

# EFFICIENT MITIGATION OF ABIOTIC STRESS BY A MODIFIED POTASSIUM HUMATE

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## MODIFIED POTASSIUM HUMATE

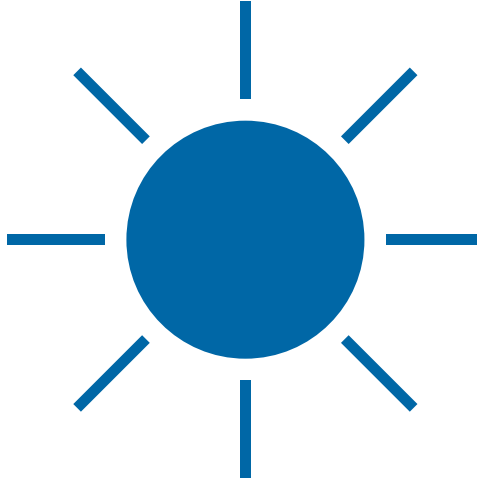
### Product features

- Superior solubility and compatibility over the entire pH range (2-12).
- Typical dosing rates: 3-8 kg/ha (lb/ac) per season.
- Key Agronomical Benefits:
  - Mode of action – H<sup>+</sup>-ATPase and root architecture.
  - Improved Nutrient Use Efficiency (P, N, micronutrients).
  - Enhanced tolerance to abiotic stress.



Scan to learn more about product solubility and compatibility

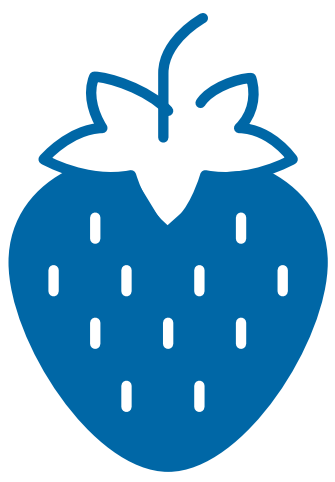
### Documented Biostimulant Claims:



Abiotic stress resistance



Nutrient Use Efficiency

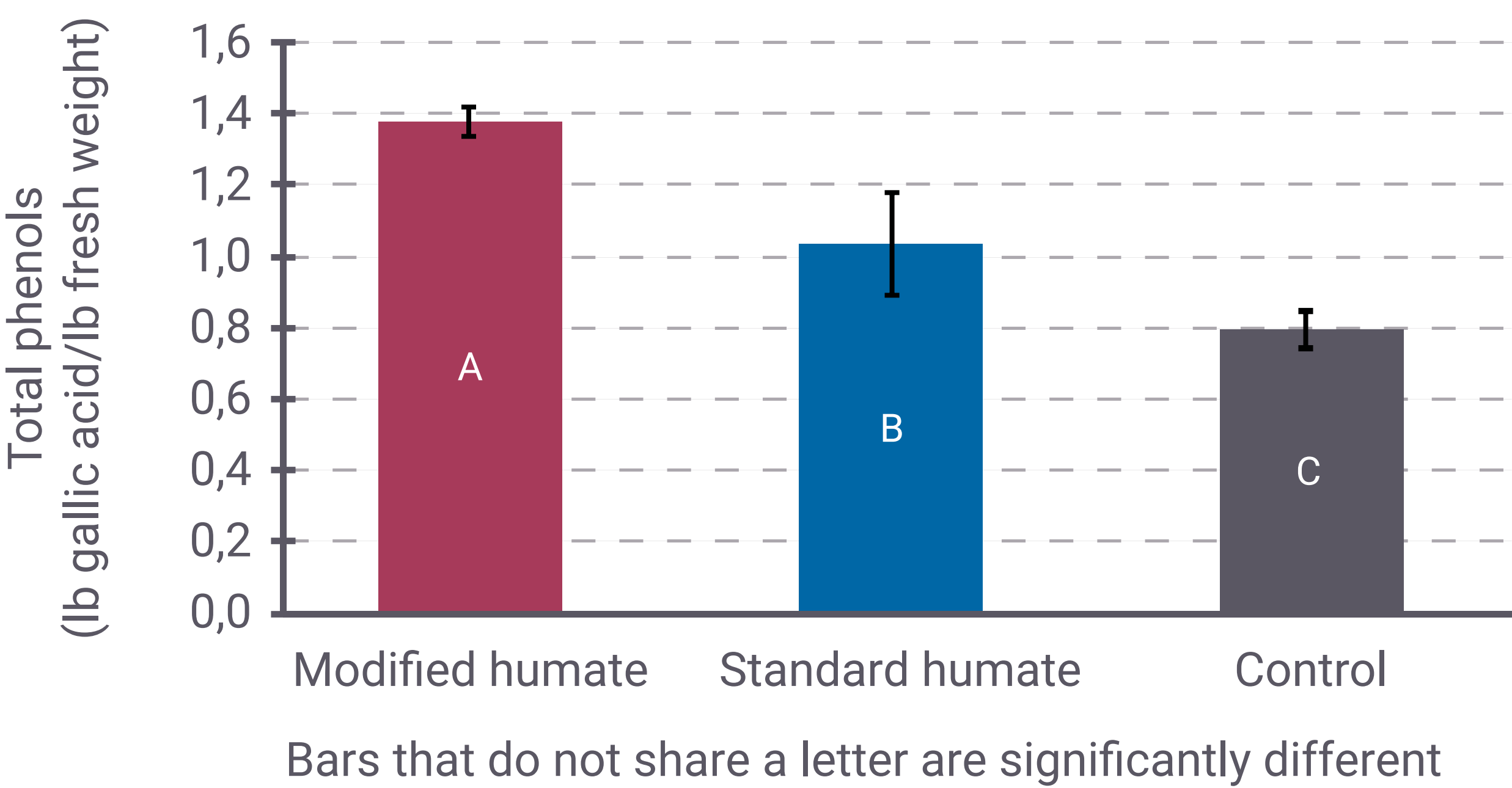


Quality traits

## MODES OF ACTION

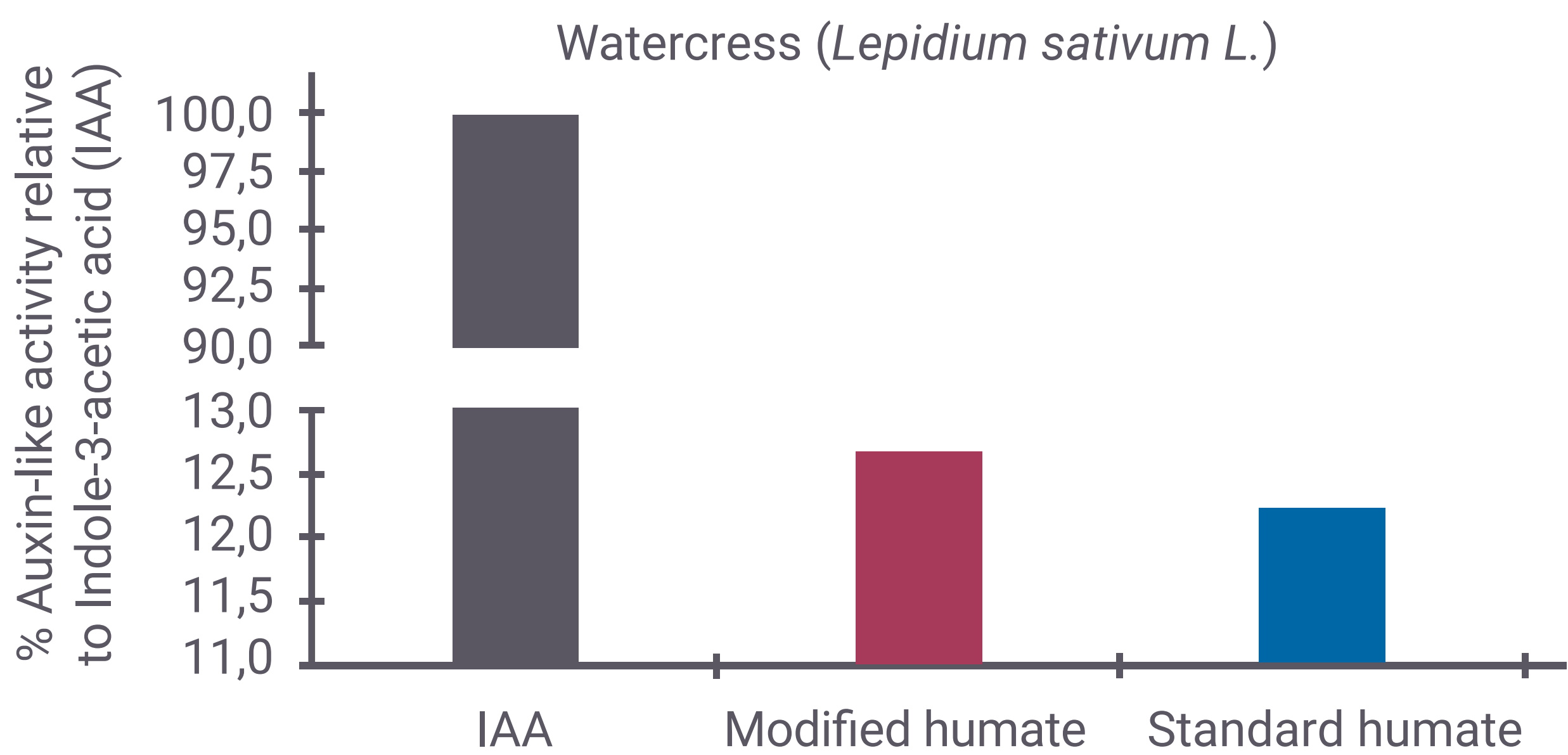
### Enhanced stimulation of secondary metabolism

- *Zea mays L.* germinated seeds transplanted to 3 L (7.5”) pots containing an aerated Hoagland solution.
- Humate concentration in Hoagland solution: 1 ppm C, added 12 days after transplanting. Plants harvested after 48 hrs.
- Higher accumulation of phenolic compounds with modified humate (33% higher than standard humate), better plant protection against stress by reactive oxygen species (ROS).



