameter to determine application timing
- Do not wait for color to begin applications

Soft berries, yet no color

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APPLICATION GUIDELINES - RATE OF APPLICATION

- Use up to four hundred (400) grams active ingredient per hectare per application
- Use up to three applications per season

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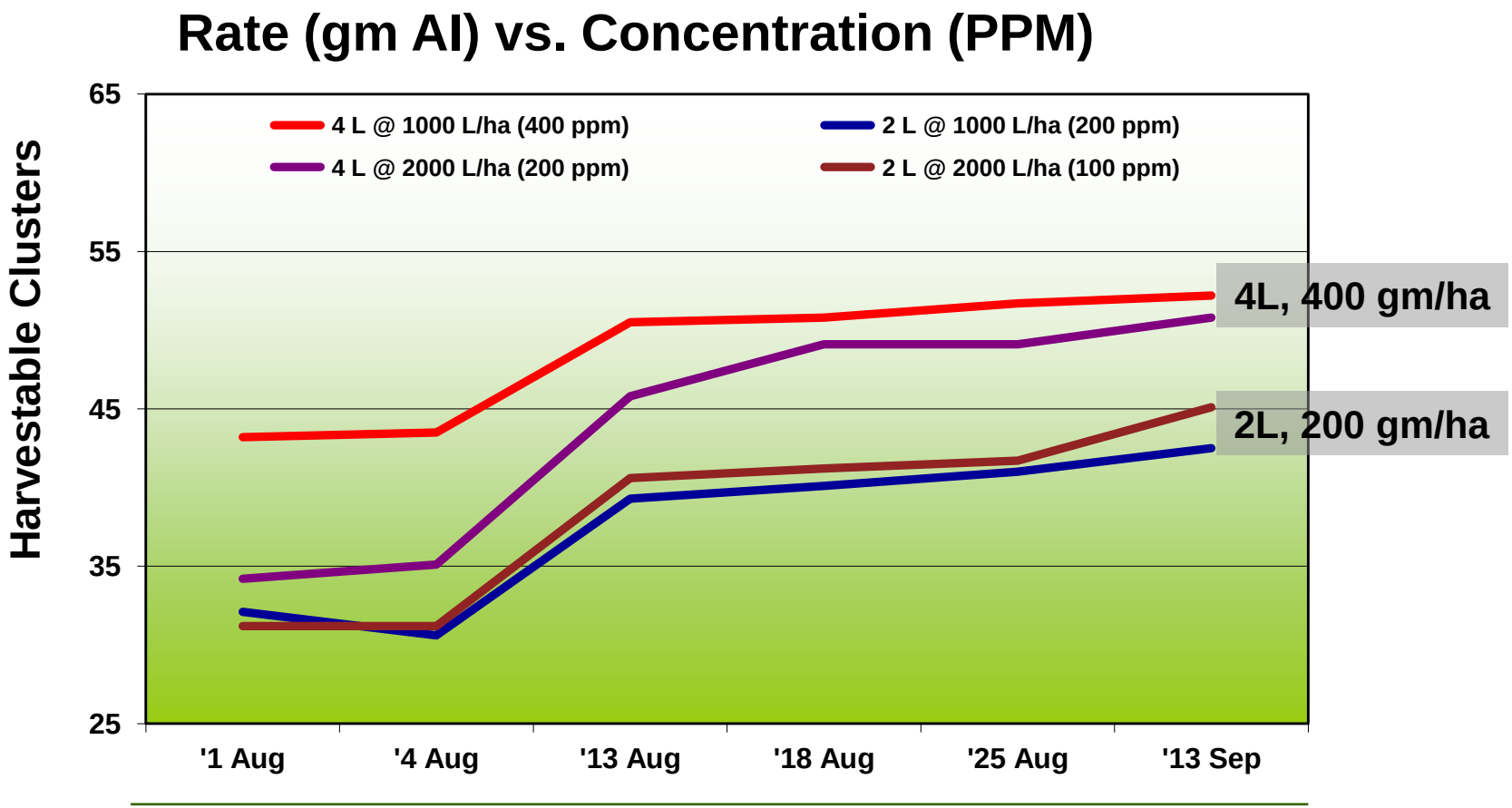
RATE OF APPLICATION

