



PENNAMIN



**Turf, Ornamentals &
Agricultural Applications**

NUTRITION FOR PLANTS & MICROORGANISMS

- Chelates micronutrients
- Improves foliar uptake of nutrients
- Slowly releases organic nitrogen
- Nourishes beneficial microorganisms
- Improves stress tolerance

PENNAMIN products - organic fertilizers, micronutrients and nutritional products for microbial populations - contain amino acids derived from hydrolyzed feathers.

PENNAMIN DRIVER-P has the appearance of a beige dry powder and is **100% water-soluble**.

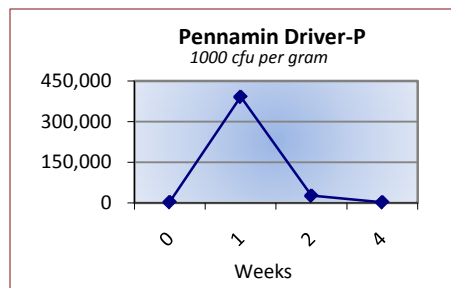


80% of the amino acids in **PENNAMIN** products are **free amino acids**. This means nitrogen becomes plant available very quickly and the benefits of each amino acid are expressed sooner.

PENNAMIN's amino acids are in *L-Form*. Only *L-Form* amino acids are suitable for plant uptake and utility.

PENNAMIN's mix of 17 amino acids maintains the inherent characteristics of the individual amino acids.

PENNAMIN Driver-P has a 6:1 carbon to nitrogen (C:N) ratio. This means nitrogen becomes plant available shortly after application and is slowly released for two (2) weeks.



PENNAMIN products have very low sodium chloride (NaCl) content - 1% to <5%.

PENNAMIN amino acids have the ability to chelate metals and improve micronutrient absorption by plants and turf.

PENNAMIN amino acids have a **very low average molecular weight: 130 Daltons**. Studies have confirmed that **PENNAMIN** improves the foliar absorption of critical micronutrients through the leaf's stomates.

PENNAMIN amino acids are the precursors of other nitrogen-containing compounds; as examples, nucleic acids and chlorophyll.

PENNAMIN amino acids promote microbial life in the soil and on the leaf surface and are "easy-to-use" nitrogen sources for micronutrients.

PENNAMIN amino acids help the plant defense against water stress and drought.

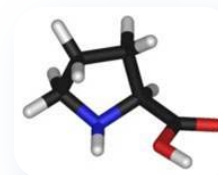
PENNAMIN products have a high level of Proline, an amino acid known to contribute to water and drought stress tolerance.

PENNAMIN products **improve plant and turf water stress and drought tolerance**.

Note: Research has shown exogenous proline applications can delay wilting when a plant is exposed to osmotic stress.

PENNAMIN impacts enzyme activity

Proline can protect enzymes against denaturation by salinity, heat or dilution.



Proline and other amino acids in PENNAMIN help regulate stomate closure.

Amino acids like proline and others have been shown to have an inhibiting action on stomatal opening.

Histidine and other amino acids found in **PENNAMIN** promote the opening of the stomates.

Trial results suggest amino acids are part of the balancing mechanism of the stomates, and are essential for water retention and the exchange of gases.

MEMBRANE PERMEABILITY AND OSMOTIC REGULATION

By managing membrane permeability and ionic uptake, the amino acids in PENNAMIN products help mitigate drought and salt stress affects.

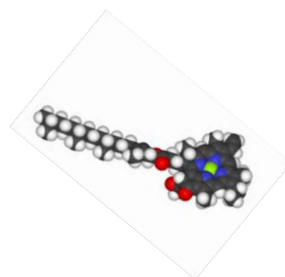
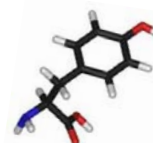
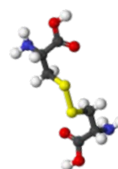
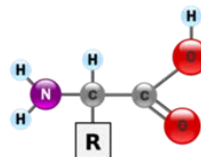
BUILDING PROTEINS

PENNAMIN's amino acids are the building blocks of proteins and are essential plant constituents.