### Higher auxin-like activity: improved rooting and stress adaptation

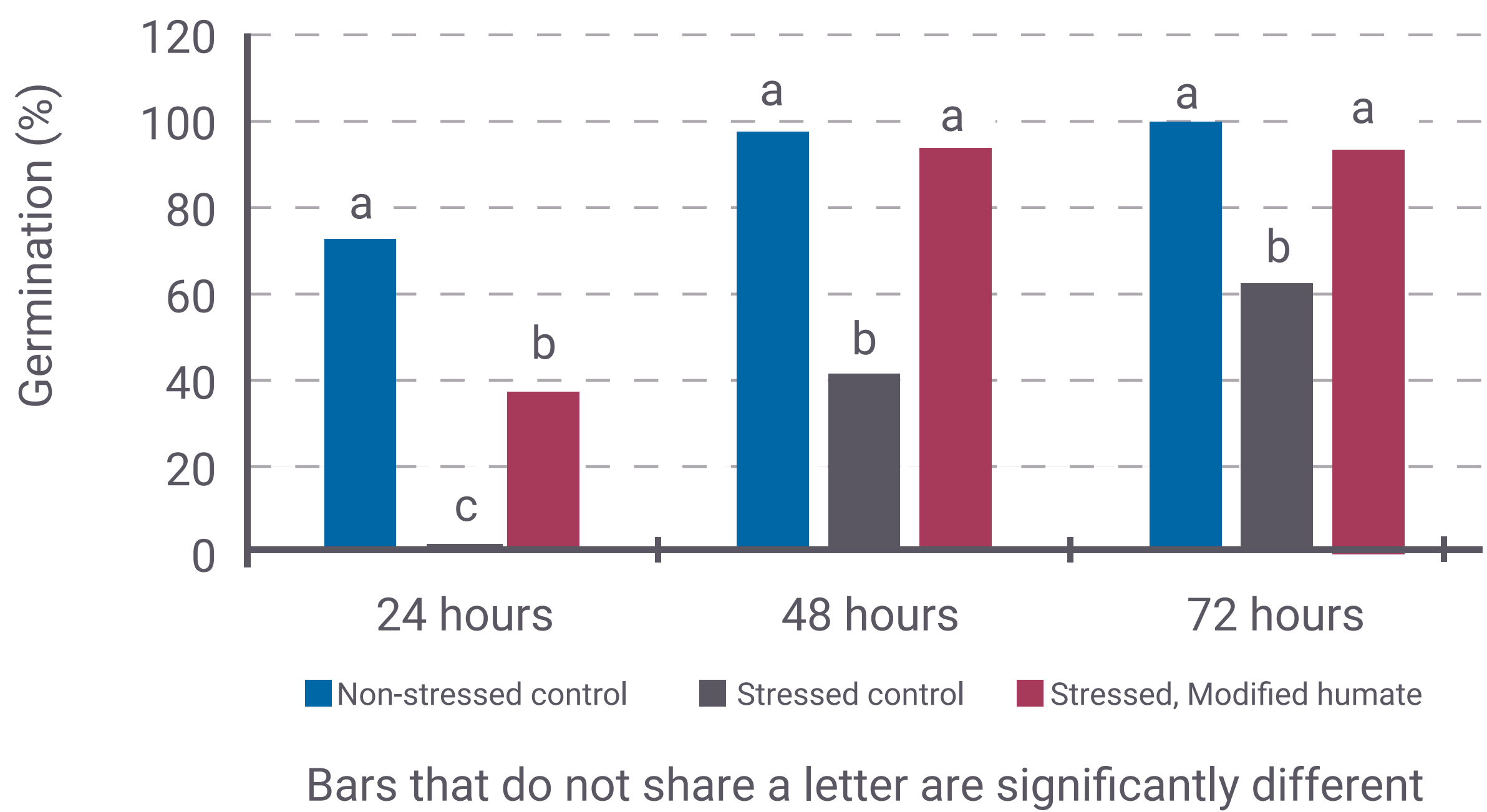
- H<sup>+</sup>-ATPase is a major enzyme activated by auxins. It is key for root development, mineral nutrient uptake and plant adaptation to abiotic stress.
- Audus test measures auxin-like activity as the reduction of root growth in the model plant, watercress (*Lepidium sativum L.*).
- Higher auxin-like activity documented for modified humate vs. standard humate in Audus test.



