Ammonium Phosphate Liquid

Efficient Polyphosphate Liquid Superior to Granular Fertilizer

The Liquid Advantage

- *Easy Handling*
- *Speedy Application*
- *Uniform Application*
- *Higher Agronomic Value*
- *Compatible with pesticides*

P

SYMBOL

CRYSTAL STRUCTURE (2)

ACID-RASE PROPERTIES

COVALENT RADIUS	1.06	2.1	ELECTRONEGATIVITY
ATOMIC RADIUS	1.28	2.97	HEAT OF VAPORIZATION
IONIC RADIUS	2.14 (-3)	0.15	HEAT OF FUSION
IONIC RADIUS	0.34 (+5)	10^{-17}	ELECTRICAL CONDUCTANCE
ATOMIC VALUE	17.0	-	THERMAL CONDUCTANCE
FIRST IONIZATION ENERGY	254	0.177	SPECIFIC HEAT

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Granular Fertilizer Found To Be INFERIOR TO LIQUID In CALCAREOUS SOILS.

SUMMARY:

Data indicates that GROW MORE's **Liquid Ammonium Poly Phosphate** fertilizers are superior to granular fertilizers for delivery of **Phosphorous (P)** to crops grown in alkaline and calcareous soils. Field and greenhouse experiments demonstrated the benefits, and the results were verified using isotopic and spectroscopic techniques.

Granular fertilizers such as single super and triple super phosphate *(calcium phosphate or calcium. polyphosphate)* were inferior to liquids due to the precipitation of insoluble aluminum calcium phosphates in the fertilizer zone *(in and around the granule)*. Isotopic studies verified **P** diffusion from the soil incorporation zone was inhibited with granular application. Liquid supplied **Ammonium Poly Phosphate P** had minimal fixation.

Alkaline and calcareous soils, abundant throughout the world, constitute a major soil type for agricultural use. These soils are characterized by low annual rainfall - between 9 and 14 inches (22 to 36 cm)

The results of the study focused, specifically on the reaction of granules (*calcium phosphate/calcium polyphosphate*) and liquid **(Ammonium Poly Phosphate)** fertilizer in these soils, and characterize the solubility of these nutrients and their availability to plants.

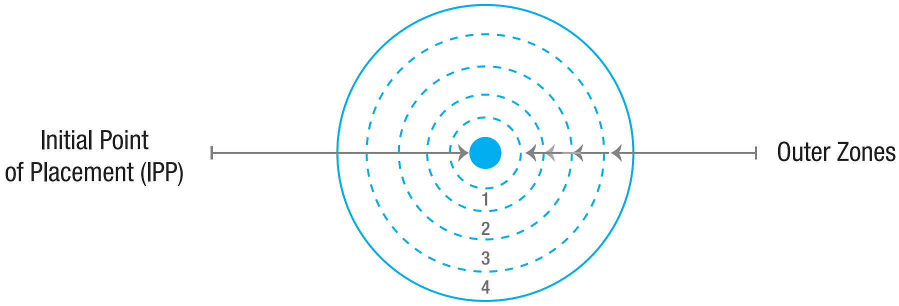
IMPROVED DIFFUSION:

Study results show that **granular calcium phosphate (GCP)** or calcium polysulfate based fertilizer which includes MAP, DAP, single or triple super phosphate is an extremely inefficient source of **P** in calcareous or alkaline soils, due to the poor dissolution of the granule into the surrounding soil.

Greenhouse Petri Disk - Examination of total **P** concentration in the various zones around the granule indicate a marked difference in distribution of **P (from the initial point of placement - IPP)** when compared to **Liquid Ammonium Poly Phosphate (LAPP)**

RESULTS:

GCP supplied **P** was concentrated in the first zone around the granule - **LAPP** supplied **P** in the liquid form allowed much more of the P to diffuse away from the **initial point of placement (IPP)** into the outer zones of soil.



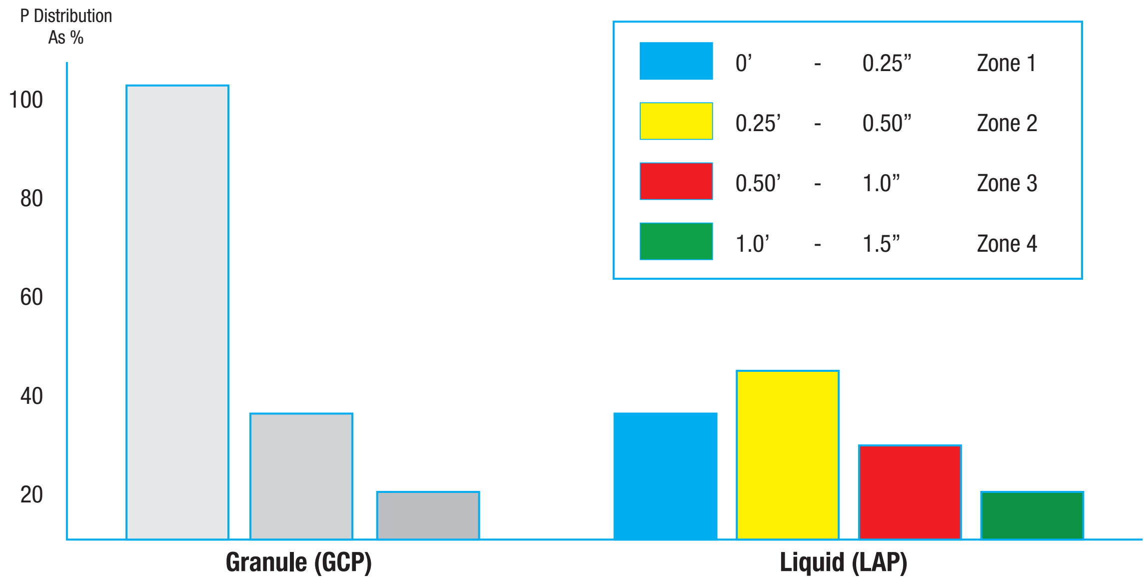
Over 80% of P supplied as GCP was still 0.25 inches (0,64 cm) from point of placement.

