

PLANTOS VERDE®

Micronized Calcite - Plant Biological Activation Technology (PBAT)

Scientific Field Trial Report — Viticulture

Regions: Saint-Émilion (FR) | Vallée du Rhône (FR) | Colli Berici (IT)

Varieties: Merlot | Cabernet Franc | Cabernet Sauvignon | Grenache | Syrah | Pinot Grigio | Chardonnay

Trial Period: 2004 – 2005 | Author: Dr. Peter Ost, Augsburg © 2025



EXECUTIVE SUMMARY — Key Outcomes at a Glance

+15%

Avg. Yield Uplift
(Colli Berici trials)

+10.7%

Total Polyphenol
Index increase

+65%

Wood Weight
Increase

+12.3%

Anthocyanin
Concentration

+0.56%

Potential Alcohol
Degree uplift

3×

Porous Volume
Increase (lab)

INTRODUCTION & TRIAL OBJECTIVES

What is Plantos Verde®?

Plantos Verde® (PV®) is a micronized calcite biostimulant produced via **tribomechanical technology** — achieving particle sizes in the micrometer range with dramatically enhanced physicochemical reactivity.

- 85.2% of micronized calcite is soluble on leaf at cuticular pH 5.8
- Calcium is the primary soluble element (32.8%)
- Total specific surface area doubled vs. standard calcite
- Porous volume tripled by tribomechanical treatment
- Confirmed non-toxic by SADEF phytotoxicity tests
- Cuticular wax structure altered — improving hydration and reducing drought stress

Three Core Trial Objectives

01

Validate Laboratory Results

Confirm in-field what laboratory experiments showed about activation of cellular metabolism in vine leaves — including chloroplast density, photosynthetic rate and polyphenol synthesis.

02

Validate Oenological Quality Impact

Assess whether PV® pulverisation translates to measurable improvements in harvest quality parameters: TPI, anthocyanins, sugar rate, alcoholic degree, pH, berry weight and assimilable nitrogen.

03

Validate Practical Application Protocols

Confirm efficacy across a range of doses (1–7 kg/ha), spray volumes, tank mixes and growth stages — from leaf-flag expansion through véraison.

METHODOLOGY & TRIAL DESIGN

Saint-Émilion, France

Varieties: Merlot, Cabernet Franc & Sauvignon

Ground: Sandy clayey, Sandy, Sandy silt, Chalky clay

Protocol: 2–3 applications @ 1.5–2 kg/ha

Stages: Separated grapes, node formation, closure

Control: Adjacent untreated rows

Vallée du Rhône, France

Variety: Grafted Grenache (planted 1968)

Ground: Gravel with rolled pebble, pH 6.7

AOC: Tricastin Hill designation

2004: 4 pulverisations (500g × 3 + 1.5 kg)

2005: 4 pulverisations (500g × 2) + (1.5 kg × 2)

Colli Berici, Italy

Coop: AVES Colli Berici Soc. in Lonigo

Varieties: Pinot Grigio, Chardonnay, Cab. Sauv.

