

# ProTone™ to reduce berry size variation and improve colour in red wines



**ProTone™**  
Plant Growth Regulator  
*Picture the Possibilities.™*

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## Abstract – Introduction

Some wine grape varieties can have variability in berry size called hen and chicken (millerandage) and also variability in colouring during veraison. This creates problems for harvesting and wine making as the bunches can comprise berries of different maturities. A similar problem can occur in table grapes where bunches with berries of varying maturity cannot be marketed.

ProTone™ was developed by Valent Biosciences to address this problem. The active ingredient S-abcisic acid is a compound that occurs naturally in plants and has been granted residue exemptions in all countries it has been registered in. It is made by a fermentation process.

Pinot Noir grapes in the Marlborough region of New Zealand can have significant variation in berry size and colour in some seasons. Currently this is addressed by selectively removing by hand undersized and green berries from bunches prior to harvest. This is costly in terms of hand labour and lost tonnage.

Small plot randomised complete block trials were conducted with two leading Marlborough wineries in the 2019/20 and 2020/21 seasons where different rates and timings of ProTone were applied to Pinot Noir grapes after capfall and during veraison. Berry size colour and maturity were assessed in field. The better treatments were then harvested and made into wine at the Brigato Research Institute. This was subject to chemical analysis and sensory evaluation.

The results show that ProTone treatment improved berry size uniformity and improved uniform colouration, without compromising the quality of the wine and thereby removed the need for hand thinning.



Figure 1. Uneven ripening and berry size on Pinot Noir grapes New Zealand

## Aim

To compare several rates and application timings of ProTone by foliar application, to alleviate 'hen and chicken' in Pinot Noir grapes, to remove the need for selective hand thinning of undersized and green berries prior to harvest and so improve wine quality.

## Materials and methods

Four trials were conducted over two seasons on Pinot Noir grapes in two different locations. Trial design was randomised complete block with four adjacent vines per plot and five replicates. ProTone (200 g/kg abscisic acid) was applied by foliar spray – post capfall, early veraison and late veraison at rates of 50 - 200 g/100 L in 350 L/ha of water with a non-ionic surfactant at 25 mL/100 L. Spraying was conducted with an HPA over the row small plot sprayer using hollow cone nozzles. Grape bunches were assessed by multiple sampling for 'hen and chicken', % berry colour intensity, and Brix. Data analysis was done with the statistical package ARM and analysis of variance and Tukey's Test (HSD 0.05) were used to compare treatments.

The best treatments were harvested by combining the replicates to get sufficient juice to fill 17 L wine fermenters at the Brigato Research Institute. Juice parameters were measured and monitored during fermentation through to wine – which was bottled. Sensory analysis of these wines was performed after 30 days of storage by an expert panel of 15 professional winemakers with experience in making Marlborough Pinot Noir wines.

Note: All ProTone treatments included non-ionic surfactant at 25 mL/100 L of spray mix.

## Results

### Example of first year results 2019/20

Table 1. Effect of single post capfall, or post capfall followed by veraison treatments on hen and chicken prior to harvest

Treatment	Product per 100 L	Timing	Mean % large berries – hen	Mean % small berries – chicken
1	Untreated	-	62.9 ns	37.1 ns
2	ProTone 50 g	Post-capfall	69.1	30.9
3	ProTone 100 g	Post-capfall	70.7	29.4
	100 g	Early veraison		
	200 g	Late veraison		

Table 2. Effect of single post capfall, or post capfall followed by veraison treatments on % red berry colour

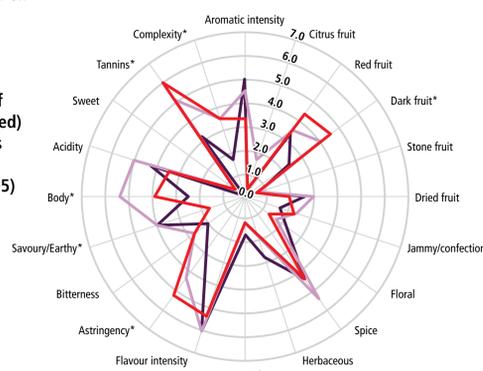
Treatment	Product per 100 L	Timing	Mean % red berry colour (p<=0.05)	
			Mid veraison	Pre-harvest
1	Untreated	-	36.2 ns	86.2 b
2	ProTone 50 g	Post-capfall	48.5	94.5 a
3	ProTone 100 g	Post-capfall	56.6	97.5 a
	100 g	Early veraison		
	200 g	Late veraison		
4	ProTone 100 g	Early veraison	51.2	96.9 a
	200 g	Late veraison		
5	ProTone 200 g	Early veraison	55.3	96.3 a
	200 g	Late veraison		

Table 3. Effect of post capfall, or post capfall and veraison treatments on Brix prior to harvest

Treatment	Product per 100 L	Timing	Mean berry Brix 3 weeks before harvest
1	Untreated	-	16.2 ns
2	ProTone 50 g	Post-capfall	16.8
3	ProTone 100 g	Post-capfall	16.9
	100 g	Early veraison	
	200 g	Late veraison	
4	ProTone 100 g	Early veraison	17.0
	200 g	Late veraison	
5	ProTone 200 g	Early veraison	17.4
	200 g	Late veraison	

There were no negative effects on juice and wine parameters or on the fermentation process from ProTone treatments.