HEAVY METAL TOLERANCE

PENNAMIN chelates heavy metals and can help protect crops grown in soils high in heavy metals.

Acknowledgement: V.K. RAI Department of Biosciences, H.P. University, Shimla-17115 India



PENNAMIN DRIVER-P

AMINO ACIDS	CONTENT
Aspartic Acid	6.28%
Serine	11.11%
Glutamic Acid	9.26%
Glycine	7.29%
Histidine	0.96%
Arginine	5.32%
Threonine	4.08%
Alanine	4.23%
Proline	9.66%
Cystine	1.27%
Tyrosine	1.09%
Valine	4.96%
Methionine	0.45%
Lysine	1.40%
Isoleucine	2.51%
Phenylalanine	4.39%
Total	80.44%

PENNAMIN DRIVER – P

TYPICAL CHEMICAL ANALYSIS

Dry Matter	96%
Free Amino Acids	80%
Crude Ashes	6%
Sodium Chloride	4%
Organic Nitrogen	12%

PHYSICAL DATA

Water Solubility at 20° C	200 grams/litre
pH in solution:	5.5

PENNAMIN DRIVER-P

BACTERIOLOGICAL SPECIFICATION

Total Plate Count	<200 grams/litre
Yeast	< 50 grams/litre
Molds	< 50 grams/litre
Salmonella	None detected in 25 g



Application Rates, Timing and Typical Costs per Acre

PENNAMIN DRIVER-P 12-0-0

- Enhance fertilizer efficiency
- Promote microbial life in the soil and on the leaf surface
- Improve foliar uptake of micronutrients

RATE: Add to every tank of fertilizer solution at a rate of 4 - 8 ounces per 100 gallons.

Typical Cost per 100 Gallons of Fertilizer
\$3.00 - \$6.00 per 100 gallons

PENNAMIN DRIVER-LC 3-0-0

- With a chitosan sticker for improved rain-fastness
- Enhance fertilizer efficiency
- Promote microbial life in the soil and on the leaf surface
- Improve foliar uptake of micronutrients

RATE: Add to every tank of fertilizer solution at a rate of 0.25 – 1.0 ounce per gallon of fertilizer solution.

Typical Cost per 100 Gallons of Fertilizer
\$3.00 - \$10.00/100 gallons

PENNAMIN DRIVER-L 3-0-0

- Enhance fertilizer efficiency
- Promote microbial life in the soil and on the leaf surface
- Improve foliar uptake of micronutrients

RATE: Add to every tank of fertilizer solution at a rate of 0.25 – 1.0 ounce per gallon of fertilizer solution.

Typical Cost per 100 Gallons of Fertilizer
\$3.00 - \$10.00/100 gallons

PENNAMIN Ca 7-0-0 + 14% Ca Foliar Application Instructions

RATE: 1 – 3 pounds of PENNAMIN Ca per acre (0.4 – 1.2 ounces per 1,000 ft²).

TIMING OF FOLIAR SPRAYS:

- Crops: Apply every 14-28 days as needed.
- Turf: Apply every 14-28 days throughout the growing season.

Typical Cost per Application
\$8.00-\$25.00/acre \$0.18-\$0.57/1,000 ft²

Notes : Use a minimum of 2.5 gallon of water per pound of Pennamin product. ~ The recommended rate of 50 gallons of spray solution per acre.
A jar test is recommended before tank mixing with other components.



Application Rates, Timing and Typical Costs per Acre

PENNAMIN Cu 11-0-0 + 8% Cu

Foliar Application Instructions

RATE: 0.75 – 1.5 pounds of PENNAMIN Cu per acre (0.25 – 0.50 ounces per 1,000 ft²).

TIMING OF FOLIAR SPRAYS:

- Crops: Apply every 14-28 days as needed.
- Turf: Apply every 14-28 days as needed.

Typical Cost per Application

\$10.00-\$20.00/acre \$0.23-\$0.46/1,000 ft²

PENNAMIN HIGH K + Ca 6-0-15 + 9% Ca

Foliar Application Instructions

RATE: 1 – 3 pounds of PENNAMIN High K + Ca per acre (0.4 – 1.2 ounces per 1,000 ft²).

