



FREE L-AMINO ACIDS FOR SUPERIOR PLANT HEALTH

The Pennamin Difference

Amino acids are the essential building blocks of plant health and growth, driving critical processes that support vitality and performance. However, plants can only absorb amino acids in their free form—not when they are locked up in peptides or proteins. **Pennamin® Products** are uniquely formulated with an unmatched concentration of free-form L-Amino Acids—the only form usable by plants. Every Pennamin product is highly soluble and provides rapid absorption of nutrients. This ensures efficient and effective plant nutrition to support healthier, more resilient growth.

Why Choose Pennamin?

- 🌱 **Unmatched Free Amino Acid Content:**
High percentage of free amino acids for quick plant uptake and efficiency.
- 🌱 **Accelerated Foliar Uptake:**
Boosts absorption of nutrients for faster nutrient delivery.
- 🌱 **Stress Tolerance:**
Increases drought tolerance and heat resistance while mitigating salt stress.
- 🌱 **Improved Plant Vitality:**
Enhances plant turgidity and protects from heavy metal toxicity.
- 🌱 **Flower and Fruit Development:**
Stimulates flowering, enhances pollination, and improves fruit setting.
- 🌱 **Pest and Pathogen Resistance:**
Strengthens plant defenses for healthier growth.
- 🌱 **Revitalizes Soil:**
Enhances soil structure and microbial activity to improve nutrient availability.
- 🌱 **Versatile and Easy to Use:**
Available in highly water-soluble powders, providing seamless blending and application for various needs.

Product Options

Pennamin Driver-P

12-0-0

81.3% FREE Amino Acids

Pennamin High-K

5-0-15 + 9% Ca, 5.4% S

38.5% FREE Amino Acids

Pennamin Perfect-K

8-0-9 + 3.1% S, 5% Ca, 0.1% Fe,
0.05% Cu, 0.05% Mn,
0.05% Zn, 0.02% B

53.3% FREE Amino Acids

Pennamin Ca

7-0-0 + 14% Ca

47.9% FREE Amino Acids

Pennamin FeMn

8-0-0 + 4% Fe, 3% Mn

57.3% FREE Amino Acids

Pennamin Mn

9-0-0 + 7% Mn

63.5% FREE Amino Acids

Pennamin Si

10-0-0 + 4% Si

65% FREE Amino Acids



Free the Aminos

Why apply amino acids to soil if they're not available for plants to use?

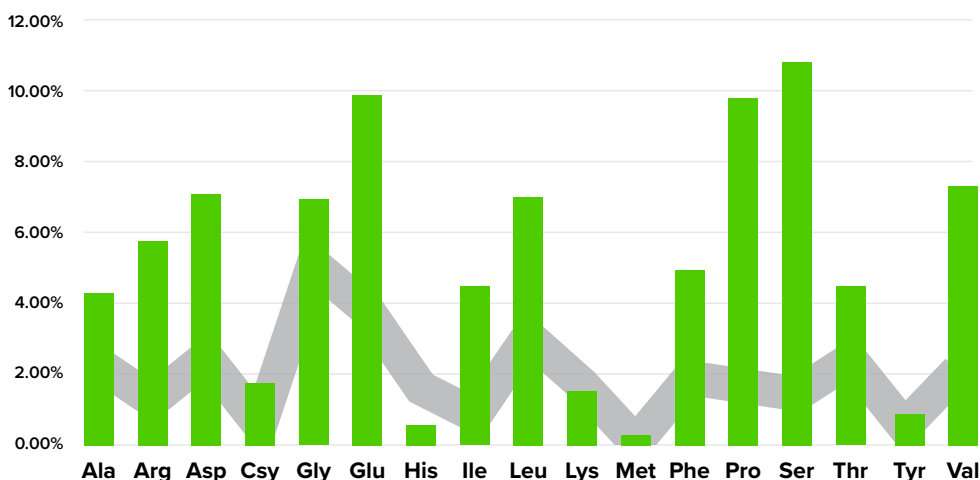
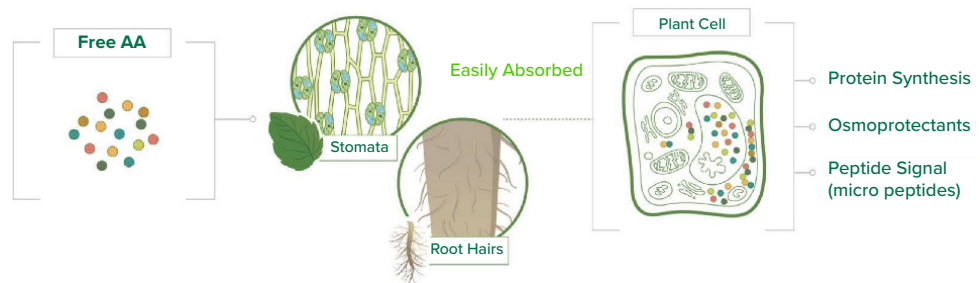
Amino acids are essential building blocks for plant health and growth. These vital nutrients are absorbed through the roots and utilized in critical physiological processes. However, plants can only take up amino acids in their free form, not when bound in peptides or proteins.

Many products on the market today list only total amino acid profiles. The Pennamin product line is specifically designed to provide a highly concentrated source of free-form L-amino acids, delivering exceptional efficiency and rapid nutrient absorption.



Total vs. Free Amino Acids

A large percentage of the amino acids found in many of our competitor's products are tied up in long and short chains of peptides. Depending on several factors such as moisture levels, temperature, pH levels, available microbes and chain length, these peptide chains can take days, weeks, months, or even entire growing seasons or longer to break down into the free form amino acids that plants can use. Directly applying free L-form amino acids to soil allows plants to absorb the nutrients immediately and far more efficiently for superior results.



Pennamin vs. Market Standard Range: Free Amino Acids Comparison

■ Pennamin Driver-P ■ Market Standard Range



Boost Stress Tolerance & Resilience

Proline, Serine, Glutamic Acid, Alanine, Arginine, Isoleucine, Leucine, and Cystine enhance a plant's ability to tolerate stress from heat, drought, and environmental challenges. They regulate water balance, improve recovery, and strengthen resistance to harsh conditions.



Maximize Growth & Productivity

Glycine, Glutamic Acid, Methionine, and Histidine drive plant growth and development. They enable nutrient absorption, support fruit ripening and ensure plants grow stronger and healthier.



Enhance Flowering, Pollination & Fruit Quality

Arginine, Lysine, Histidine, and Phenylalanine promote flowering, enhance pollination, and improve fruit set and quality. Phenylalanine also strengthens woody tissue and increases structural integrity for long-term productivity.



Defend Against Pests & Diseases

Aspartic Acid, Alanine, and Cystine promote plant vigor and natural stress tolerance, helping plants thrive under pressure. **Tyrosine** regulates water use, protein balance, and stomatal activity for healthier, more resilient growth.



Support Microbe Growth in Soil

Glutamic Acid, and Aspartate are crucial for nitrogen metabolism. **Leucine, Isoleucine, and Valine** can be used as both energy and carbon sources for microbes. **Proline** can be used by some microbes as a nitrogen source.

