Amino Acids in NutriSoil® Build Protein

Amino acids are produced by the decomposition of organic matter and their key elements are nitrogen, carbon, hydrogen and oxygen. Most organic nitrogen is tied up in amino acids and is mineralised through the nitrogen cycle into ammonium and nitrate. Plants have been found to take up amino acids directly in the soil organic material including whole microbes. In soil, organic nitrogen in amino acid form could be in plant residues, decomposing material, in the soil solution and held in microbial bodies. NutriSoil® is high in amino acids which can be attributed to the worms gut bioreactor which complexes nutrients into amino acids, culls pathogenic microbes and increases beneficial microbes at times by 1000 fold.

Plants use amino acids as a source of organic nitrogen. They are also the building block of proteins. The function of a protein depends on its amino acid sequence and structure. The structure is what makes a protein into either an enzyme, a hormone, a structural protein or an antibody.

Healthy plants are resistant to insects and disease

A healthy plant converts sugars produced through photosynthesis into complex sugars; starches and lignin. This increases the immune system of the plant resulting in increased plant secondary metabolites. Insects and diseases cannot digest complex sugars, only simple sugars. Plants that are not photosynthesizing effectively will not complex sugars.

Soil, plant and human health link!

Amino acids can be taken up by plants directly through foliar application and in the soil. They then convert these into proteins. When a plant's protein structure is compromised, it is not able to protect itself from pests and diseases. Similar, thousands of human genetic diseases have been traced to the production of defective proteins.

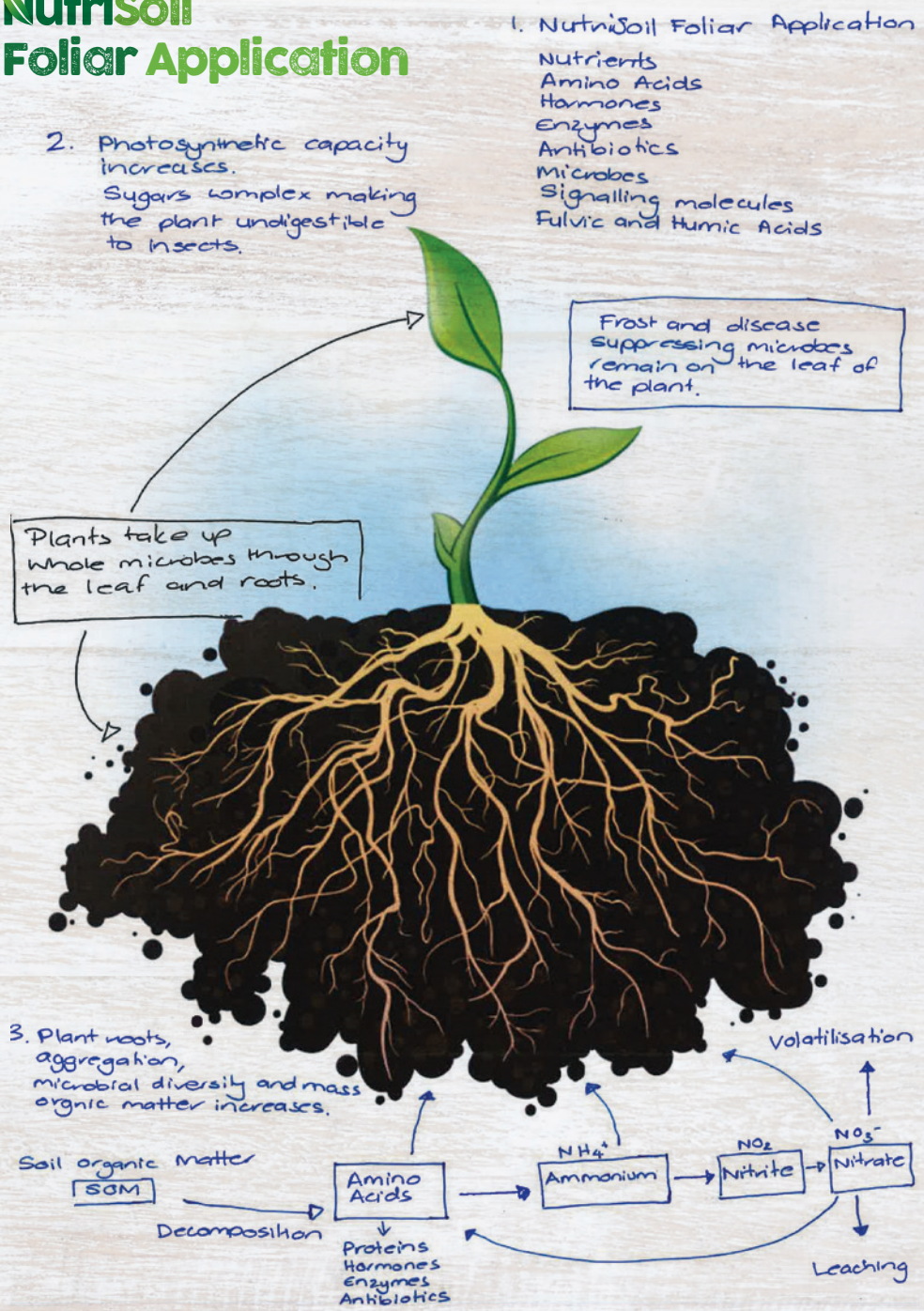
Genes and the environment instruct the protein what shape to form. Proteins also assist in plant signalling. If a protein does not have the right environment with all of its required nutrients, it is unable to form into its desired form, such as an enzyme and plants are left unprotected, lacking immunity, and unable to express its full genetic capability.

