InnoSolve™ PKMe

InnoSolve PKMe is a proprietary biodegradable nutrient enhancer that has been researched and agronomically proven to increase yields in over 900 trials and over 40 crops across the world.

Product Description

InnoSolve PKMe is a negatively-charged (anionic), biodegradable amino-acid polymer that is polymerized from L-aspartic acid, a natural amino acid synthesized in plants. Its molecular weight is approximately 5000 g/mol—small enough to remain highly water soluble, but large enough where it cannot be taken up by a plant.

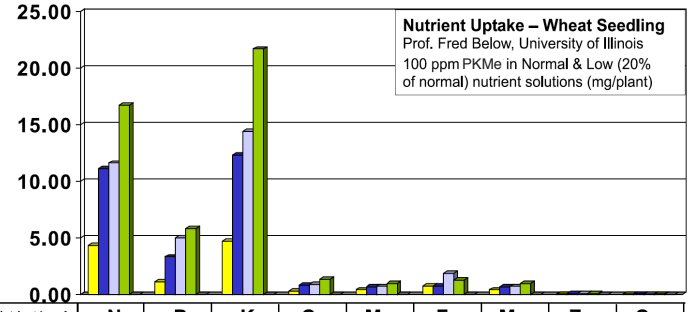
Due to its molecular structure, InnoSolve PKMe has the ability to function as a humectant and attract and retain moisture. The anionic sites on the polymer attract positively-charged ions (cations) and prevent them from forming insoluble complexes with anionic ions and compounds such as phosphates, nitrates, sulfates, chlorides, and bicarbonates. Due to the increase in water-holding capacity along the polymer, the anionic sites can carry a higher solution of nutrients, which allows them to be held at a higher concentration and be more available to the plant. Through this process, InnoSolve PKMe acts as a crystal growth inhibitor that delays the formation of insoluble, unavailable precipitates that form between cations and anions.

Competitive products in the market place purport to work like InnoSolve PKMe. However, those products can complex (or chelate) nutrients too strongly, which causes the product-nutrient complex to precipitate from the soil. This causes the complexing agent to no longer be useful, while also making the complexed nutrient no longer available to the plant. InnoSolve PKMe does not have this issue due its molecular structure. It gently bonds to nutrients, preventing their precipitation and making them more available to the plant. This cycle repeats itself over and over until the biology in the soil slowly degrades the polymer over the course of a couple of months. As such, with the addition of InnoSolve PKMe, growers in a variety of growing environments can increase the efficiency of their traditional nutrient management programs.

Product Benefits

- Enhanced nutrient uptake through the increased availability of nutrients.
- Reduces precipitation in irrigation water, and thereby the clogging and plugging of irrigation lines and emitters.
- Flexible delivery methods on granular fertilizer or as a liquid sprayed onto the soil and/or foliage of plants.
- Yields consistent return on investment (ROI).

PKMe Nutrient Uptake



Nutrient Level	N	P	K	Ca	Mg	Fe	Mn	Zn	Cu
Low w/o PKMe	4.3	1.1	4.7	0.28	0.38	0.6900	0.0039	0.0055	0.0011
Low with PKMe	11.1	3.3	12.3	0.78	0.64	0.6900	0.0118	0.0135	0.0034
Normal w/o PKMe	11.6	5.0	14.4	0.87	0.68	1.8200	0.0123	0.0146	0.0100
Normal with PKMe	16.7	5.8	21.7	1.32	0.96	1.2700	0.0323	0.0222	0.0058

Molar Mass Comparison

NH_4	**Ammonium** 18.039 g/mol	Ca	**Calcium** 40.078 g/mol
Mg	**Magnesium** 24.305 g/mol	Cu	**Copper** 63.546 g/mol
Fe	**Iron** 55.845 g/mol	Mn	**Manganese** 54.938 g/mol
K	**Potassium** 39.098 g/mol	Zn	**Zinc** 65.308 g/mol

What Is A Humectant?

Humectant /(h)yo͞o'mektənt/ (noun)

a substance used to retain or preserve moisture

Examples Of Common Fertilizer Precipitates

Calcium Phosphate
$H_2PO^{4-} + Ca^{2+} = Ca(H_2PO_4)_2$

Calcium Sulfate
$SO_4^{2-} + Ca^{2+} = CaSO_4$

Magnesium Carbonate
$HCO_3^{2-} + Mg^{2+} = MgCO_3$

Iron(II) Phosphate and Iron (III) Phosphate
$PO_4^{3-} + Fe^{+2} = Fe_3(PO_4)_2$

$PO_4^{3-} + Fe^{+3} = FePO_4$

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PKMe

PKMe Effects on Root Morphology and Nutrient Uptake

In many crops, the root system of treated plants will have more root branching and longer root hairs, which enables them to make greater use of available nutrients both in the soil and from fertilizer applications. This allows the plants to develop easier and faster. Below is research from Dr. Fred Below's work with InnoSolve PKMe at the University of Illinois. It shows both an increasing in rooting as well as an increase in the uptake of nutrients.