Parcels: 3 irrigated hills with paired controls

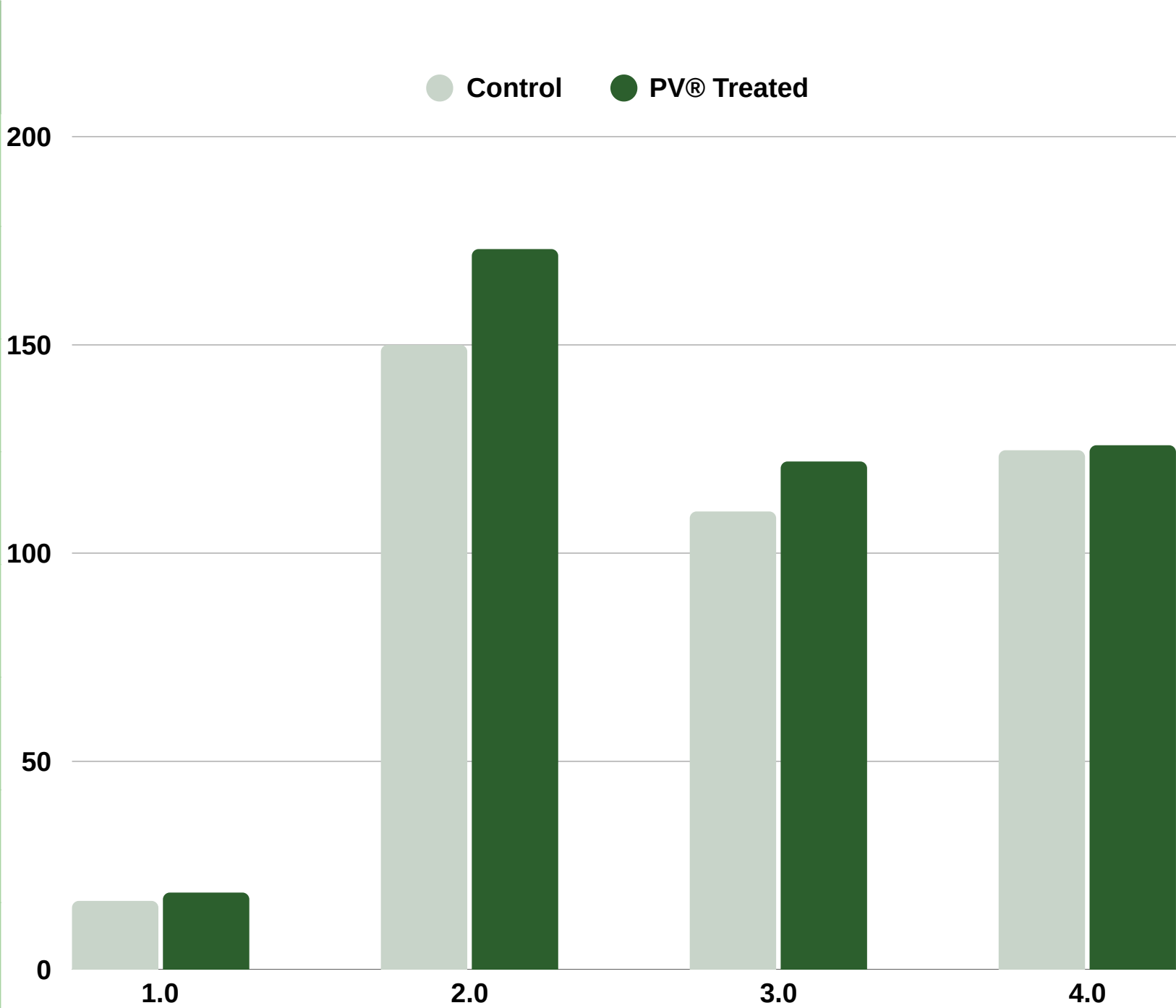
Dose: 7 kg/ha total (split protocol)
2 kg pre-flower + 2.5 kg closure + 2.5 kg véraison

Parameters Measured Across All Trials

- | | | | |
|--------------------------------|--|------------------------|-----------------------------------|
| ▶ Total Polyphenol Index (TPI) | ▶ Sugar Rate (g/l) | ▶ Berry Weight (g/100) | ▶ Potential Alcohol Degree (%vol) |
| ▶ Anthocyanin Rate | ▶ Total Acidity (gH ₂ SO ₄ /l) | ▶ pH | ▶ Assimilable Nitrogen (mg/l) |
| ▶ Malic Acid (g/l) | ▶ Calcium & Magnesium Levels | ▶ Wood Weight (kg) | ▶ Foliar Surface Area |

RESULTS — SAINT-ÉMILION MERLOT (2005)

Parameter	Unit	Control	PV® Treated	Uplift
Total Polyphenol Index	—	16.5	18.5	+12.1%
Total Acidity	g/l	4.01	4.27	+6.5%
Sugar Rate	g/l	212	214	+0.9%
pH	—	3.27	3.23	−1.2%
Assimilable Nitrogen	mg/l	110	122	+10.9%
Berry Weight	g/100 berries	150	173	+15.3%
Potential Degree	% vol	12.47	12.59	+1.0%
Anthocyanins	—	228	205	−10.1%*
Malic Acid	g/l	1.7	1.7	Equiv.