Fig. 1

In contrast, the **LAPP** applied **P** was found between 0.25 and 0.5 inches (0.64 - 1.27 cm) from point of placement.

ISOTOPIC DILUTION - verified that relatively more **P** was exchangeable when applied as **LAPP** than **GCP**, therefore **P** not only diffuses farther from the **IPP** but also remains more readily available **(Isotopically Exchangeable)** when applied as a liquid.

The explanation for this is related to the fact that after the initial rapid dissolution of the granules, a significant percentage of **P** (10 to 20%) does not diffuse out of the granules within a 12-week period. Evidence of this was obtained by exposing granules for different time periods in calcarious soil, while maintaining soil water holding capacity at 60%, the distribution of **P**, **Ca** and **AL** were then determined at 5 weeks and 12 weeks.



Percentage of P from Fertilizer at Different Distances from Initial Point of Placement (IPP)

Fig. 2

What is clear from x-ray diffraction examination of the soil surrounding the fertilizer granule is that several crystalline phases were identified including the poorly soluble cranciallite $[CaA]_3 (P0_3)_2 (OH)_5 (H_20)]$. Clearly, crandallite is a poor source of **P** for crops grown in calcareous soil, even in long-termed growth.

Additional data from the isotopic dilution studies clearly showed that when **P** was supplied at different rates as a granule **(GCP)**, a large portion of **P** was rapidly fixed.

Conversely, application of liquid phosphate (**LAPP)** diffused more readily into surrounded soil and also appears to mobilized native **P**.

CALCAREOUS SOIL - Soil containing sufficient calcium carbonate (often with magnesium carbonate) to effervescence visibly when treated with cold aln hydrochloric acid.

ALKALINE SOIL - Any soil that has pH > 7. The degree of acidity or alkalinity ranging from extremely acid pH < 4.5 to very strongly alkaline pH 9.

CONCLUSION:

The **P** bio availability measured in the plant uptake experiment demonstrates that application of liquid ammonium poly phosphate facilitates the more homogeneous distribution of soluble orthophosphate or polyphosphate ions in the soil, avoiding precipitations of solid phase calcium phosphate or calcium polyphosphate in the zone of fertilization.

Why is nutrient uptake improved when **Liquid Ammonium Poly Phosphate** fertilizer is surface applied *Fig. 3*.

The movement of LAPP in soil with subsequent irrigation water can be up to 30cm horizontally and 25cm vertically encouraging deeper root growth.

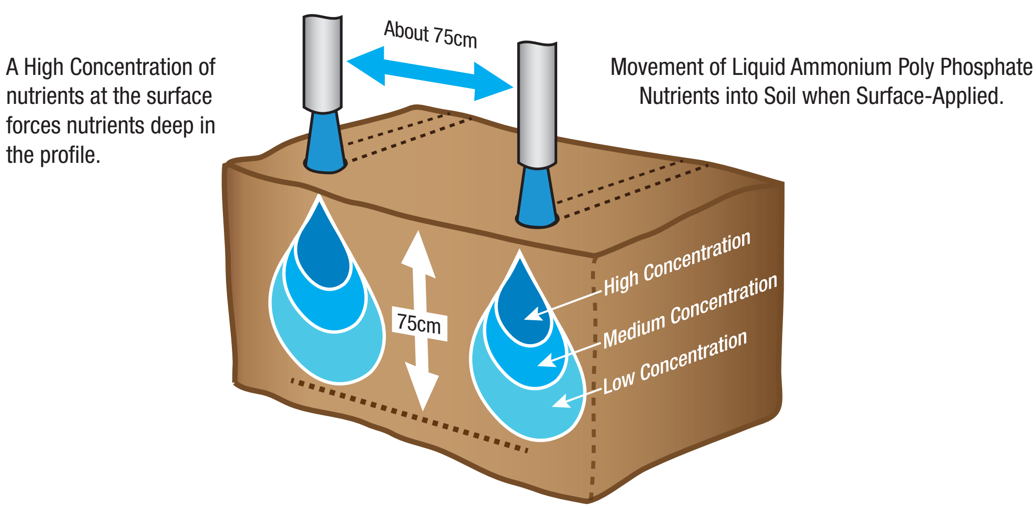


Fig. 3