	Root Hair Length (mm)	Lateral Branches Per Plant
100% Nutrient Strength + 0 PPM PKMe	0.53	220
100% Nutrient Strength + 100 PPM PKMe	0.71	219
	Seminal Roots (mm)	**Lateral Branches Length**
100% Nutrient Strength + 0 PPM PKMe	29.1	3.6
100% Nutrient Strength + 100 PPM PKMe	35.2	4.3

Dr. F. Below, University of Illinois

Recommended Use Rates

Vegetable Crops (including artichokes, beans, brassica vegetables, bulb vegetables, carrots, celery, cole crops, cucumbers, leafy greens, legume vegetables, lettuce, melons, onions, peas, peppers, petiole vegetables, potatoes, root and tuber vegetables, spinach, sweet corn, tomatoes)	Apply 64 oz per acre in furrow at planting. Follow with 16 oz per acre two weeks later, with another application of 16 oz per acre two weeks after that.
Field Crops (including alfalfa, cotton, corn, dry beans, forage grasses, hemp, herbs and spices, oil seed, rice, safflower, sorghum, soybeans, sugar cane, sugar beets, and sunflowers)	Apply 16-64 oz per acre when applying fertilizer either in furrow during time of planting, or foliarly if the crop is established.
Berries, Trees & Vine Crops (including citrus, date palm, nuts, pome fruits, stone fruits, blackberries, cranberries, grapes, raspberries, tropical/subtropical fruits)	Apply 32-128 oz per acre via irrigation during a fertilizer application (liquid or granular). Multiple applications of 32 oz can be made for a total of 64-128 oz per acre.
Strawberries	Apply 32 oz per acre in furrow at planting and 32 oz per acre at first bloom. Depending on the variety, successive applications of 32 oz per acre can be applied every 6 weeks throughout the plant's life cycle.
Sod Farms	Apply 16-64 oz per acre when applying fertilizer—either as a preplant or after the sod is established.
Nursery/Greenhouse Crops	Apply a constant feed in order to deliver 25-50 ppm of polymer in a continuous feed irrigation system. If only feeding once a week, apply 100-200 ppm.
Granular Fertilizer	Apply 1 gallon per ton. Fertilizer blend should not contain more than 40% urea. If blends contain more than 40% urea, drying amendments may be needed.

PKMe Research and Field Trials

41 Crops–911 Trials–29 States
Updated May 2019

Crop	# Trials	Yield Increase
Alfalfa	3	15.15%
Bell Peppers	6	150 boxes
Bermudagrass	6	6.4%–36.3%
Cabbage	1	7.5%–11.9%
Cannabis	1	18%
Celery	1	13.3%
Chrysanthemum	1	Bloom count 11.4%
Citrus	1	1.55 tons
Collards	1	20.3%
Corn Silage	10	1.98 tons
Cotton	37	211 lbs
Cucumber	2	11.2%–14.5%
Dry Beans	7	$56.64/A
Eggplant	2	11%–14.5%
Field Corn	539	7.56 bu.
Grain Sorghum	7	22 bu.
Grapes	1	16.4%
Grass Seed	2	19.5%–33.3%
Grass Sod	3	9.6%
Jalapeno	2	22.1% wt.
Lettuce	2	18.6%
Onions	10	27.9%
Peanut	1	8.7%
Potatoes	24	56 cwts.
Pumpkin	2	8%–14%
Rice	3	12.8%
Snap Beans	11	$122/acre
Soybeans	74	3.14 bu
Squash	1	17.4%
Sugar Beets	7	$64.57/acre
Sugar Cane	7	578 lbs
Sunflower	1	11%
Strawberries	1	15%
Sweet Corn	11	8.5%
Sweet Potatoes	1	12.5%
Tobacco	1	25.7%
Tomatoes	32	7.8%–13.9%
Triticale	1	340 lbs–516 lbs
Turnip	2	14.6%–18.4%
Watermelon	4	21%–28.4%
Winter Wheat	82	8.74 bushels