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## GrowthKing Overview



Avantu is committed to providing advanced technology for the enhancement of global food production through research and development as well as through collaborations with academic institutions and industry partners. The aim is to supply breakthrough bio-catalytic product formulations that contribute significantly to reducing global food scarcity and simultaneously reducing environmental damage from the overuse of chemical fertilizers and pesticides.

Economic, societal, political and regulatory trends have created a strong demand for viable innovative agricultural solutions that address biodiversity, climate change challenges and global food demand. New opportunities to maximize returns on investment in urban, specialised and traditional farm agriculture that will meet consumers' demands are driving new innovations in growing techniques.

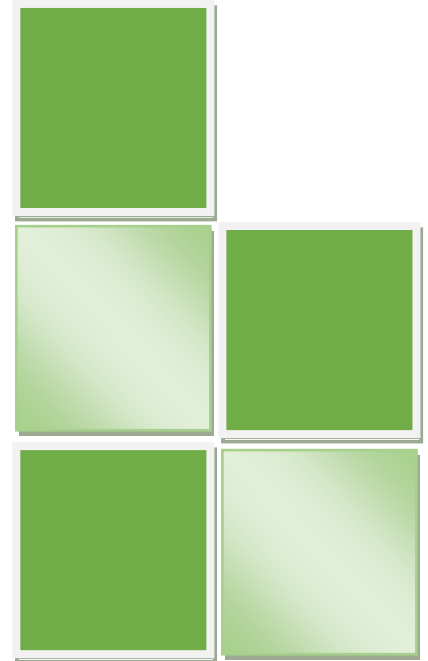
There are major challenges humanity will have to face during the 21st century in meeting the growing demands for food and nutrition. In many regions of the world, climate makes it highly difficult to meet the requirements of their growing population. GrowthKing provides an innovative and sustainable solution to various food supply challenges facing our world's growing population and simultaneously combating pollution inherent to large scale agriculture.

GrowthKing is a technologically advanced plant growth enhancer new to the horticultural and agricultural industry. The bio-catalytic composition of GrowthKing offers a revolutionary technology for the enhancement of the microbial health of soils and optimizing the bioavailability of nutrients. GrowthKing works with all types of grow mediums and is highly beneficial to hydroponic systems.

GrowthKing is not a bacterial or enzyme formulation, but offers highly enhanced broad spectrum enzymatic reactions in water, organic wastes, and soils, providing multiple powerful benefits beyond those possible by traditional enzymatic formulations, at a fraction of the price.

GrowthKing is completely non-toxic to humans, animals, and plant life, GrowthKing is "Not A Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200. From a bio-aquatic perspective, GrowthKing offers the highest safety profile, and actually contributes to ecological restoration in water bodies and soils.

Multiple plant species have been tested in several types of grow mediums and systems. It is believed that the benefits of GrowthKing will carry across all types of growing operations, including; loamy soils, hydroponic, aeroponic, aquaponic, sands, and manure.



## THE POWER IN NATURE

Further testing is required to realize the full extent and potential of the GrowthKing technology in the full spectrum of agricultural operations. The results of the limited studies are documented here, yet are not fully quantified, or have been subject to peer-reviewed studies.

**Product Description:** GrowthKing is built upon the powerful bio-catalytic capabilities of the amphiphilic molecule with a formulation of a specially designed fermentation supernatant, derived from plants and minerals, which is then blended with surface modifying compounds, into a very powerful bio-catalytic liquid concentrate. When introduced into water, the product formulations create highly self-organized and ultra-fine micro-bubbles, a highly reactive platform that allows an acceleration of biological and chemical reactions to occur within multiple substrates.

The primary benefits when used in soil are related to improving the microbiological conditions within the soil, thus directly impacting on root growth and the optimization of nutrient uptake.

GrowthKing is a multipurpose product, designed to enhance plant requirements and growing conditions, providing accelerated plant growth in soils, or any other grow mediums, including hydroponic and aeroponic systems. Case studies have demonstrated harvested yield was 50% to 300% greater than previous crops.

