Aminex™
Crop Stimulant

Reg. No: K 10409 Act No. 36 of 1947

Fertilizer Group 2

A CROP BIO-STIMULANT WITH NITROGEN, AMINO ACIDS AND ORGANIC CARBON FOR CROPS AS LISTED.

Active Ingredient: N, P, K, Organic Nitrogen, Amino Acid, Organic Carbon, Polyamine Betaine.

Aminex is a crop bio-stimulant with nitrogen, amino acids and organic carbon for crops.

Aminex contains 3 essential plant promoting actives, namely nitrogen, amino acids and organic carbon which helps the plant to overcome or recover from stresses like transplanting, heat, cold, physical damage to plant structure and water stress. This product contains high quality amino acids in the formulation to maximize protein synthesis in the plant for increased growth. Aminex is formulated to increase sap flow in plants and reduce stress. Apply Aminex prior to heat or cold stress or in the aftermath of these stresses. The increased sap flow obtained by the application will aid in various metabolic, enzymatic and physiological processes needed by the plant to counter act these stresses. Organic carbon is a high-quality carbohydrate source which increases the plant's sap flow and sugar content, stimulating plant recovery. Finally, nitrogen is added to increase the plant's nitrogen content for continuous growth. Aminex can increase the efficacy of foliar fertilizer spray, i.e. $CaNO_3$, KNO_3, MKP, K_2SO_4. This is due to the formulation and combination that will aid in the uptake of plant nutrients, because of the complexing of cations by amino acids.

THE KEY BENEFITS OF AMINEX:

- An increase in plant tolerances to biotic and abiotic stress.
- An increase to cross talk dynamic of nutrient movement and placement in plants.
- A formulation designed to reduce the negative effects of plant stress by increasing sap flow.
- An increase Flavonoid and Phenolic production in high Nitrogen fertilizer practices.
- It stimulates metabolic action in plants.

PLANT STRESS

Energy is an absolute requirement for the maintenance of structural organization over the lifetime of any living organism. The maintenance of such complex actions over time requires constant energy. This results in a constant flow of energy through all biological organisms, which provides the dynamic driving force for the performance of important maintenance processes such as cellular biosynthesis and transport to maintain its characteristic structure and organization as well as the capacity to replicate and grow. The maintenance of a steady state results in a metastable condition called homeostasis.

Plant membranes consist of a lipid bilayer interspersed with proteins and sterols, and any abiotic factor that alters membrane properties of the lipids greatly influence the activities of the integral membrane proteins, including H^{+-} pumping ATPases, carriers and channel-forming proteins that regulate the transport of ions and other solutes. High temperatures cause an increase in the fluidity of membrane lipids and a decrease in the strength of hydrogen bonds and electrostatic interactions between polar groups of proteins within the aqueous phase of the membrane. High temperatures thus modify membrane composition and structure and can cause leakage of ions. High temperatures can also lead to a loss of the three-dimensional structure required for correct function of enzymes or structural cellular components, thereby leading to loss of proper enzyme structure and activity. Misfolded proteins often aggregate and precipitate, creating serious problems within the cell.

WHAT FACTORS CAUSE PLANT STRESS?

- **Soil pH**
  Soil pH determines what nutrients are in solution and available to plants. Unfavorable soil pH can thus have an effect on plant stress as 17 nutrients are essential for plant growth, and so far, 57 dynamic processes exist between nutrients and plants.

- **Temperature (soil and ambient)**
  Certain nutrients are not available for plant uptake under 14 degrees Celsius, this is due to enzyme activity in the roots and biological agents in the soil that are inactive below these temperatures.

  Low ambient temperatures also slow down sap flow and plant growth, low temperatures do not slow the biosynthesis of nitrates and plant hormones into the plants, but it does slow down the transport of these essential elements in the plant.

- **Salinity**
  Salinity have a range of stress factors in plants, these include water stress (this reduces leaf expansion), ion toxicity, nutrition disorders, alteration of metabolic processes and reduction in cell division. Salinity negatively effects plant enzymes and causes cells to swell and high Na^+ disrupts protein synthesis.