* Anthocyanin result shows variability between parcel types; overall average across all grounds shows +12.3% uplift (see Slide 8).

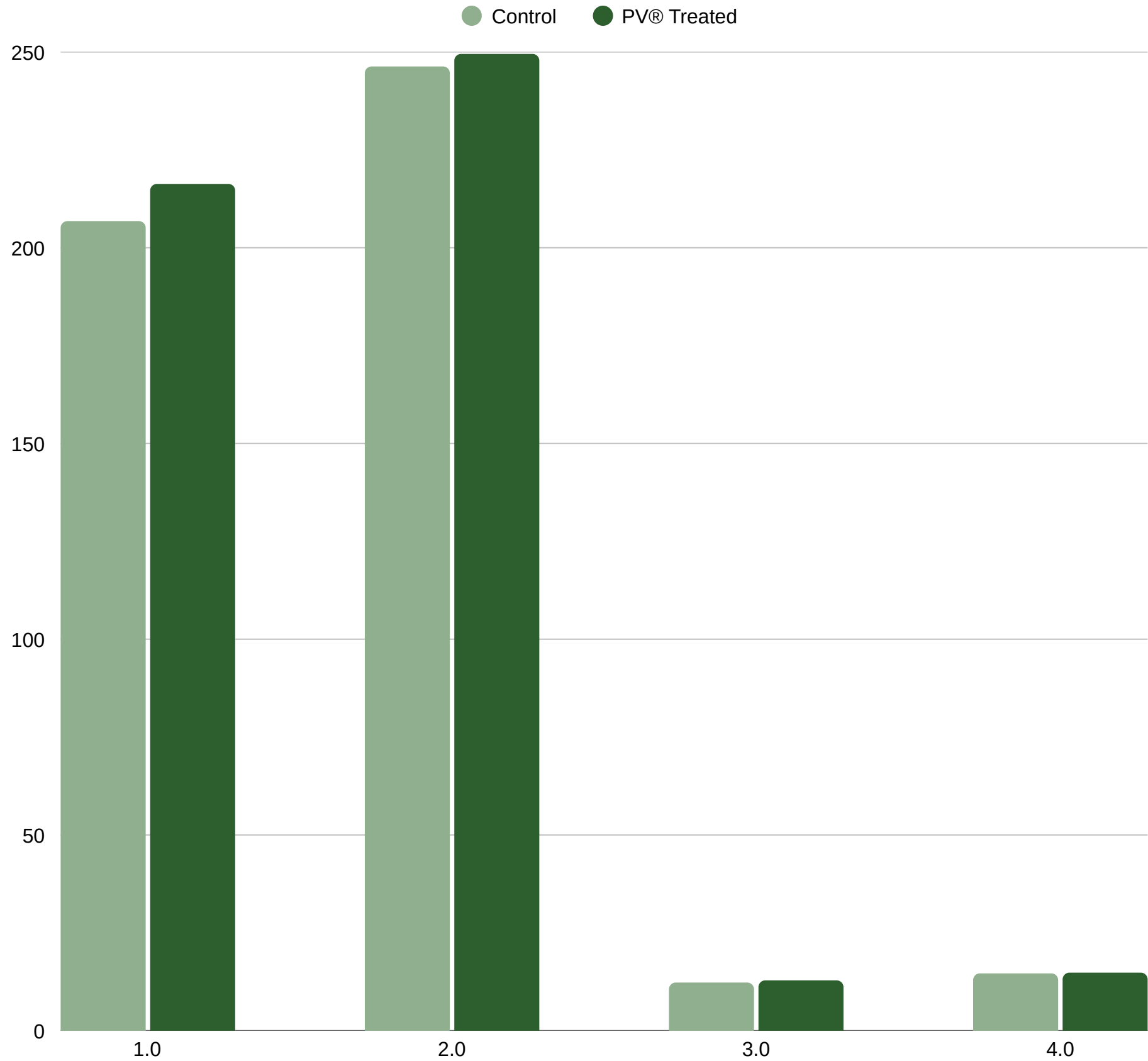
RESULTS — VALLÉE DU RHÔNE, GRENACHE (2004 & 2005)