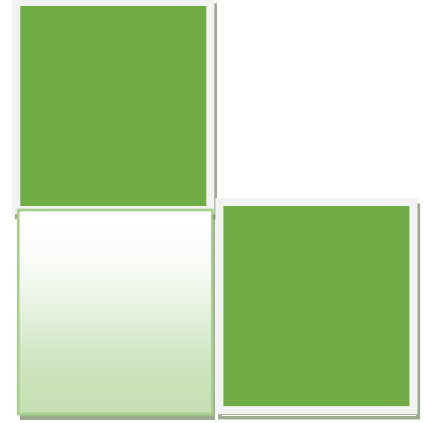
GrowthKing offers superior plant growth enhancements, however GrowthKing is not classified as a fertilizer, rather GrowthKing is a nutrient optimizer, molecular oxygen enhancer and biological soil conditioner that together provide a superior growth environment and maximum nutrient availability.

GrowthKing maximizes plant health by providing maximum utilization of nutrients, while providing an optimal grow environment. Plants will grow faster, generate higher yields and will be more resistant to disease and insect infestation.

The studies have demonstrated increased survivability, enhanced root growth, overall plant strength increased, and healthy foliage and accelerated overall growth rates, all resulting higher yields in much less time.

GrowthKing is used in golf course turf maintenance to solve the chronic issues of water pecculation, either preventing anaerobic conditions due to poor water pecculation, or dry conditions due to lack of adequate biomass health within the subsurface soils.

Recent studies in greenhouses with tomato plants and other vegetables have demonstrated increased survivability to 100% and a doubling of (+200%) the produce grown.



### **GrowthKing**

#### **Benefits Include:**

- Simple delivery method (add to water)
- Reduces additional fertilizer requirements
- Compatible with all growing mediums
- Compatible with all hydroponic type systems
- Optimized nutrient uptake
- Unbinds immobile nutrients in soil
  - Increased dissolved oxygen in solution
- Pythium (root rot) control
- Prevents bio-fouling in hydro systems / nozzles
- Controls excess Biofilm (slime) on roots
- Roots are healthy and clean
- Root wetting agent (enhanced nutrient uptake)
- Accelerated growth
- Helps balance PH
- Reduces algae, mold and salt deposits



A recent case study was performed in a controlled growing environment for the production of pharmaceutical grade cannabis. This study demonstrated harvested product nearly tripled in weight compared to previous crops; this has promoted our interest in offering GrowthKing to the industry for further investigation.

The potential of improving nitrogen fixation, thereby lowering the amount of fertilizer usage of nitrogen required for optimal plant growth, is an area where further investigation of GrowthKing use on a broad basis.

Additionally, the oxygen transfers enhancements, nutrient availability and breakdown of biological film growth; offer exciting implications in Hydroponic, Aquaponic and Aeroponic type systems.

Some growth enhancement products on the market have been proven to stretch cellular growth, this will result in larger plants and produce, but the plant structure is generally weaker with little gain in weight. GrowthKing enhances multi cellular growth that allows for strong and compact plants that leads to dense cellular growth that increases weight and size equally.

GrowthKing is 100% safe for the environment. It is non-toxic, non-caustic, non-corrosive, non-irritating, hypoallergenic, bacteria-free and biodegradable. The environmentally friendly feature of GrowthKing substantially reduces exposure and liability to the user, its workers and the environment and does not trigger costly OSHA or hazardous material handling charges

### **Rice, Corn, Sugar Cane, Berries, Commodity Crops.**

Our limited studies have demonstrated crop yields can be increased several times with GrowthKing. The concept of increasing yields through non-traditional methods have been examined for many years such as (SRI) System of Rice Intensification, an interrelated set of farming principles that rely on fewer seeds, less water and a partial or complete shift from inorganic fertilizers to organic manures and compost.

Like SRI, GrowthKing promotes better growth and health of plant roots and improves the microbial health and activity of beneficial soil microorganisms. GrowthKing goes beyond SRI by optimizing nutrient availability and up-take plus increasing oxygen availability to the root structure thus maximizing nutrient ions available for cellular growth. Case studies have demonstrated double to triple crop yields using less than 25% of the usual amount of organic or inorganic fertilizers.