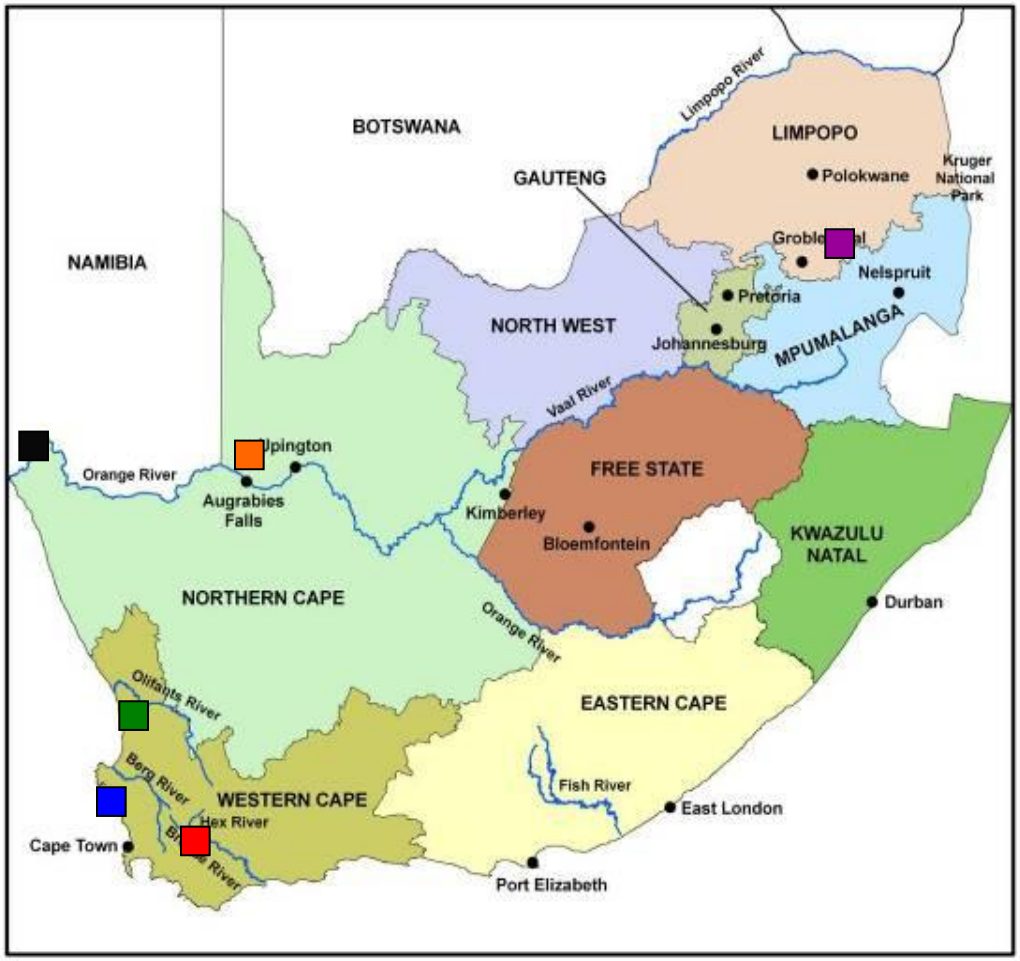


Field Rep: R. Hopkins
ExSum#: 2008RHOPK009

Variety: Crimson Seedless
Volume: 100 & 200 gpa
Application Date: Jul 13, 2008

Harvest Date: Aug - Sep
Site: Fowler, CA
Country: USA

SOUTH AFRICA



Northern Province:
Marble Hall, Grobersdal, Polekwane, Nelspruit, Hoedspruit

'Orange River' Valley:

Upington, Kakamas, Keimoes, Augrabies, Blouputs, Onseepkans

Western Cape:

- 'Hex River' Valley
- 'Olifants River' Valley
- 'Berg River' Valley

Namibia

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ETHEPHON RESIDUES

Spray program	Ethephon (Ha)	Last Ethephon application	Ethephon residue (mg/kg)
ProTone Ethephon Ethephon	1,020 ml	23 Oct	0.4 (10)
ProTone Ethephon Ethephon	1,500 ml	1 Nov	0.99 (8) 0.41 (14)
ProTone Ethephon ProTone + Ethephon	1,500 ml	2 Nov	0.89 (7) 0.43 (13)
ProTone + Ethephon ProTone + Ethephon Ethephon	1,600 ml	5 Nov	1.09 (7) 0.75 (13) 0.9 (17)

Ethephon 480

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ETHEPHON RESIDUES

Spray program	Ethephon (Ha)	Last Ethephon application	Ethephon residue (mg/kg)
ProTone Ethephon Ethephon ProTone + Ethephon	2,000 ml	29 Oct	4.24 (8) 2.5 (15) 1.67 (20)
ProTone Ethephon ProTone + Ethephon Ethephon	2,250 ml	22 Oct	1.64 (8) 2.83 (13) 3.1 (19) 1.88 (23) 2.33 (30)
Ethephon Ethephon Ethephon	2,405 ml	8 Nov	1.23 (10) 1.28 (22)

Ethephon 480

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MATERIALS AND METHODS

- Randomized complete block design with 7 replicate blocks
  - Three vines experimental unit, middle vine sampled
- Application Method: Motorized knapsack sprayer
- Water Volume: ± 1,000 L water per hectare (bunch directed spray)
- Timing: Veraison & Veraison + 3 days
- Analysis of variance using STATISTICA. Student's t-LSD (least significant difference) at the 5% level.

