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Featuring an Exclusive UVI Report
on V.Gro Vermiculite-Based Fertilizer

Banana planted in V.Gro showed exceptional growth and yields

Factors Involved in the Efficiency of IBI/Canmin V.Gro Vermiculite-Based Fertilizer in the Growth and Yield Enhancement of Agricultural Crops

Summary: V.Gro is a composite fertilizer and soil enhancement product comprised of exfoliated Premium Namekara vermiculite plus other mineral matter from the Namekara Mine in Eastern Uganda. Namekara Vermiculite has been approved by the Organic Materials Review Institute (OMRI) with the OMRI Seal as being suitable for certified organic production. The Namekara vermiculite deposit is a typical volcanic carbonatite complex, rich in many beneficial minerals. In addition to major minerals, more than 50 minor micronutrients can be found in V.Gro. The pH of V.Gro is close to neutral (6,8 to 7).

V.Gro agricultural properties:

V.Gro exhibits a number of characteristics that make it particularly effective for agricultural applications. V.Gro enhances early germination and provides a very good environment for emerging seedlings. V.Gro subsequently provides the emerged seedlings with an environment conducive to growth and gives a head start for early root development. V.Gro then continues to aid overall plant growth and yield through the growing cycle.

V.Gro properties that enhance crop response:

- High water holding capacity
- Excellent cation exchange capacity
- Aeration and thermal properties
- Ability to capture atmospheric nitrogen
- Good thermal (insulating) ability, and:
- Beneficial properties as 'rock mulch.'

Aeration and thermal properties

Aeration capability is critical, because without adequate aeration, plant roots cannot grow properly. Roots must have adequate levels of oxygen from the soil and aeration is the process that facilitates oxygen exchange. Eighty percent of all plant problems start with soil or root problems -- good aeration can be instrumental in preventing or alleviating many of these problems.

Water Holding Capacity

This characteristic enhances germination and root and shoot development and

continues to provide the benefits of moisture retention throughout the growth cycle.

High Cation Exchange Capacity (CEC)
Cation exchange capacity is a value given on a soil analysis report to indicate its capacity to hold cation nutrients. The cation process captures available ammonia (nitrogen ions), magnesium, potassium and calcium for slow release as the plant requires it.

The CEC function indicates a condition or possibly a restriction that must be considered when working with a particular soil. The two main colloidal particles in soils are clay and humus and neither is practical to apply in large quantities.

Capturing atmospheric nitrogen
The nitrogen cycle is both important and complex. Nitrogen Fixation is the process by which the air's nitrogen is converted to nitrates and ammonia, both of which are critical to plant growth.

Nitrogen gas makes up 78% of the volume of the Earth's atmosphere, and with the assistance of certain bacteria, algae and fungus*, atmospheric nitrogen (Dinitrogen N2) is is made available to most plants. Once converted into ammonia ions by nitrogen fixation, it is held by V.Gro, due to the vermiculite's high cation exchange capacity, for later release.
* Cyanobacteria and Blue-Green Algae are essential to all life on earth. They create the fundamental building blocks for each cell in all plants.

Lightning and photochemical fixation
Lightning discharges and sunlight convert a small amount of atmospheric nitrogen to nitrates.


Root development is dramatic with plant on left grown in V.Gro compared with control.

V.Gro as a significant minerals source
V.Gro is an excellent source of a variety of minerals that are important to plant growth, including magnesium, copper, and manganese

Magnesium
V.Gro contains about 9 to 12% Magnesium. Plant roots absorb magnesium as the divalent cation Mg^{2+}. Carl Sprengel first established the essential role magnesium plays in plant growth in 1839.

Magnesium has an important function in the formation of chlorophyll.

Chlorophyll is what gives plants their green color such as in their leaves. Chlorophyll contains about 7% magnesium. Chlorophyll is essential for photosynthesis, the process by which green leaves synthesize carbohydrates, fats, and proteins in the presence of sunlight. Plant dry matter usually contains 0.2-0.5% Mg which is relatively mobile in the plant. About 15 to 25% of the Mg in plants is associated with chlorophyll.

Cob size is significantly larger with plants grown in V.Gro compared with cob from control shown on left.