- **Nutrient availability and remobilization**
  Higher plants have to cope with fluctuating availability of plant nutrients. Nitrogen can be remobilized in all plant species with different efficiencies ranging from 40% (maize) to 90% (wheat), other macronutrients (K, P, S, Mg) can be mobilized in most species. Ca and Mn usually considered as having low phloem mobility can be remobilized from leaves in wheat and barley. These fluctuations of availability of plant minerals can cause plants to stress as it is well documented that the older a plant the harder it is for it to remobilize essential nutrients.

- **ATP energy in plants**
  ATP is a ubiquitous compound in all living cells, it not only provides the energy to drive many biochemical reactions, but also functions in signal transduction as a substrate for kinases, adenylatecyclases, etc. Stress decreases the amounts of ATP and ribulose bisphosphate found in the leaves, correlating with reduced CO_2 assimilation, but the amount and activity of ribulose bisphosphate carboxylase oxygenase (Rubisco) do not correlate. ATP-synthase (coupling factor) decreases with stress and photo-synthetic assimilation of CO_2 by stressed leaves and is not limited by CO_2 diffusion but by inhibition of ribulose biphosphate synthesis, related to lower ATP content resulting from loss of ATP synthase.

- **Photosynthesis**
  Although plant growth is controlled by a multitude of physiological, biochemical, and molecular processes, photosynthesis is a key phenomenon, which contributes substantially to the plant growth and development. The chemical energy expended in a number of metabolic processes is, in fact, derived from the process of photosynthesis, which is capable of converting light energy into a usable chemical form of energy. Stressful environments, including drought, salinity, and unfavorable temperatures, considerably hamper the process of photosynthesis in most plants by altering the ultrastructure of the organelles and concentration of various pigments and metabolites including enzymes involved in this process as well as stomatal regulation.

- **Drought Stress**
  Scarcity of water is a severe environmental constraint to plant productivity.

  Drought-induced loss in crop yield probably exceeds losses from all other causes, since both the severity and duration of the stress are critical.

  Drought stress reduces leaf size, stem extension and root proliferation, disturbs plant water relations and reduces water-use efficiency.

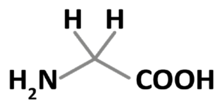
BIOLOGICAL STRESS

Any change in the surrounding environment may disrupt homeostasis. Environmental modulation of homeostasis may be defined as biological stress. Thus, it follows that plant stress implies some adverse effect on the physiology of a plant induced upon a sudden transition from some optimal environmental condition where homeostasis is maintained to some suboptimal condition which disrupts this initial homeostatic state. Thus, plant stress is a relative term since the experimental design to assess the impact of a stress always involves the measurement of a physiological phenomenon in a plant species under a sub-optimal stress condition compared to the measurement of the same physiological phenomenon in the same plant species under optimal conditions.

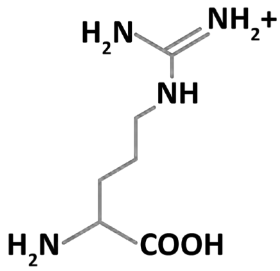
WHAT DOES IT DO?

- Increases plants tolerances to biotic and abiotic stress
- Increases the crosstalk dynamic of nutrient movement and placement in plants
- The formulation is designed to reduce the negative effects of plant stress by increasing sap flow
- Increases Flavonoid and Phenolic production in high Nitrogen fertilizer practices
- Stimulates metabolic action in plants