### **Contamination:**

- GrowthKing does not promote, contain or cause in any way bacterial and fungal contamination such as E. coli, Salmonella and S. Aureus.
- GrowthKing also does not promote, contain or cause contamination from any metals and mycotoxins (Aflatoxin B1, B2, G1, G2 and Ochratoxin A).
- GrowthKing will reduce the conditions that promote bacterial proliferation such as E. coli, Salmonella, S. Aureus, and Pythium (root rot) in Hydroponic type systems.
- GrowthKing also reduces heavy metal exposure to plants in hydroponic type systems by breaking the molecular bonds that hold metals in suspension thus reducing their contact and absorption through the roots. GrowthKing Basics:
- GrowthKing improves general bio-chemical plant characteristics and a considerable increase in both plant and produce production.
- GrowthKing assists in a more complete utilization of available nutrients and physiological reserves in plants that stimulates accelerated metabolic processes resulting in enhanced production.



GrowthKing is dosed at 4lt per acre through irrigation spray systems. Crops such as rice and sugar cane that use irrigation ditches or flooding the area like rice terraces or rice paddies can accelerate crop growth, increase plant health and increase yields far beyond attempting to increase production by simply improving crop genomes, or applying more chemical fertilizer that mostly ends up polluting the environment.

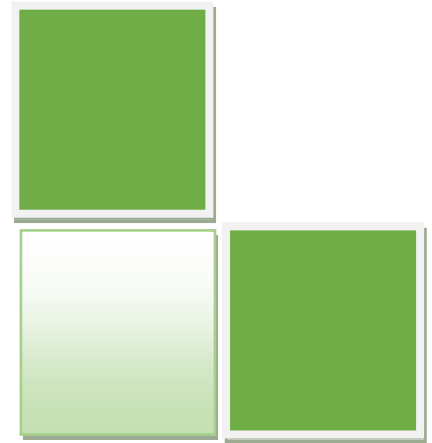
Organic growers using manure and compost will see exponential growth due to GrowthKing's ability to accelerate the breakdown of organic additives making more nutrients available and increasing the roots ability to absorb them, thus greatly increasing crop yields through boosting the natural process, not increasing chemical usage promoting environmental pollution. GrowthKing works on multiple levels:

- 1, GrowthKing is a molecular oxygen enhancer providing increased dissolved oxygen throughout the nutrient solution.
- 2, GrowthKing acts as a catalyst that provides plant support through an accelerated reactive breakdown of organic compounds (nutrients) within solution, providing plants with maximum available nutrients for cellular growth continuously.
- 3, GrowthKing is a technically advanced root zone conditioner that allows your plant to build a healthy & productive root system.
4. GrowthKing is multi-functional and designed to benefit all species of plants in any type of growing system. GrowthKing allows your plants to maximally absorb nutrients by facilitating an optimal root environment. Plants that have a healthy & productive root system can absorb maximal amounts of nutrients & water that translates into enhanced growth & development providing maximum crop yield.

#### Root Zone & Biofilm Relationship:

Root zone bacteria such as plant growth promoting rhizobacteria not only induce plant growth but also protect plants from soil-borne pathogens in a process known as bio-control. Contrastingly, other rhizobacteria in a biofilm matrix may cause pathogenesis in plants. Although research suggests that biofilm formation on plants is associated with biological control and pathogenic response.

Plant roots and biofilm establish a complicated relationship, no bacterial colonisation on roots can retard growth yet an overabundance can also have adverse effects. GrowthKing reduces the built up old layers of biofilm on roots leaving the healthy beneficial bacterial colonies.



### **Product Delivery:**

GrowthKing is delivered in very high dilutions through watering systems, including hydroponic and aeroponic systems. In these systems, simply add GrowthKing at a rate of 4lt GrowthKing per 1600 litres of water - weekly.

For best results add GrowthKing at the water outlet so it blends and hits the water surface in the main storage tank. This will result in the formation of billions of micro-bubbles in solution that provides extremely high oxygen transfer ability, eliminating the energy usage previously required to increase oxygen in solution.

If air stones, ventures, power-heads or bubble walls/ air curtains, are used then inject GrowthKing into the airline; this will cause the formation of micro bubbles upon exit into the solution, dramatically increasing oxygen and provide a method to dose in the product.

