



## Yield and quality enhancement for apples

The Harpin response in plants promotes cell wall strengthening and stress tolerance mechanisms which increase marketable yield

Pro Act is a bio stimulant 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.

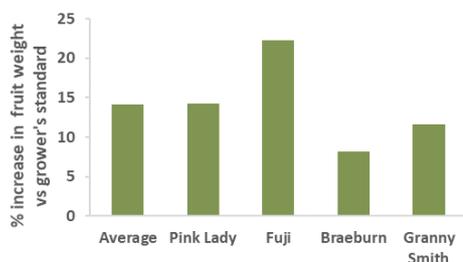
Harpin proteins are isolated from plant pathogenic bacteria. When Harpin  $\alpha\beta$  is applied to plants the proteins function as an elicitor, triggering defense and growth responses. Plants which have been primed by Harpin  $\alpha\beta$  protein therefore respond faster and more intensely to subsequent real stress events.

ProAct® stimulates an increase in expression of genes involved in:

- Nutrient absorption & translocation including increased in the most bio-effective form of calcium in cell walls.
- Fruit firmness.
- Photosynthesis.
- Abiotic stress tolerance

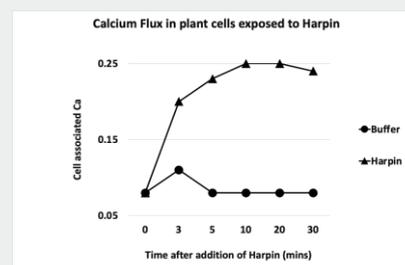
### Increased marketable yield – South Africa 2018

In commercial grower trials carried out in South Africa, 1% Harpin  $\alpha\beta$  was applied 7 times to 4 different varieties. Averages are from 50 samples per variety. Across all varieties, average fruit weight in 1% Harpin  $\alpha\beta$  treated trees was increased by 14%, with the largest increase seen in Fuji (+22%). Average fruit size in the same varieties was increased by +8% (data not shown).



### Harpin $\alpha\beta$ and cell wall calcium

The Harpin  $\alpha\beta$  protein in ProAct® works by activating stress hormone pathways. This stimulates  $Ca^{2+}$  translocation, directing more  $Ca^{2+}$  towards storage in cell walls. The increase in cell wall calcium content makes them stronger and able to withstand abiotic stresses such as cold and water deficit.



The Harpin  $\alpha\beta$  protein response also increases the production of antioxidants and osmoprotectants which further enables plants to maintain membrane integrity which can continue functioning in sub-optimal conditions

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

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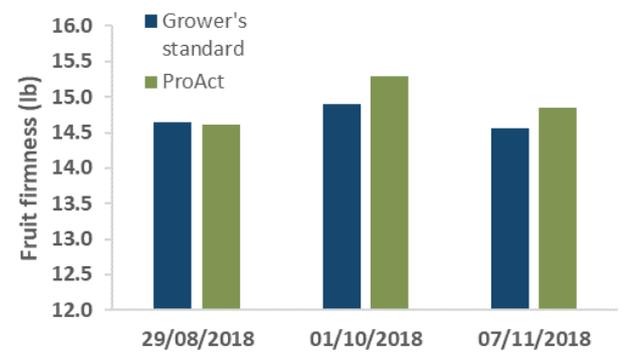
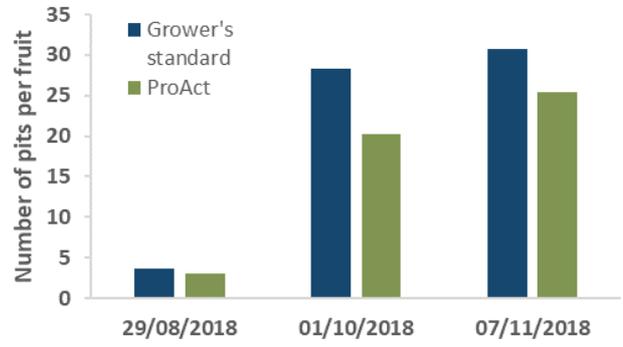
**Improved fruit quality – USA 2018**

In trials carried out by independent researchers in Washington, USA, ProAct® was applied to Honey Crisp variety apples. ProAct® was applied four times; at pink bud, petal fall, 30 days before harvest and 15 days before harvest. Each treatment was replicated 6 times in a randomised complete block design.

Three harvests were taken and 20 fruit per plot were assessed for quality parameters.

The top graph shows that ProAct® reduced the number of bitter pit lesions on fruits compared to the grower's standard at each harvest (+16.7%, +28.3% and +17.6% respectively). Bitter pit is associated with poor calcium mobility in fruits, Harpin αβ protein in ProAct® stimulates higher concentrations of bound calcium (see previous page).

The lower graph shows that ProAct® treated plots produced firmer fruits than the grower's standard in by the second and final harvest (+2.6% and +1.9% respectively). Firmness is an important determinant of apple quality and storability.



**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 orchards
- + Late prune to delay bud break in susceptible areas, also leaving sacrificial spurs
- + 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

**Yield and bitter pit reduction programme:**

Rate	Number of Applications	Application timing
200 g/ha	2- 4	Start of flowering (GS60)
		14-21 day intervals until 14 days before first harvest (GS87)

**Colour enhancement programme:**

Apple colouration can be improved by applying ProAct® at a rate of 150 g/ha at 21-30 days before harvest and again at 10-15 days before 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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