(AA) AMINO ACIDS IN PLANT

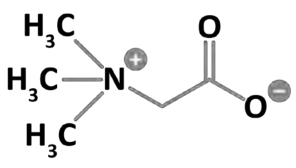


GLYCINE (GL, G)
MW: 75.07



ARGININE (ARG, R)
MW: 174.2. PK = 12.48

- Plants synthesize amino acids from the primary elements:
  - The carbon and oxygen obtained from air
  - Hydrogen from water in the soil
  - Forming carbohydrate by means of photosynthesis and combining it with the nitrogen which the plants obtain from the soil.
  - Leading to synthesis of amino acids through collateral metabolic pathways.
- Only L-amino acids are part of these proteins and have metabolic activity.
- The requirement of amino acids in essential quantities is well known as a means to increase yield and overall quality of crops.
- The application of amino acids for foliar use is based on its requirement by plants in general and at critical stages of growth in particular. Plants absorb amino acids through stomas and is proportionate to environmental temperature.
- Amino acids are fundamental ingredients in the process of protein synthesis. About 20 important amino acids are involved in the process. Studies have proved that amino acids can directly or indirectly influence the physiological activities of the plant.
- Amino acids are also supplied to the plant by incorporating them into the soil. It helps in improving the microflora of the soil thereby facilitating the assimilation of nutrients.
- Foliar nutrition in the form of protein hydrolysate (known as amino acids liquid) and foliar spray provide ready made building blocks for protein synthesis.

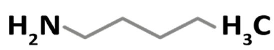


BETAINES

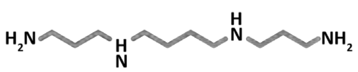
(GB) BETAINES IN PLANT

- Glycine betaine (GB) and proline are two major organic osmolytes that accumulate in a variety of plant species in response to environmental stresses such as drought, salinity, extreme temperatures, UV radiation and heavy metals.
- Although their actual roles in plant osmo-tolerance remain controversial, both compounds are thought to have positive effects on enzyme and membrane integrity along with adaptive roles in mediating osmotic adjustment in plants grown under stress conditions.
- While many studies have indicated a positive relationship between accumulation of GB and proline and plant stress tolerance, some have argued that the increase in their concentrations under stress is a product of, and not an adaptive response to stress.

(PA) POLYAMINES IN PLANT



PUTRESCINE

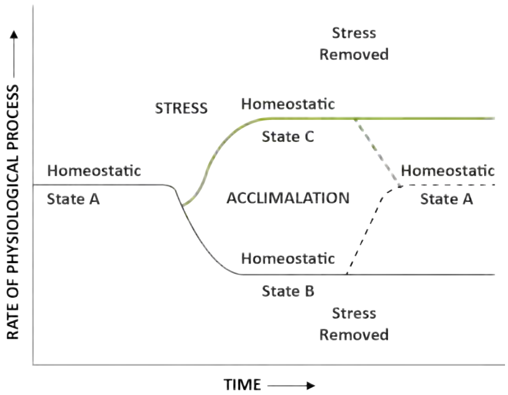


SPERMINE

- Polyamines (PAs) (putrescine, spermidine and spermine) are a group of phytohormone-like aliphatic amine natural compounds with aliphatic nitrogen structure and present in almost all living organisms including plants.
- Evidence shows that polyamines are involved in many physiological processes, such as cell growth and development and respond to stress tolerance to various environmental factors.
- In many cases the relationship of plant stress tolerance was noted with the production of conjugated and bound polyamines as well as stimulation of polyamine oxidation. Therefore, genetic manipulation of crop plants with genes encoding enzymes of polyamine biosynthetic pathways may provide better stress tolerance to crop plants. Furthermore, the exogenous application of PAs is also another option for increasing the stress tolerance potential in plants. Here, we have described the synthesis and role of various polyamines in abiotic stress tolerance in plants.

AMINEX FOR COLD & HEAT STRESS

Plant stress usually reflects some sudden change in environmental condition. However, in stress-tolerant plant species, exposure to a particular stress leads to acclimation to that specific stress in a time-dependent manner. Thus, plant stress and plant acclimation are intimately linked with each other. The stress-induced modulation of homeostasis can be considered as the signal for the plant to initiate processes required for the establishment of a new homeostasis associated with the acclimated state. Plants exhibit stress resistance or stress tolerance because of their genetic capacity to adjust or to acclimate to the stress and establish a new homeostatic state over time. Furthermore, the acclimation process in stress-resistant species is usually reversible upon removal of the external stress.