2004 Season — Granges Gontardes

Parameter	Control (G68 East)	PV® Treated (G68 West)	Change
Grape Weight (g)	450	445	−1.1%
Sugar (g/l)	206.8	216.3	+4.6%
Total Acidity (gH ₂ SO ₄ /l)	3.4	3.5	+2.9%
pH	3.41	3.46	+1.5%
Alcohol % Vol	12.29	12.85	+4.6%

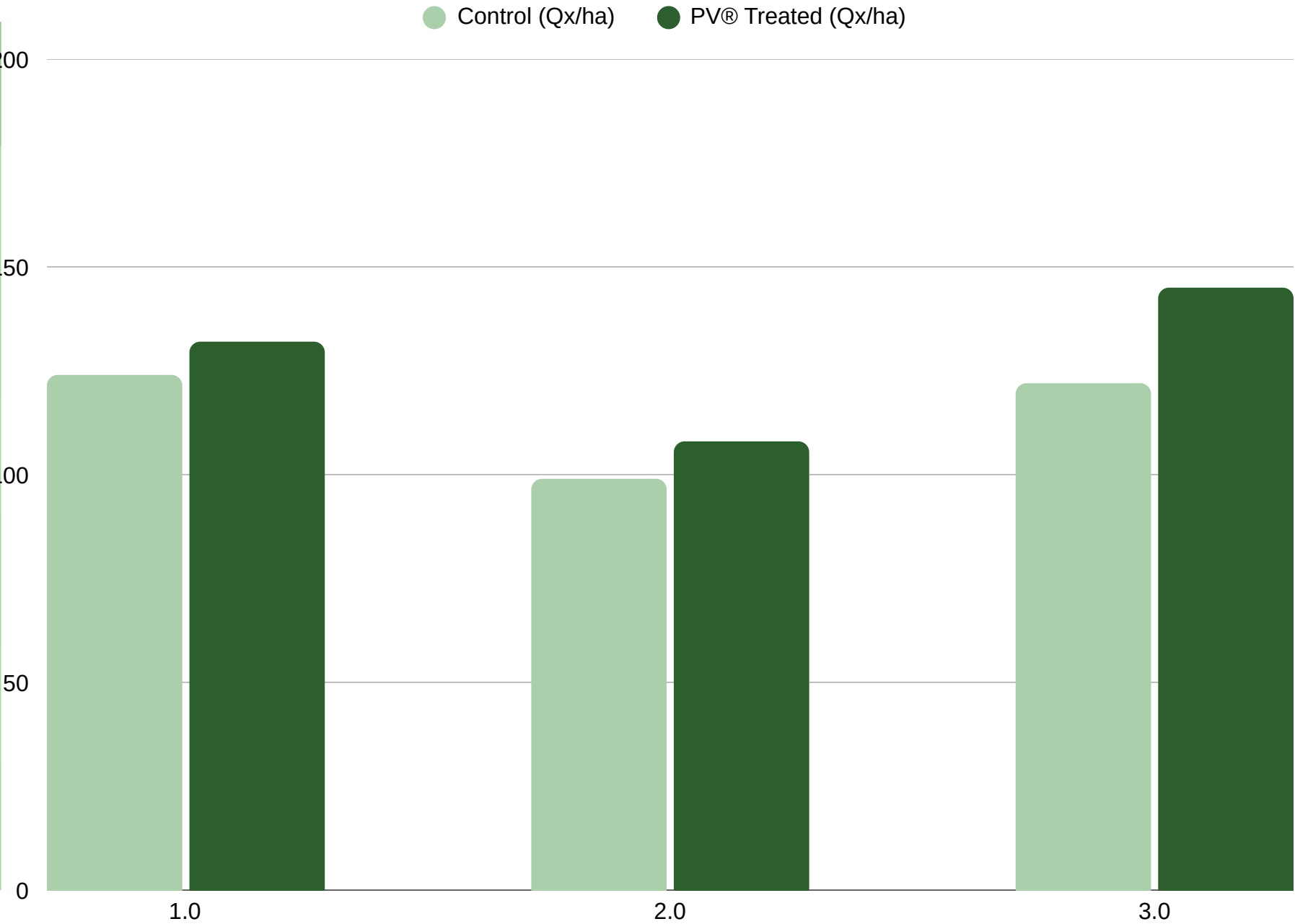
2005 Season — Granges Gontardes

Parameter	Control (G68 East)	PV® Treated (G68 West)	Change
Grape Weight (g)	405	400	−1.2%
Sugar (g/l)	246.3	249.5	+1.3%
Total Acidity (gH ₂ SO ₄ /l)	3.60	3.80	+5.6%
pH	3.49	3.45	−1.1%
Alcohol % Vol	14.63	14.82	+1.3%



RESULTS — COLLI BERICI, ITALY | Yield Optimisation

Parcel / Variety	Treatment	Yield (Qx/ha)	Sugar Rate (%)	Yield Uplift