TIMING OF FOLIAR SPRAYS:

- Crops: Apply every 14-28 days as needed.
- Turf: Apply every 14-28 days throughout the growing season.

Typical Cost per Application

\$8.00-\$25.00/acre \$0.18-\$0.57/1,000 ft²

PENNAMIN Fe 9-0-0 + 6% Fe

Foliar Application Instructions

RATE: 1 – 3 pounds of PENNAMIN Fe per acre (0.4 – 1.2 ounces per 1,000 ft²).

TIMING OF FOLIAR SPRAYS:

- Crops: Apply every 14-28 days as needed.
- Turf: Apply every 14-28 days throughout the growing season.

Typical Cost per Application

\$8.00-\$25.00/acre \$0.18-\$0.57/1,000 ft²

PENNAMIN Ca+Mg 8-0-0+ 8% Ca + 8% Mg

Foliar Application Instructions

RATE: 2 – 4 pounds of PENNAMIN Ca+Mg per acre (0.75 – 1.5 ounces per 1,000 ft²).

TIMING OF FOLIAR SPRAYS:

- Crops: Apply every 14-28 days as needed.
- Turf: Apply every 14-28 days throughout the growing season.

Typical Cost per Application

\$15.00-\$30.00/acre \$0.35-\$0.70/1,000 ft²

Notes : Use a minimum of 2.5 gallon of water per pound of Pennamin product. ~ The recommended rate of 50 gallons of spray solution per acre.
A jar test is recommended before tank mixing with other components.



Application Rates, Timing and Typical Costs per Acre

PENNAMIN MN 10-0-0+7% Mn **Foliar Application Instructions**

RATE: 1.0 – 3.0 pounds of PENNAMIN MN per acre (0.4 – 1.2 ounces per 1,000 ft²).

TIMING OF FOLIAR SPRAYS:

- Crops: Apply every 14-21 days as needed.
- Turf: Apply every 14-28 days throughout the growing season.

Typical Cost per Application
\$8.00-\$25.00/acre \$0.18-\$0.57/1,000 ft²

PENNAMIN Fe & Mn 9-0-0 + 4% Fe + 3% Mn **Foliar Application Instructions**

RATE: 1 – 3 pounds of PENNAMIN Fe & Mn per acre (0.4 – 1.2 ounces per 1,000 ft²).

TIMING OF FOLIAR SPRAYS:

- Crops: Apply every 14-28 days as needed.
- Turf: Apply every 14-28 days throughout the growing season.

Typical Cost per Application
\$10.00-\$30.00/acre \$0.23-\$0.70/1,000 ft²

PENNAMIN ZN 11-0-0+9% Zn **Foliar Application Instructions**

RATE: 1.0 – 3.0 pounds of PENNAMIN ZN per acre (0.4 – 1.2 ounces per 1,000 ft²).

TIMING OF FOLIAR SPRAYS:

- Crops: Apply every 14-28 days as needed.
- Turf: Apply every 14-28 days as needed.

Typical Cost per Application
\$8.00-\$25.00/acre \$0.18-\$0.57/1,000 ft²

PENNAMIN Mg 12-0-0 + 12% Mg **Foliar Application Instructions**

RATE: 0.5 – 1.5 pounds of PENNAMIN Mg per acre (0.2 – 0.4 ounces per 1,000 ft²).

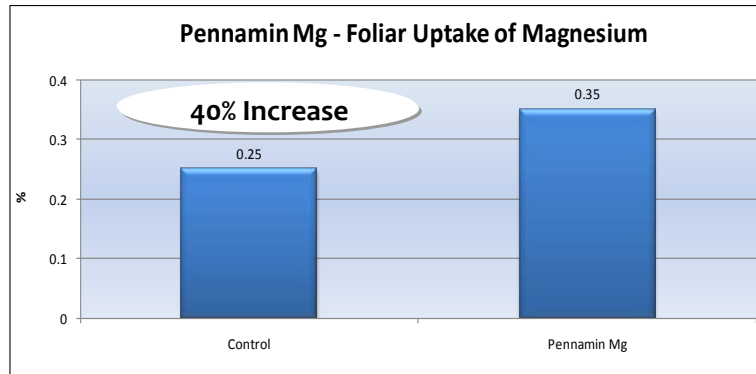
TIMING OF FOLIAR SPRAYS:

- Crops: Apply every 14-21 days as needed.
- Turf: Apply every 14-28 days throughout the growing season.

