

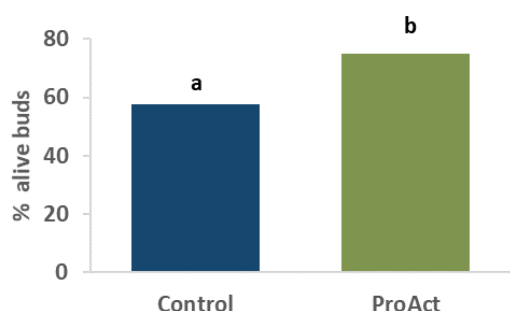
Frost protection and quality enhancement for grape vines

The Harpin response in plants promotes cell wall strengthening and stress tolerance mechanisms which reduce frost damage

ProAct® is a biostimulant product containing 1% Harpin $\alpha\beta$ protein. It is a natural means of improving tolerance to abiotic stresses such as frost as well as final fruit quality. Harpin proteins are isolated from plant pathogenic bacteria. When Harpin $\alpha\beta$ is applied to plants the proteins function as an elicitor, triggering defence and growth responses. Plants which have primed by Harpin $\alpha\beta$ protein therefore respond faster and more intensely to subsequent real stress events.

Independent frost protection trials – South Africa

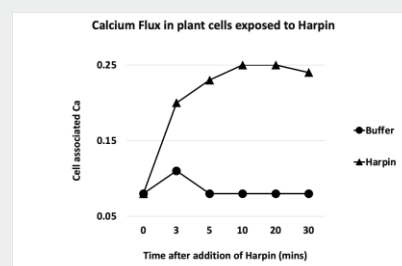
In experiments undertaken by independent researchers in South Africa, ProAct® was applied foliarly to 1 year old vines at woolly stage one day prior to simulated frost events in controlled environment conditions. Vines were exposed to 6h periods of 0 °C every 24 hours over three days (72h). Seven days later, vines were assessed for frost damage. Vines treated with ProAct® had significantly more surviving buds than vines treated with the water control (74.8% and 57.6% respectively, different letters above bars indicate means are statistically different (P<0.01 LSD)).



Across the trial **ProAct® increased bud survival by 15-45%** at frost temperatures down to -4 °C.
 Refs: ¹. Arboriculture & Urban Forestry 34(3): May 2008. 191-199.

Harpin $\alpha\beta$ and cell wall calcium

The Harpin $\alpha\beta$ protein in ProAct® works by activating stress hormone pathways. This stimulates Ca²⁺ translocation, directing more Ca²⁺ towards storage in cell walls. The increase in cell wall calcium content makes them stronger and able to withstand the mechanical and osmotic pressure of freeze/thaw cycles¹.



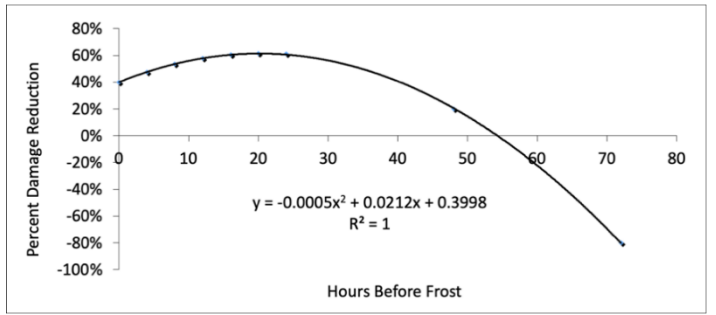
The Harpin $\alpha\beta$ protein response also increases the production of antioxidants and osmoprotectants which further enables plants to maintain membrane integrity during frost events.

For more information, please contact your usual Agrii agronomist, our **Customer Services Team** on **0845 607 3322** or email **fruit.solutions@agrii.co.uk**



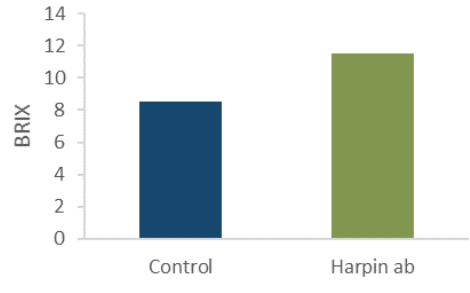
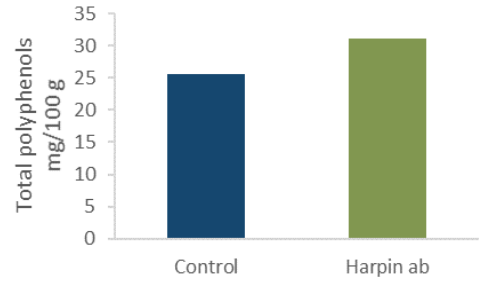
Pre-frost application timing is critical

Trials carried out on Apple trees at Cornell University, USA, show that Harpin αβ is most effective when applied 16 – 24 hours prior to a frost event. The beneficial effect is not present when applications occur more than 2 days before the frost.



Improved grape quality

Later in fruit development, the cell wall-calcium fortifying effect of ProAct® ensures that grapes are firm during maturation and harvest, less prone to splitting and softening disorders. The Harpin αβ protein also promotes a shift in plant metabolism which leads to elevated levels of secondary metabolites such as polyphenols and antioxidants. In on-farm trials carried out in La Rioja, Spain 2003, wine grapes treated with with Harpin αβ between flowering and harvest had higher Brix (+3 Bx) and total polyphenols (+24%) than the untreated control.



Application advice for frost protection:

Apply 200 g/ha a minimum of 24 h prior to onset of frost. Repeat applications every 4 – 5 days in prolonged frost periods.

Integrate ProAct® as part of a frost risk mitigation strategy:

- + Site selection and management to avoid cold air accumulation in the vineyard
- + Late prune to delay bud break in susceptible areas, also leaving sacrificial canes
- + Reduce ground cover and cultivations to optimise soil temperatures in April and May
- + Frost protection equipment to raise air temperature e.g. bougies, frost drains, frost fans

Full programme:

Rate	Number of applications	Application timing
200 g/ha	2 – 4	Fruits 4 – 8 mm (GS71)
		After 7 – 10 days (GS75 – pea sized fruits)
		Beginning of colouring (GS81)
		14 days prior to harvest

Compatibility

- + Do not use water with a pH of less than 5 or greater than 10.
- + Apply the spray mixture within 8 hours of preparation.
- + In tank mixes apply ProAct to the tank first and mix well

ProAct® (Harpin αβ) is exempt from MRL restrictions in United Kingdom.

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