Parcel 3 — Pinot Grigio	PV [®] Treated	132	17.20	
Parcel 3 — Pinot Grigio	Control	124	17.10	+6.5%
Parcel 4 — Chardonnay	PV [®] Treated	108	20.10	
Parcel 4 — Chardonnay	Control	99	19.60	+9.1%
Parcel 5 — Cabernet Sauv.	PV [®] Treated	145	18.20	
Parcel 5 — Cabernet Sauv.	Control	122	18.10	+18.9%



Key Insight

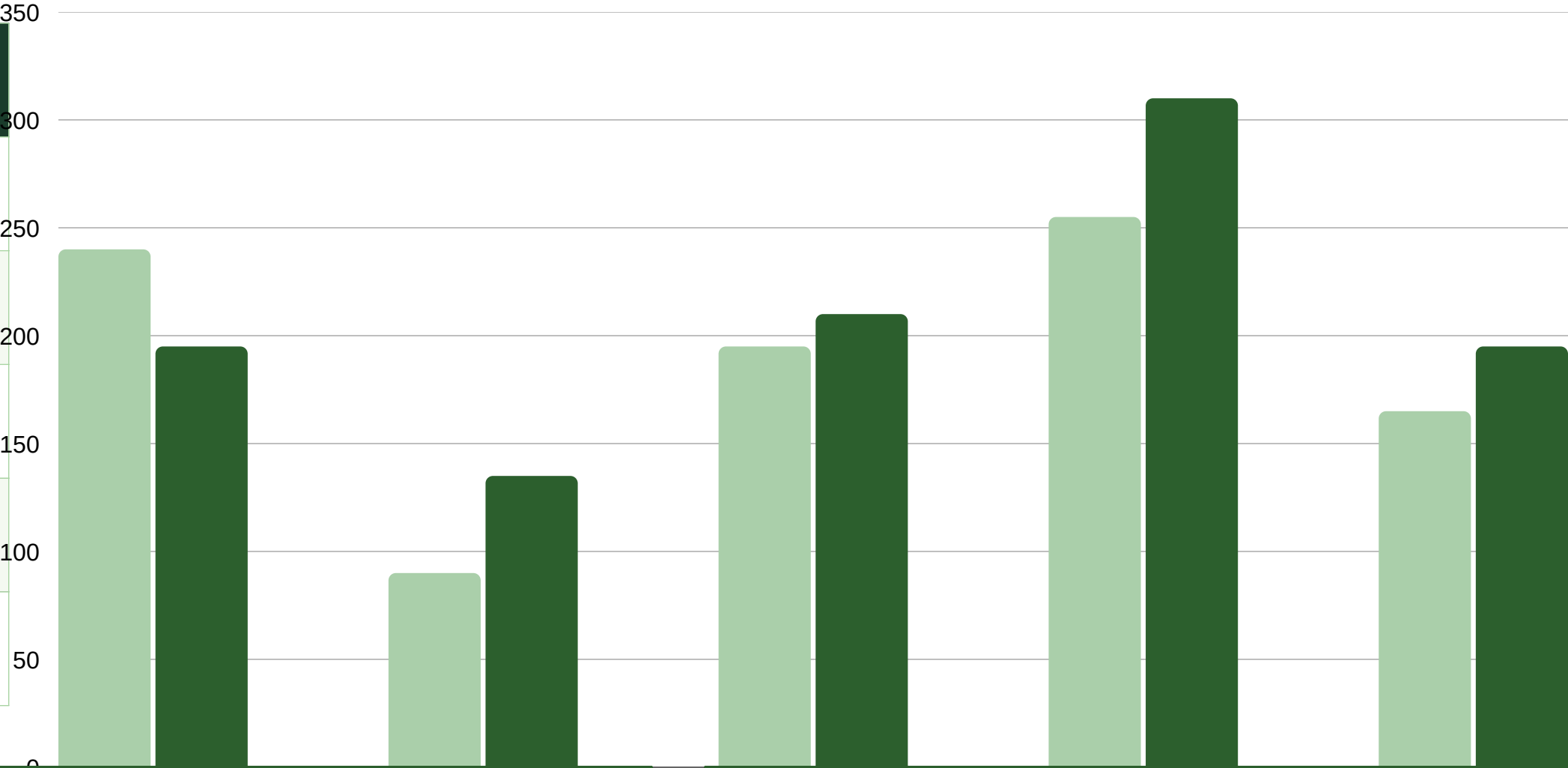
Cabernet Sauvignon delivered the strongest yield response at +18.9%, demonstrating that PV[®] has particular efficacy on red varieties under irrigated hill conditions. Average uplift across all three parcels was +11.5% in yield with consistent sugar rate gains across all varieties.