Magnesium plays an important role in the formation of carbohydrates, fats and vitamins. It also activates the formation of the polypeptide chain from amino acids and aids in a number of physiological and biochemical functions including phosphate transport. It is required for maximum activity of energy phosphorylating enzymes in carbohydrate metabolism.

Magnesium is also known to be essential for many of the constant energy reactions taking place in plant cells and as an activator of several enzymes. In addition, it serves as a structural component in rhibosomes and appears to stabilize the rhibosomal particles for protein synthesis.

Magnesium is not only important in the formation of chlorophyll for photosynthesis but also for phosphorus related functions essential for enzymatic and energy transfer processes as well as for proteins and carbohydrates. In addition, magnesium plays an important role as a phosphate carrier within the plant.

Copper

Copper has a number of attributes important in the plant growth cycle:

- Copper is essential for chlorophyll formation
- It is vital in many plant enzymes
- Copper is involved in electron transfer
- It is critical in enzyme systems associated with grain, seed, and fruit formation
- It has a marked effect on the formation and chemical composition of cell walls

Elevated copper concentrations might also contribute to protection of the emerging plant from fungi and other pests. Copper-based products, for example, are used as fungicides and algaecides.

Manganese

Manganese performs a number of important functions in plant growth:

- Manganese has a role in production of chlorophyll, but is not a component
- It is involved in electron transfer reactions
- Involved in enzyme systems, arginase and phosphotransferase
- Involved in enzyme systems of sugar metabolism
- Participates in the oxygen-evolving system of photosynthesis.
- Involved in electron transport in chloroplasts.
- Involved in transfer of electrons from water to the photosynthetic II protein fraction .
- It accelerates germination and maturity.

V.Gro is a moderate source of: phosphate, potassium, and iron

Phosphate
Phosphate is essential for all plant growth, because it is needed for energy transfer.
Because phosphorus is so easily fixed in iron-aluminum rich soil (especially in acid soils), crops and pasture take up only 5 to 20% of phosphorus applied to the soil.

Potassium
Potassium is major ion inside every living plant and animal cell.

Iron
Iron is critical for chlorophyll formation and photosynthesis. It is also important in enzyme systems and respiration in plants

Micronutrients in V.Gro include Titanium, Silica, and Zinc

Titanium
Potentially has a photo-catalytic and oxidizing function

Silica
Silica performs a number of functions in plants and soil:

* In epidermal cell walls it reduces water loss by cuticular transpiration
* Acts as a barrier against invasion of parasites and pathogens in endodermis cells of roots
* Increases epidermal layer of leaves' resistance to fungal attacks
* It is associated with incorporation of inorganic phosphate into ATP, ADP, and sugar phosphates.
* It is a structural component of some plant species such as rice.

Dr. Peter van Straaten, University of Guelph, shown with maize grown in V.Gro.

Zinc

Zinc functions in plants or soil include involvement in:

- A large number of enzymes, including dehydrogenases, aldolases, isomerases, transphosphorylases, RNA and DNA polymerases
- Carbohydrate metabolism
- The rate of protein synthesis

Additional background on the use and properties of V.Gro

Use in Uganda: V.Gro has been used successfully on many different crops in Uganda. Yield increases of more than 100% have been seen in Groundnuts and Cabbages where V.Gro was applied.

Will not burn: V.Gro can be applied directly on top of or below seeds. Unlike many chemical fertilizers, it will not burn or damage seeds or sprouts.

DAP and NPK acidity: NPK and DAP have a tendency to make soil acid. For every kilogram of chemical ammonia in DAP, 2 to 5 kilogram of lime needs to be applied to neutralize the acidifying affect.

Phosphate uptake: Chemically liberated phosphate applied on soil with a pH below 5 is not of much use to plants. Applied phosphate will form strong bonds with the aluminum-iron component in the soil and thereby will not be available to plants.

pH readings essential: Soil tests will be misleading unless all elements are considered. Knowing the pH (acidity) is critical in understanding the soil's fertility or lack thereof.

As an extender: V.Gro can also be used as a chemical fertilizer extender by mixing a small amount of DAP or NPK (in a soluble form) with V.Gro . However, it is important to note that the resulting mixture has the potential burn seeds and emerging sprouts.

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