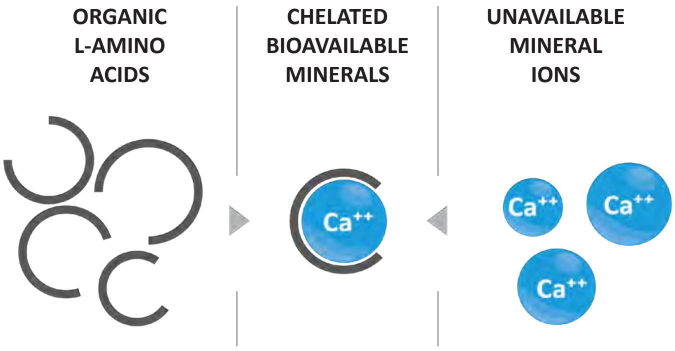


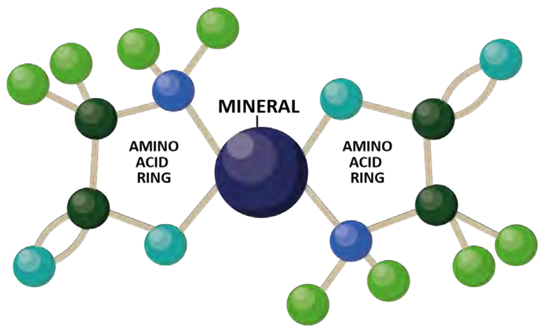
PREVENTATIVE & CORRECTIVE STRESS PERIODS

Aminex is formulated to increase sap flow in plants and reduce stress. Apply Aminex prior to heat or cold stress or in the aftermath of these stresses. The increased sap flow obtained by the application will aid in various metabolic, enzymatic and physiological processes needed by the plant to counter act these stresses.

AMINEX, AN ADDITIVE TO INCREASE THE UPTAKE OF STRAIGHT SOLUBLE FERTILIZER AS FOLIAR APPLICATION.

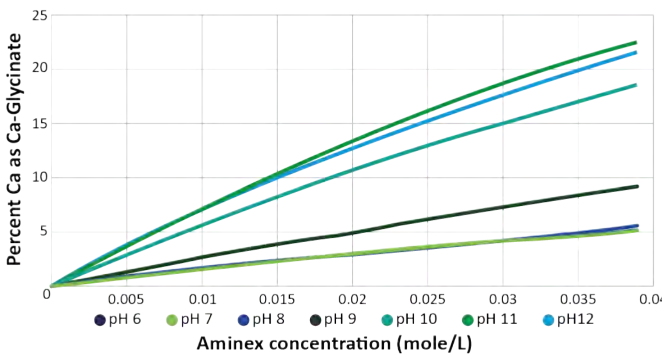
Aminex can increase the efficacy of fertilizer foliar sprays, i.e. $CaNO_3$, KNO_3, MKP, K_2SO_4. This is due to the formulation and combination that will aid in the uptake of plant nutrients, because of the chelation of cations by amino acids.