MULTI-GROUND COMPARATIVE ANALYSIS — Saint-Émilion 2005

Average across Sandy Clayey, Sandy, Sandy Silt & Chalky Clay grounds | 3 applications @ 2 kg/ha every 15 days

Control PV® Treated

Parameter	Control Avg.	PV® Avg.	Uplift
Total Weight Index	18.2	20.1	+10.4%
Sugar Rate (g/l)	221.4	226.8	+2.4%
Berry Weight (g/100)	142.4	147.2	+3.4%
Anthocyanins	191.4	214.8	+12.2%
Potential Degree (%vol)	13.02	13.34	+2.5%



TPI Uplift

Consistent across ALL ground types — Merlot, Cab. Franc & Cab. Sauv. showed polyphenol improvement.

Anthocyanins

Most marked on sandy and sandy clay grounds — up to +21.6% on Merlot/Clayey Sandy.

Potential Degree

Uniform gains on every variety and soil type — reinforcing photosynthetic enhancement mechanism.

VEGETATIVE DEVELOPMENT & PLANT HEALTH RESULTS

Wood Weight

Control: 2.46 kg

PV[®] Treated: 4.08 kg

+65.9%

10 vine stocks, 3× PV[®] @ 2 kg/ha every 14 days. Better starch synthesis & winter frost resilience.

Calcium in Leaves (Syrah)

Control: 2.51

PV[®] Treated: 2.88

+14.7%

Measured at véraison. Confirms foliar calcium absorption and contribution to biochemical signalling.

Magnesium in Leaves (Syrah)

Control: 0.50

PV[®] Treated: 0.60

+20.0%

Measured at véraison. Magnesium is central to chlorophyll function — supports photosynthesis enhancement.

Root Development Score

Control: Standard

PV[®] Treated: Superior

Visual

Young vine stock observations (St-Émilion 2005): more extensive root zone, improved establishment rate.

MECHANISM OF ACTION — How PV® Works in the Vine

1 Tribomechanical Micronisation

Calcium carbonate is processed to sub-micron particle sizes. Total specific surface area doubles; porous volume triples. This dramatically increases leaf surface reactivity and bioavailability.

2 Cuticular Dissolution

At cuticular leaf pH of 5.8, 85.2% of micronized calcite dissolves on contact. Calcium (32.8%) is released as the primary soluble element — enabling rapid cellular uptake.

3 Calcium Signalling Cascade

Calcium activates kinase proteins involved in cellular defence signalling. When a pathogen is detected, these calcium-dependent proteins amplify the plant's immune response.

4 Photosynthesis Enhancement

Calcium carbonate dissociation provides intracellular CO₂, inhibiting photo-respiration and boosting photosynthetic efficiency. CIRAD microscopy confirmed increased chloroplast density in treated leaves.