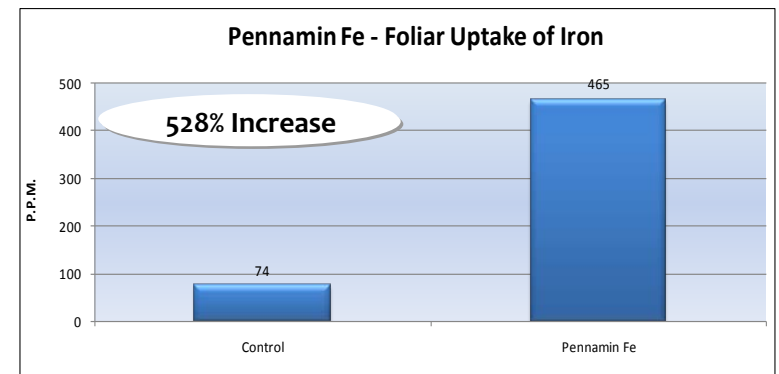
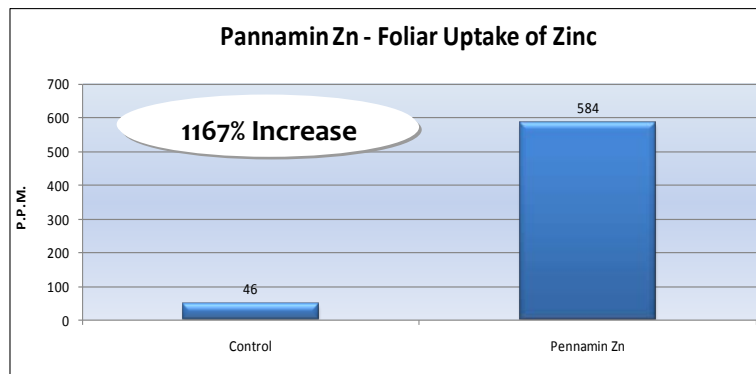
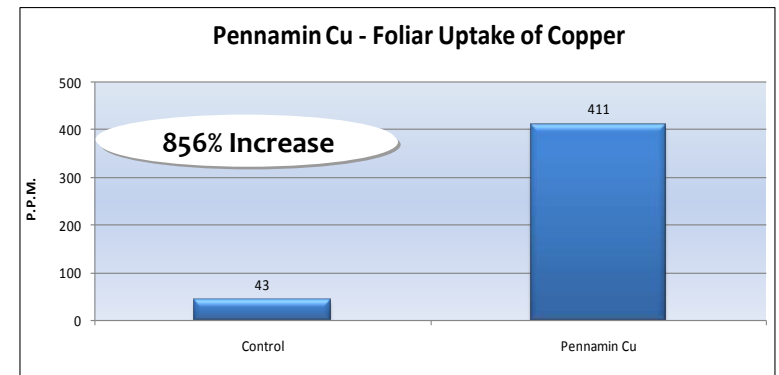
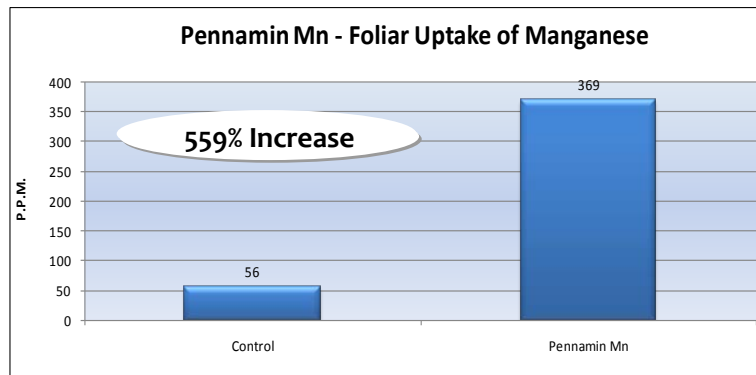
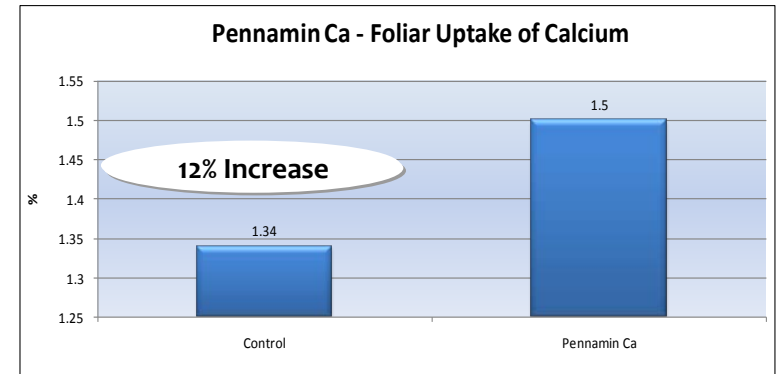
Typical Cost per Application
\$5.00-\$15.00/acre \$0.11-\$0.35/1,000 ft²