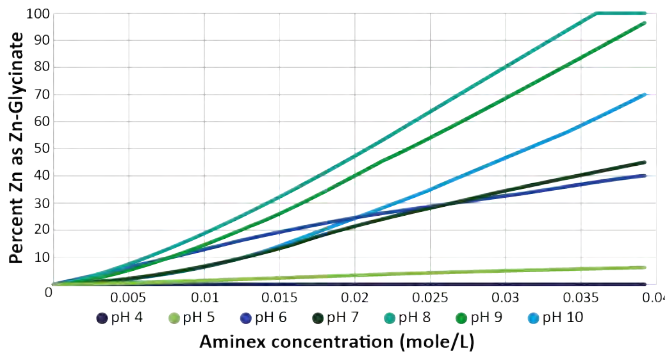




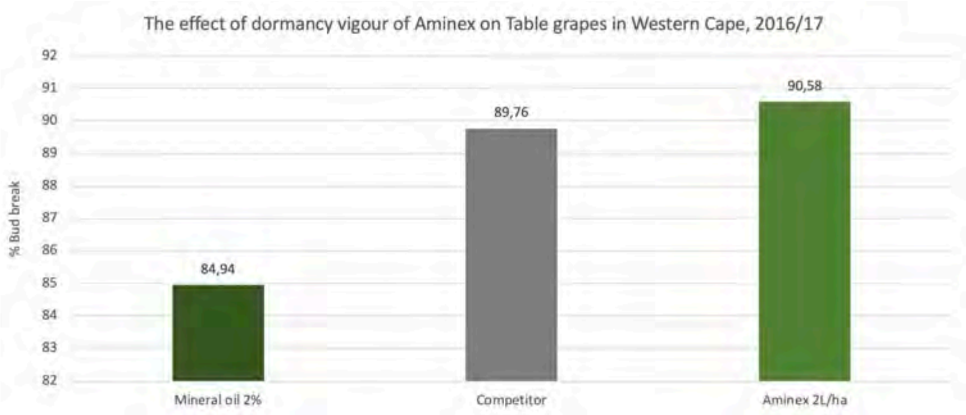
AMINEX CHELATION FACTORS WITH VARIOUS STRAIGHT NUTRIENT FERTILIZERS.

For each litre of Aminex per 100 litres of water you get = 0.035 mole/ℓ amino acid.

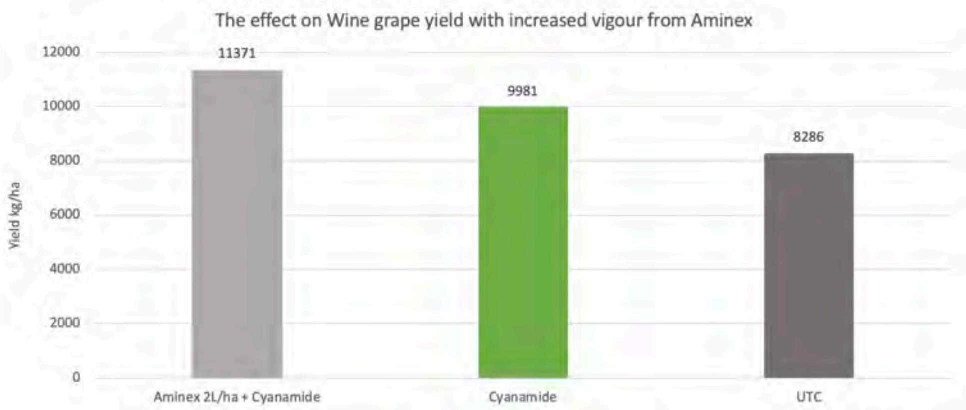




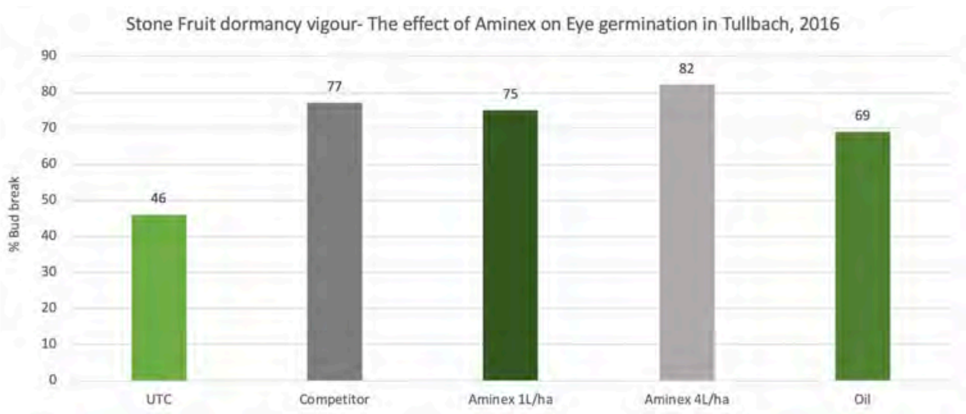
Graph 1: Application of Aminex with conventional dormancy break products increased budbreak percentage with 5.64% over mineral oil and outperformed the competitor product.