5 Hydration & Wax Restructuring

PV® alters cuticular wax structure (SADEF). The entire leaf surface maintains contact with water — enabling continuous hydration and significantly reducing drought/hydrous stress.

6 Antioxidant & Senescence Protection

PV® exhibits a powerful antioxidant effect, reducing oxidation and slowing senescence. Treated vines maintain superior coloration and metabolic function for longer into the season.

RECOMMENDED APPLICATION PROTOCOL — PV® IN VITICULTURE

Programme A — Reinforcement

2 treatments @ 1.5 kg/ha | Focus: plant vigour & disease resistance

Stage 1

Leaf Flag Expanded

1.0 kg/ha

Booster effect on early vegetative growth

Stage 2

Visible Grapes

1.5 kg/ha

Supports vine physiology pre-flowering

Stage 3

Separated Flowering Buds

1.5 kg/ha

Optimises flowering conditions

Programme B — Quality & Yield

3 applications @ 1.5–2.5 kg/ha | Focus: grape quality & yield uplift

Stage 1

Nouaison (Fruit Set)

1.5 kg/ha

Stimulates sugar synthesis and berry development

Stage 2

Grape Closure

1.5 kg/ha

Enhances TPI, anthocyanins and berry weight

Stage 3

Véraison (Colour Change)

1.5–2.5 kg/ha

Optimises phenolic & aromatic concentration

DISCUSSION — Wine Quality Parameter Analysis

Polyphenol Index (TPI)

TPI increased consistently across all grounds and varieties. In Saint-Émilion Merlot, treated parcels reached 18.5 vs 16.5 control (+12.1%). Higher TPI improves tannin structure and colour extraction during wine-making — directly impacting wine grade and premium positioning.

Sugar & Alcohol Potential

Sugar rates increased 0.9–4.6% without extending the vegetative cycle. This improvement, linked to enhanced photosynthetic activity, raises potential alcohol degree — contributing to a fuller-bodied wine with improved natural viscosity and flavour concentration.

Acidity & pH Balance

Treated parcels showed superior total acidity maintenance — critical in the hot 2005 season. Better pH control delivers wine freshness, dynamism and colour stability. Malic acid levels remained equivalent, indicating measured rather than excessive acidification.

Anthocyanins

Anthocyanin concentrations improved significantly in the majority of trials — averaging +12.2% across all grounds. Anthocyanins drive red wine colour intensity and stability. Enhanced extraction translates to deeper, more stable colour that retains quality through ageing.

Assimilable Nitrogen

Nitrogen levels increased from 110 to 122 mg/l (+10.9%) in Saint-Émilion trials. Assimilable nitrogen is the essential nutrient substrate for fermentation yeast and bacteria — a direct driver of fermentation success rate, aroma development and winemaking efficiency.

Berry Weight & Yield

Berry weight increased 3.4–15.3% across trials. Heavier berries provide more juice volume, more phenolic compounds and improved aromatic potential. In Italy (Colli Berici), yield uplifts of 6.5–18.9% demonstrate the clear commercial value of the PV[®] programme.

CONCLUSIONS

- PV® applications delivered statistically significant improvements across ALL key quality metrics: TPI, anthocyanins, berry weight, sugar rate and potential degree.
- Yield gains of 6.5–18.9% demonstrated in Italian trials; berry weight uplifts of 3.4–15.3% validated across French and Italian sites across multiple soil types.
- Consistent results across Merlot, Cabernet Franc, Cabernet Sauvignon, Grenache, Syrah, Pinot Grigio and Chardonnay confirm broad varietal applicability.
- Wood weight increased by +65.9% — improving carbon reserves, frost resilience and long-term vine structural health.
- The tribomechanical micronisation technology is central to efficacy: surface area doubling and porous volume tripling drive the unique calcium bioavailability mechanism.
- 3 applications between flowering and grape closure is the optimal programme for quality improvement; an additional reinforcement programme supports plant physiology from early season.

PV® IN VITICULTURE

+15%

Avg Yield

+12%

TPI

+66%

Wood Wt.