Figure 2. Sensory evaluation by Brigato Institute panel of winemakers showing treatments 3 (light purple) and 5 (red) received higher perception scores for specific descriptors – dark fruit, astringency, body, tannins and complexity compared to the untreated control (dark purple). (p<=0.05)



### Example of 2nd year result 2020/21

This season was a poorer flowering year with generally lighter crops. ProTone application was at two timings A = 4-5 days after capfall, B = 30% version.

Table 4. Effect of post capfall followed by veraison treatments on hen and chicken at bunch closure

Treatment	Product per 100 L	Appln timing	Mean % bunches affected (p<=0.05)	Mean % bunch area affected (p<=0.05)
1	Untreated	-	76.0a	54.0a
2	Untreated – green hand thinned	-	69.0a	43.0ab
3	ProTone 100 g	AB	50.0b	30.0b
4	ProTone 100 g	A	48.0b	27.0b
	200 g	B		

Table 5. Effect of post capfall followed by veraison treatments on berry colour at veraison

Treatment	Product per 100 L	Appln timing	Mean % bunches affected (p<=0.05)
1	Untreated	-	87.2b
2	Untreated – green hand thinned	-	87.0b
3	ProTone 100 g	AB	97.4a
4	ProTone 100 g	A	98.5a
	200 g	B	

Table 6. Effect of post capfall followed by veraison treatments on mean berry maturity

Treatment	Product per 100 L	Appln timing	Mean Brix
1	Untreated	-	22.1ns
2	Untreated – green hand thinned	-	23.3
3	ProTone 100 g	AB	23.6
4	ProTone 100 g	A	24.0
	200 g	B	

There were no negative effects on juice and wine parameters or on the fermentation process from ProTone treatments.



Figure 3. At harvest – untreated Pinot Noir grapes (left) compared with grapes treated with ProTone (right)

Figure 4. Sensory evaluation by Brigato Institute panel of winemakers showing treatments 2 (light purple), 3 (red) and 4 (blue) perception scores for specific descriptors – compared to the untreated control (dark purple). (p<=0.05)

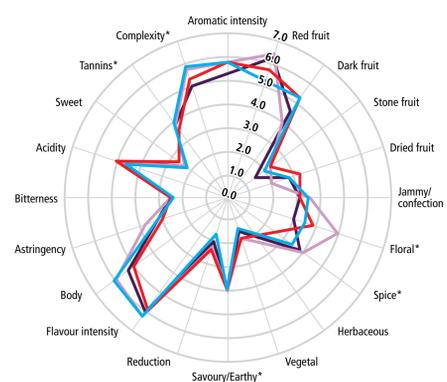
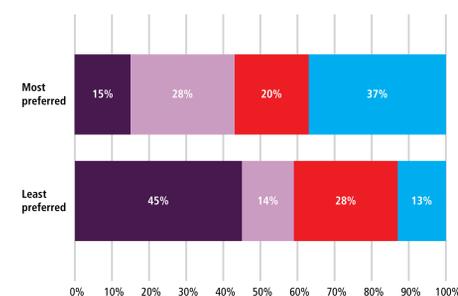


Figure 5. Wine preference test from the expert panel showing treatment 4 (blue) being the most preferred for 37% of panellists, followed by treatment 2 (light purple) with treatment 1 (dark purple) being the least preferred



## Discussion

Four separate replicated trials at two different locations were conducted over two seasons.

In all trials ProTone applied post capfall and at veraison significantly reduced 'hen and chicken' and improved grape colour and uniformity through veraison to harvest on Pinot Noir grapes.

In the first year clearly this effect was then carried over into the wine that was made – giving higher perception scores for specific descriptors – dark fruit, astringency, body, tannins and complexity compared to the untreated control.

The two seasons were different, as in the second year generally there was poorer flowering and lighter crops. Lighter crops can generally colour better and this is likely reflected in the second year results where there was less difference in the sensory evaluation ratings between treated and untreated.

Individual wine makers may prefer some greener berry in their grapes to impart particular characteristics to the wine.

Nevertheless, the data shows that an application of ProTone post capfall at 100 g/100 L followed by one application of 200 g/100 L at 30% version produced wine that was most preferred by an expert panel – even compared to that produced from green hand thinned grapes.

Further trial work is being conducted in the 2021/22 season in other areas producing Pinot Noir grapes and to compare one veraison spray with two.

As ProTone can be applied in minimal water volumes with bunch line sprays, the cost is not likely to be prohibitive and it presents a viable option to counter millerandage on Pinot Noir grapes and improve wine quality.

## Acknowledgements

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