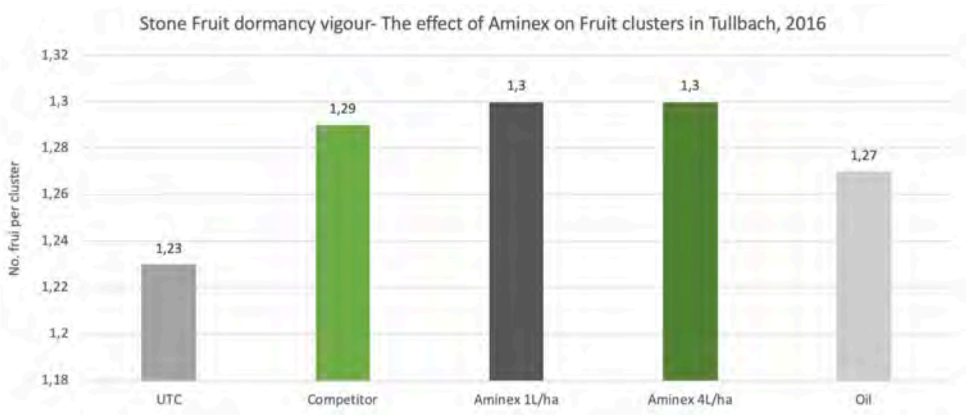
Graph 2:The increase in early season vigour from the Aminex application increased Wine grape yield with 1390 kg/ha over the cyanimide treatment and a significant increase of 3085 kg/ha over the untreated control.



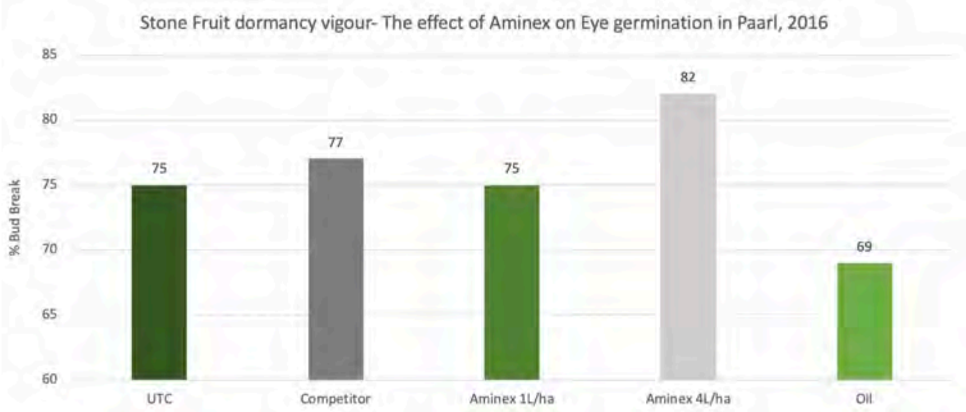
Graph 3: Application of Aminex to increase vigour and bud break on plums, the 4L/ha dosage increased bud break % with over 36% over the untreated control and with 5% over the competitor. Aminex at 1L/ha dosage increased bud break with 29% over the untreated control.



