

Super Kelp

Stress Tolerance - heat



Effect of Heat Stress on Plants

Many trees, vines & vegetable crops are susceptible to heat stress. Above 30 deg C the rate of photosynthesis is reduced and at higher temperatures, heat stress at key crop stages can severely affect yield and quality.

Common signs of heat stress are:

- Reduced growth
- Reduced (or no) flowering
- Reduced (or no) fruit
- Fruit drop
- Reduced fruit quality
- Leaf tip burn

The Solution

The agents in Super Kelp activate plant growth and heat tolerance.

Super Kelp effectively reduces plant shutdown times and stimulates root growth to repair damaged roots. Can be used to provide protection during periods of heat stress; effect will last for 2-3 weeks.

How - Betaines in Kelp increase chlorophyll content and consequently photosynthesis; cytokinins induce heat tolerance; multiple components increase potassium uptake, improve root growth & increase turgidity of cell walls so less water likely to flow out of cells; and antioxidants in Kelp help plants in temperature extremes. - (Khan, 2009)

Under high temperature conditions, heat damages chlorophyll and other components of photosynthesis, reducing the amount of energy captured by plants.

Plants also divert more of the captured energy to cope with heat stress. This dramatically reduces the energy available; severely limiting plant growth and production during times of high temperature stress.

Root growth ceases in many crops when soil temperatures are above 32 deg C; above 40 deg C generally results in root death. Plants also shut down to conserve water during the hottest part of the day.

Program for Heat Stress

Ideally 24-48 hours prior to heat stress

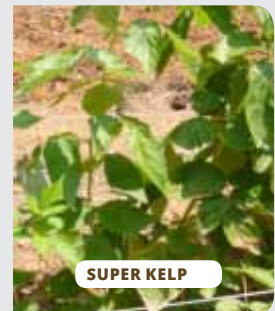
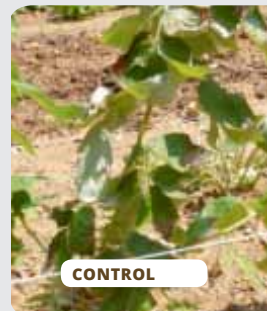
Apply Super Kelp as foliar spray or via irrigation

Apply Super Kelp at 3 - 5L/ha

Repeat every 14 days during extended heat stress periods. If too hot to apply as a foliar spray, we recommend using Super Kelp via irrigation.



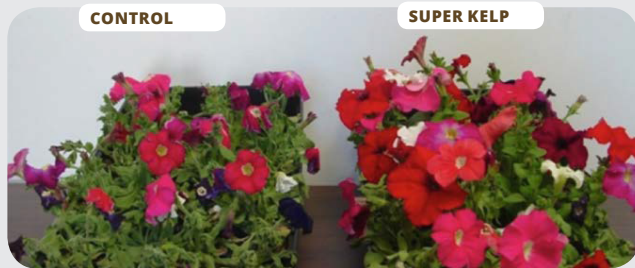
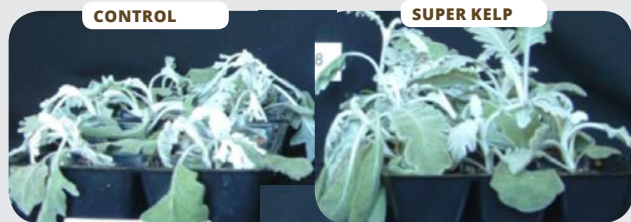
Supported higher than expected yield in WA. 4 x Kelp at 3-4L/ha in January to March heat



Raspberries - photos taken after plants had temperatures of 38°C for a week. Eight weeks into trial Super Kelp treated plants taller with more branches.

Super Kelp - strengthening plants under drought stress

Super Kelp increases water content in plants when water stressed



Kelp helps plants withstand water stress and improves recovery.

Super Kelp helps regulate cytokinin production



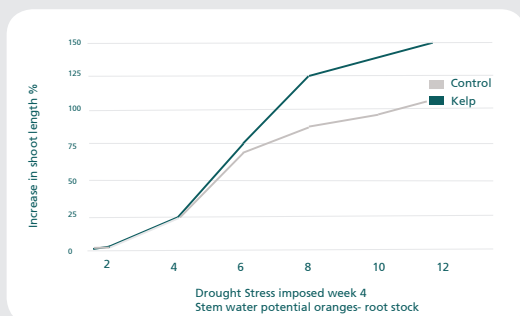
CONTROL



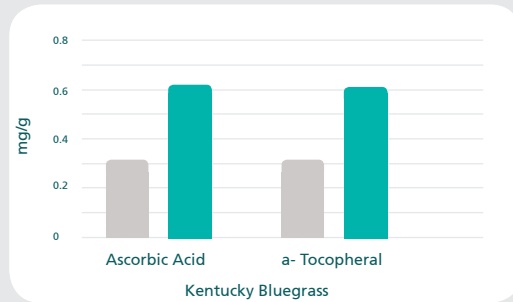
SUPER KELP

Blue area shows presence of cytokinins. The spray pattern for Super Kelp is in the vascular tissue indicating cytokinin is being produced by the plant itself. Cytokinins induce heat tolerance.

Increase in shoot length under water stress



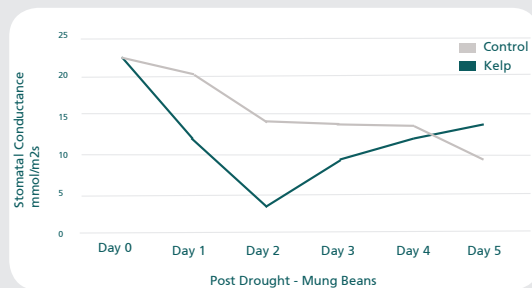
Super Kelp increases antioxidants during stress



Anti-oxidants, like ascorbic acid and tocopheral help plants through water stress periods.

Super Kelp provides anti-oxidants to increase the plants tolerance to water stress.

Super Kelp closes stomata during water stress



Plants treated with kelp close the stomata faster in response to the stress, maintaining more water within the plant.

The stomata are the pores on the underside of leaves where the plant exchanges water for carbon dioxide (photosynthesis). During water stress the stomata close and stay closed until conditions improve. 99% of water loss is via transpiration through the stomata. Plants that can close the stoma will reduce water loss and recover faster after stress.

Super Kelp opens stomata when not stressed

When not stressed, Super Kelp does not close stomata, but rather helps plants self regulate. Without water stress the graph below shows cucumbers with more open stomata allowing for increased photosynthesis.