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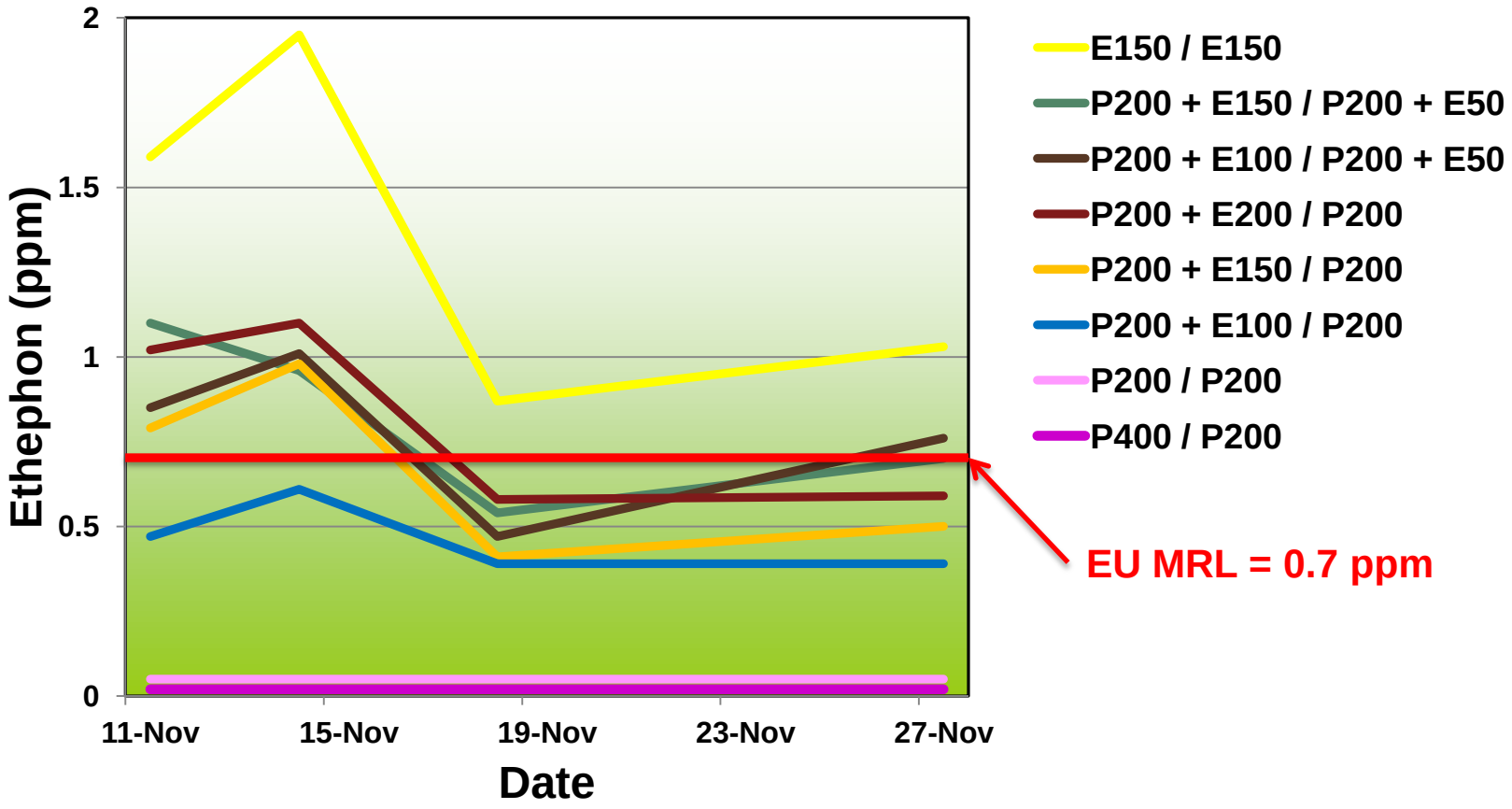
MATERIALS AND METHODS

	Product	Rate (g/ha or PPM)	Harvest 1 (24DAA)
1	Ethephon / Ethephon	150	49.2b
2	ProTone + Ethephon ProTone + Ethephon	200 + 150 200 + 50	85.5d
3	ProTone + Ethephon ProTone + Ethephon	200 + 100 200 + 50	69.1c
4	ProTone + Ethephon ProTone	200 + 200 200	81.3cd
5	ProTone + Ethephon ProTone	200 + 150 200	86.5d
6	ProTone + Ethephon ProTone	200 + 100 200	66.4c
7	ProTone / ProTone	200	22.0a
8	ProTone / ProTone	400 / 200	67.2c
	Prob.>F^2		***

Ethephon 480

ETHEPHON RESIDUES



Applications dates: 4 Nov & 7 Nov

GLOBAL MARKETS – SUMMARY

- *ProTone* is an effective tool to reduce MRLs and provide effective coloring of colored table grapes
- First global registration in November 2009
- *ProTone* is the “standard” of table grape coloring programs in most global markets

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THANK YOU

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