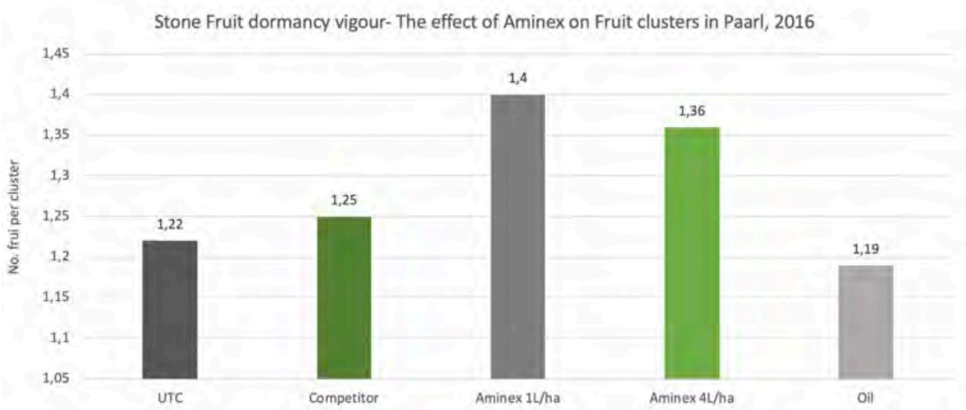
Graph 4: Application of Aminex at 1L and 4L/ha dosage rates increased fruit per clusters with 5.7% over the untreated control. Showing the effect of increased early season vigour due to Aminex application.



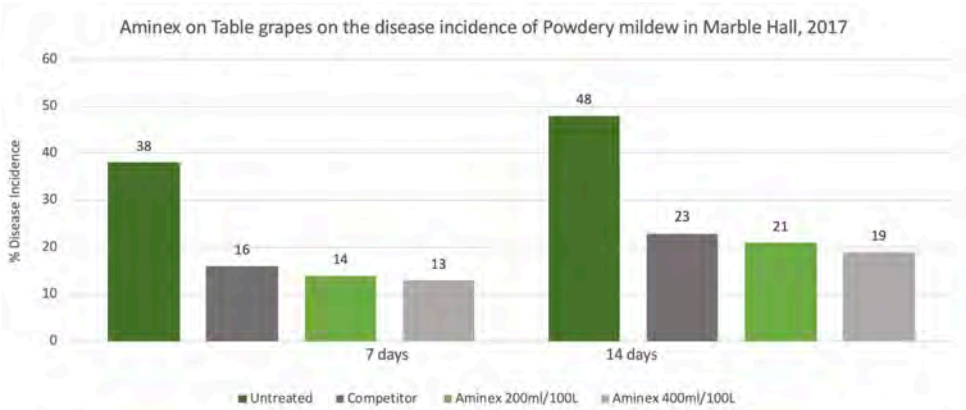
Graph 5: Application of Aminex to increase vigour and bud break on plums, the 4L/ha dosage increased bud break % with over 7% over the untreated control and with 5% over the competitor.



Graph 6: Application of Aminex at 1L and 4L/ha dosage rates increased fruit per clusters with 14.75% and 10.6% respectively over the untreated control. Showing the effect of increased early season vigour due to Aminex application.



Graph 7: Aminex at 200ml and 400ml/100L showed powdery mildew incidence suppression of 63.1% and 65.7% at 7 days after application. On 14 days after application, disease incidence was reduced by 56.3% and 60.4% for both Aminex dosages. Aminex relieves the stresses on a plant and increases its Systemic Acquired Resistance (SAR) to pathogen infection.



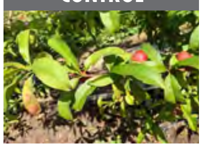
THE PURPOSE OF THE TRIAL WAS TO EVALUATE THE EFFICACY OF AMINEX + MAXSIL ON NECTARINES FOR CHILLING INJURY

CONTROL | AMINEX + MAXSIL

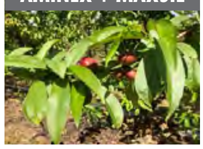
CONTROL

AMINEX + MAXSIL

CONTROL



AMINEX + MAXSIL



- This over a period of 5 days with temperatures dropping below the norm in conjunction with wind and rain.
- This is backed up by canopy cover measurement using iPAR, developed by the UC-Davis in the measurements. This determined that there was an average increase of 9.4% in canopy cover over three replicates.
- It can also be seen in the figures that there is an increase in Leaf area index LAI of the shoots and that the leaves are more uniform.
- The data in the leaf analysis shows that there is higher N levels in the treatments than in control. This is unique as normally an increase in LAI will lead to reduced levels on N in the leaves. This is due to the dilution effect of an increased LAI.