When colonizing different plant surfaces it has become clear that bacterial interactions, growth and formation of biofilms on the root surface involve complex mechanisms. Non-pathogenic plant growth promoting rhizobacteria (PGPRs) associated with plant root surfaces are known to contribute towards increases in plant yield by mechanisms such as improved mineral uptake, phytohormone production

GrowthKing promotes a structural breakdown (solubilisation) of excessive biofilm growth that can accumulate on root surfaces thus protecting plant root structures from excessive biofilm growth that can contribute to the proliferation of pathogenic microorganisms. Pythium:

GrowthKing provides an environmental cleaning action within hydroponic systems, controlling bio-film buildup (slime) on surfaces and on roots, reducing bacterial buildup along with an accelerated breakdown of organic materials in solution thus preventing root clogging (slime) and (Pythium) root rot and stem rot fungus species (including Pythium, Verticillium, and Phytophthora, and Fusarium) from proliferating in biofilm on root surfaces, Minimizing biofilm build up on root surfaces also allows roots to absorb available nutrients more efficiently.

GrowthKing does not kill bacteria. Instead, it creates an inhospitable Pythium (Root rot) environment for the Pythium bacteria by cleaning the roots and other surfaces of excess biofilm (slime). GrowthKing controls excess biofilm buildup, thus reducing pathogenic bacterial colonisation on the roots, also removing bacterial food sources (organics) in solution further reducing unhealthy levels of bacteria in hydroponic type systems.

Case studies have demonstrated surfactants can kill the bacteria (Pythium) that cause root rot. GrowthKing contains a small amount of a highly specialized environmentally friendly surfactant; this provides multiple functions in hydroponic systems and other grow mediums.

One of the most important functions of GrowthKing is its ability to act as a wetting agent that cleans the root system assisting in nutrient uptake allowing the root system to function at 100% nutrient absorption capacity

## Nitrogen:

Plants take nitrogen from the soil, by absorption through their roots in the form of either nitrate ions or ammonium ions for incorporation into amino acids, nucleic acids, and chlorophyll. Nitrogen is the one nutrient most often limiting plant growth. Soil microorganisms release nitrogen tied-up in organic matter over a period of time.

GrowthKing encourages the conversion of nitrogen to nitrate through supporting the nitrifying bacteria that live in the soil. In the primary stage of nitrification, the oxidation of ammonium ( $\text{NH}_4^+$ ) is performed by bacteria such as the Nitrosomonas species, which converts ammonia to nitrites ( $\text{NO}_2^-$ ).

Other bacterial species, such as the Nitrobacteria, are responsible for the oxidation of the nitrites into nitrates ( $\text{NO}_3^-$ ) GrowthKing provides highly oxygenated nutrient solution that helps prevent water logging and provides bacteria in the soil oxygen, allowing for enhanced conversion of nitrogen to nitrate for plants to absorb through their roots. Nitrifying bacteria are aerobic and adequate dissolved oxygen levels in solution must be maintained to help with nitrification.

## Summary:

It is uncertain whether yield increases can be achieved to keep pace with the growing global food demand. Furthermore, current projections of a required 50% increase in food production by 2050 to sustain demand have not taken into account; the losses in yield and land area as a result of environmental degradation.

The natural environment comprises the entire basis for food production through water, nutrients, soils, climate, weather and insects for pollination and controlling infestations. Land degradation, urban expansion and conversion of crops and cropland for non-food production, such as biofuels, may reduce the required cropland by 8–20% by 2050, if not compensated for in other ways.

This may cause projected yields to be 5–25% short of demand by 2050. Increased oil prices may raise the cost of fertilizer and lower yields further. If losses in cropland area and yields are only partially compensated for, food production could potentially become up to 25% short of demand by 2050. This would require new ways to increase food supply.

Agriculture, the largest industry in the world, is also the biggest threat to the environment. GrowthKing enhances crop production and reduces environmental pollution through reducing fertilizer demand (reducing run off into lakes and rivers,) optimizing the microbial health of soils to improving the microbiological conditions within the soil, thus directly impacting, Land degradation, root growth and the optimization of nutrient uptake resulting in increased growth and health of crops to combat global food shortages and pollution. The superior performance and broad applicability of GrowthKing over traditional plant enhancement or enzyme products provides profound competitive advantages in the current marketplace.