## TOLERANCE TO ABIOTIC STRESS – AGRONOMIC RESULTS

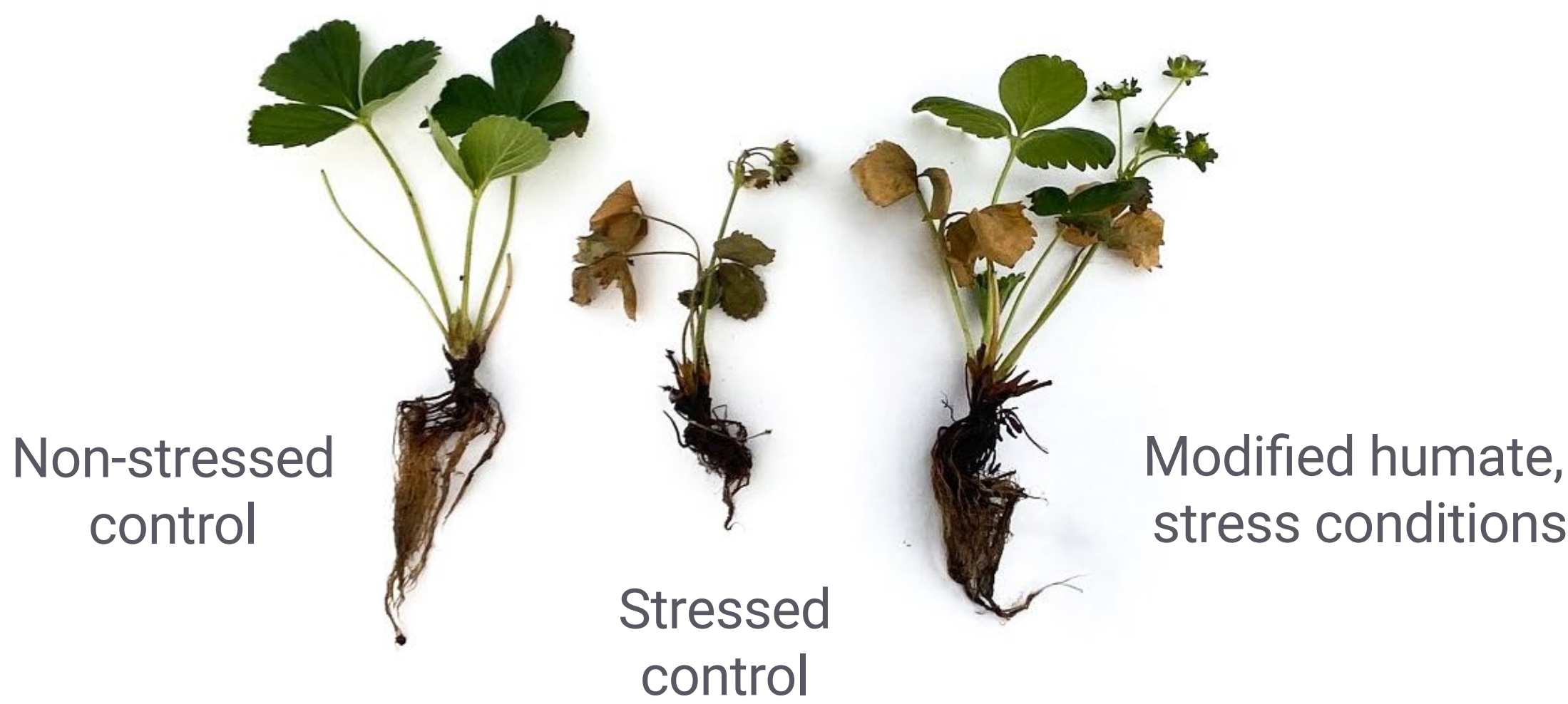
### Seed germination under hydric stress

- Seeds: *Triticum aestivum L.* (“Betong” variety).
- Stress: Hydric stress induced by 18% PEG 6000 ( $\Psi \sim -0.6$  Mpa).
- Coating: 3 g modified humate/kg seeds (0.048 oz/lb seeds), applied as 50 g/L (6.7 oz/gal) solution. Set-up: 3 replicates x 16 seeds/replicate.
- Modified humate significantly improved seed germination under hydric stress.



### Pot trials under salinity stress

- Strawberries grown in 3 L (7.5”) pots with blonde and black peat substrate.
- Non-stressed control: water from osmosis (<1 dS/m max.). Stressed control and treatments: saline solution (NaCl).
- Dosing rate: 8 kg/ha (lb/ac) split in 4 applications over the growing cycle.
- Modified humate provided significant differences in aerial fresh biomass (+162%) and root length (+54%) vs. stressed control.



### Positive effect on stress adaptation pathways through soil microbiome

- Soil samples from open field trials: Broccoli (US) and Corn (Spain).
- Samples at T0 (before application) and T1 (1-2 months after product application).
- 16S rRNA and ITS genes sequencing with Illumina MiSeq™ by Biome Makers.
- Modified humate changed soil microbiome, facilitating crop stress adaptation in both trials.