Notes : Use a minimum of 2.5 gallon of water per pound of Pennamin product. ~ The recommended rate of 50 gallons of spray solution per acre.
A jar test is recommended before tank mixing with other components.

Foliar Uptake of PENNAMIN Complexed Micronutrients



Foliar Uptake of Pennamin Complexed Micronutrients





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PENNAMIN

MICROBIAL SPRAYABLE ACTIVATORS & UPTAKE ENHANCERS

PENNAMIN DRIVER – P Water-Soluble Powder	12-0-0
PENNAMIN DRIVER – L Liquid Solution	3-0-0
PENNAMIN DRIVER – LC Liquid Solution w/ Chitosan	3-0-0



COMPLEXED MICRONUTRIENTS & MICROBIAL ACTIVATORS
Made with PENNAMIN DRIVER-P

Single-Minerals - Sprayable Powder

PENNAMIN CA	7-0-0+14% Ca
PENNAMIN DRIVER HIGH K – P	6-0-15+9% Ca
PENNAMIN CU	11-0-0+8% Cu
PENNAMIN FE	9-0-0+6% Fe
PENNAMIN MG	12-0-0+12% Mg
PENNAMIN MN	10-0-0+7% Mn
PENNAMIN ZN	11-0-0+9% Zn



COMPLEXED MICRONUTRIENTS & MICROBIAL ACTIVATORS
Made with PENNAMIN DRIVER-P

Mineral Mixes - Sprayable Powders

PENNAMIN CA + MG	8-0-0+8% Ca + 8% Mg
PENNAMIN FE + MN	9-0-0+4% Fe + 3% Mn
PENNAMIN PERFECT	5% Ca, 2% Mg, 0.025% B & Cu, 0.125% Zn, 0.008% Fe and 0.06% Mn

GENERAL INFORMATION

PENNAMIN products can be used on Fruits, Vegetables, Tree & Vine Crops, Row Crops, Field Crops, Trees, Ornamentals, Flowers, Turf, etc.

- Use 50 gallons of water per acre of field crops, fruits, vegetables, row crops, ornamentals, flowers, and turf.
- Dilute 1 quart in 125 gallons of water on trees, and tree & vine crops.
- Frequent applications at lower rates are generally more effective than fewer applications at higher rates.
- PENNAMIN products are recommended for use on all types of soils. Dilute before use to ensure uniform coverage. The product can be incorporated into liquid fertilizers or applied separately*. Soil applications may be made by sprinkler or band application.
- Please read complete product label before using any PENNAMIN products.
- Examples of typical rates given above are maintenance rates. A tissue test should be taken on a regular basis. If tests show deficient or excessive levels of any mineral consult with your local Performance Nutrition Dealer for corrective rates.

****Be sure to perform a jar test before tank mixing PENNAMIN products.***



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