There are 20 common amino acids in nature, however the number of different proteins (which are made from long chains of 100 to several thousand amino acids) can be estimated to be in the order of thousands of billions.

NutriSoil® provides plants amino acids with less energy required by the plant.

Ammonium and nitrate have been thought to be the predominant sources of nitrogen which plants utilize and take up. This is only part of the nitrogen cycle; plants also take up organic sources of nitrogen in the amino acid form including whole microbes. Plants use less energy to take up organic nitrogen than synthetic nitrogen because they do not need to convert it into amino acids. Plants ultimately convert the nitrogen back into an amino acid form once in the plant.

NutriSoil® Foliar Application



The Science of NutriSoil®

Studies have identified the following components of NutriSoil® Biological Solution, demonstrating that it is the most complex bio-stimulant on the market. Sources include:

- **Microbe Labs Australia**
- **Environmental Microbiology for Mining & Agriculture** (EMMA)
- **SWEP Analytical Laboratories**
- **Peer Reviewed Scientific Literature**

Non Nutrient Growth Promotants	
Name:	**Function:** (only some listed)
Phosphatases:	Produced by mychorrhizal fungi, these enzymes solubilise phosphorous and make it into a form available to plants.
Gibberellic Acid:	Growth-regulating chemical which assists in flowering and fruit development.
Auxins:	Elongates root and stem cells.
Cytokinins:	regulates bud growth, and leaf senescence.
Abscisic Acid:	Protects plants during stressful conditions such as drought and salinity.
Fulvic Acid:	Open the stomata on the leaf of the plant.
Humic Acid:	Holds and assist nutrient exchange for the plant.
Lactic Acid:	Strong bio-suppressive compounds that help control harmful microbes.

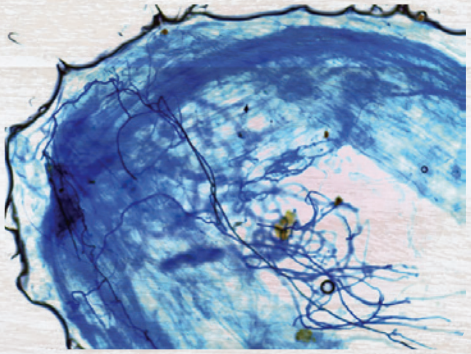
Amino Acids

Amino acids build proteins. Proteins form hormones, enzymes, antibiotics and growth promoting compounds. A plant that is photosynthesising efficiently converts amino acids into functional proteins. Alternatively, when a plant is not photosynthesising efficiently, proteins cannot form into the essential non nutrient growth promoting compounds.

Amino Acids Found in NutriSoil® Include:

• Glutamic Acid • Aspartic Acid • Glycine • Alanine • Leucine • Arginine • Valine • Proline • Threonine • Serine • Phenylalanine • Isoleucine • Lysine • Tyrosine • Histidine • Cysteine • Methionine.

Nutrient Cycling Microbes	
Name:	**Function:** (only some listed)
Trichoderma:	Breaks down plant remains into organic materials that other organisms like protozoa can consume.
Bradyrhizobium:	Many of these species fix nitrogen converting atmospheric nitrogen (N2) into nitrate and ammonium.
Candidatus Solibacter:	Produce enzymes to break down organic carbon for metabolism and participates in nitrate and nitrite reduction.
Anaeromyxobacter:	Reduces nitrate and nitrite to ammonia and reduces nitrous oxide to nitrogen gas.
Rhodopseudomonas:	Converts sunlight into energy and converts atmospheric carbon dioxide into biomass.
Rhodospirillum:	Regulates nitrogen fixation.
Frankia:	Assists in nitrogen fixing and forms root nodules on legumes.
Sinorhizobium:	Fixes atmospheric nitrogen via a root nodule and leaves excess nitrogen behind for the plant.
Nitrobacter:	Assists in the nitrogen cycle.
Magnetospirillum:	Can orient themselves according to the earths magnetic field and produce tiny crystals of the mineral magnetite, the most magnetic mineral on earth.
Nitrospira:	Plays a role in the nitrogen cycle by performing nitrite oxidation in the second step of nitrification.
Mesorhizobium:	The nitrogen fixing species, can form symbiotic root nodules with plants.



Plant Root with High Mycorrhizae Count

Biocontrol Agent Microbes	
Name:	**Function:** (only some listed)
Pseudomonas:	Produce the secondary metabolite compounds to protect plants from pathogens and produce antibiotics. P. fluorescens displaces bacteria normally found on plant surfaces that initiate the formation of frost.
Fungi Penicillium:	Produce enzymes, antibiotics and various growth regulators.
Actinomycetes:	Produce antibiotics that suppress pathogenic organisms and produce phytohormones (e.g. gibberellic acid, auxins, cytokinins, ethylene and abscisic acid).
Methylobacterium:	Stimulate seed germination and plant development, by producing phytohormones (plant hormones).
Sorangium:	A prolific producer of secondary fungicides and bactericides that reduce competition of pathogens in the soil environment.
Streptomyces:	Produce secondary metabolites such as antifungals, antivirals and antibiotics.
Roseiflexus:	A photosynthetic bacterium capable of producing their own food via photosynthesis.
Myxococcus:	Colony forming swarms called "wolf-packs" which are capable of eavesdropping on the signals produced by the bacteria it preys upon, increasing its efficiency as a predator.
Lactobacillus:	Are highly pathogen-supressing. They also possess a remarkable resistance to environmental damages, such as heat, radiation, toxic chemicals, and pH extremes.

Bioremediation Microbes	
Name:	**Function:** (only some listed)
Geobactor:	Bioremediation of the soil.
Cupriavidus:	Bioremediation heavy metals in soil and water.
Sphingomonas:	Bioremediation of the soil.
Acetobactor:	Bioremediation of the soil including glyphosate.

Laboratory Report Typical Analysis of NutriSoil® Results (Expressed as mg/kg)		
Test Parameter	**NutriSoil®**	**Worm Juice**
Nitrogen	**492**	54
Phosphorus	**130**	45
Potassium	**700**	220
Sodium	**84.0**	61
Calcium	**118**	95
Copper	**Less than 1**	Less than 1
Zinc	**1.4**	Less than 1
Manganese	**Less than 1**	Less than 1
Magnesium	**7.1**	68
Molybdenum	**3.1**	Less than 1

NOTE: The worm juice referenced here is made by feeding worms on manure and straw only. This shows the difference where NutriSoil® is the result of feeding worms value-added inputs including seaweed, fish, soft rock phosphate, lime and crushed minerals. Humate is added at 0.5%

NutriSoil® Makes Farmers Happy

Mycobacterium is found in NutriSoil®. Human studies have shown that the bacteria injection of mycobacterium "significantly improved patient quality of life", patients were happier, expressed more vitality, and better cognitive functioning.

Quality Assurance:

NutriSoil® is setting the standards for a Vermiculture Quality Assurance System with Microbe Labs Australia.

We reassure you that NutriSoil® is made to maintain the highest nutritional and biological properties of a vermiculture system. Our quality control system identifies potential hazard points in the production system and ensures control measures are in place to minimize any risk from the initial receiving of feeds stock, storage and feeding of the worms, collection, and filling of the NutriSoil® into containers. Quality Standards are set and measured against benchmarks including:

- **General microbiology**
- **Plant growth promotant's**
- **Human Pathogens**
- **Nutrient Concentration**
- **pH**
- **Humic & fulvic substances**