

ZUMSIL ® IMPROVES WATER QUALITY

To learn what are the beneficial effects that ZumSil imparts on water we first need to explain what ZumSil is.

ZumSil is a natural amphoteric (2) polymer (1) with tetrahedral structure, high stable hydrogen saturation, which gives ZumSil its unique chemical properties. Although it is characterized as a base due to its high pH (13), it is stable in almost all environments besides retaining its defined electrical properties.

This makes it a unique product containing one of the highest percentages of Monosilicic acid (24 +/- 2 % of SiO_4H_4) as active ionized silicon.

Now, that we know what this product is, we will explain the difference between the properties of acidic waters and the properties of alkaline waters treated with ionized ZumSil.

WATER

Plants are perfect “machines” for food production; they are the only living entities that can transform pure chemicals (N, P, K, Ca, Mg, etc...) into protein, amino acids, hormones, enzymes, etc... However, in order to maintain and protect these properties,

we must also preserve the quality of the raw materials that are essential to plants' livelihood and development: Air + Water + Nutrients.

Water is a solvent for many substances such as inorganic salts, sugars and organic anions and is the media in which all biochemical reactions occur. Water allows mass flow and distribution of solutes and, therefore, is essential for transporting nutrients and metabolites across the plant.

Since water is the major component of fresh herbaceous plants (80-90% by weight) and represents more than 50% of “wood” type plants, directly or indirectly, it affects most of the physiological processes taking place in the Agro ecosystem.

Plants have a huge daily demand of water and more than 90% of water entering the plants through the root system; it disperses into the air as water vapor. This loss of water in vapor form is called transpiration, which is a necessary consequence because the stomata remain open, for the plant to capture carbon dioxide

-CO₂- needed for its photosynthesis process. For example, a corn plant needs between 160-200 liters of water to grow from seed to harvest, and 1 ha. of land planted with corn consumes nearly 5 million liters of water per harvest.

1 Polymers are natural or chemical compounds of high molecular weight consisting of long molecules made of a series of repeated simple monomers bonds, obtained by polymerization process, where small molecules are joined together to form large molecules.
2 amphoteric is the term given to a non-acid / non-alkaline, yet is able to give and accept protons so it serves both acid and base.

But, what is the best type of water for our culture/crop?

Water molecules are in constant motion and these movements depend on their free energy: positive ions (3). This is the energy that we are interested in agriculture, since this energy is the one that makes available the largest amount of minerals present in the medium and by improving CIC (4) more nutrients can be supplied to the crops.

For example, a soil test determines the level of exchangeable ions of a mineral, not the total amount of this mineral in the soil, because interchangeable minerals, or plant available minerals, is the only form which plants can absorb minerals.

PH AND ITS ROLE IN THE DEVELOPMENT OF PLANTS

PH is the indicating unit of acidity and alkalinity density of water. The significance of the letter's "pH" is: "p" ("potential") and "H" (hydrogen), hydrogen potential. PH can be measured on a scale ranging from 0 to 14, with 7 being the neutral point (neither acidic nor alkaline) where the hydrogen and hydroxide ions are the same.

When the pH is less than 7, the solution is acidic, and when more than 7 is alkaline. The scale is logarithmic, based on ten. This means that each one unit of this scale is in effect 10 times more than the previous unit. For example, a drink with pH 4 is 10 times more acidic than any other drink with pH 5.

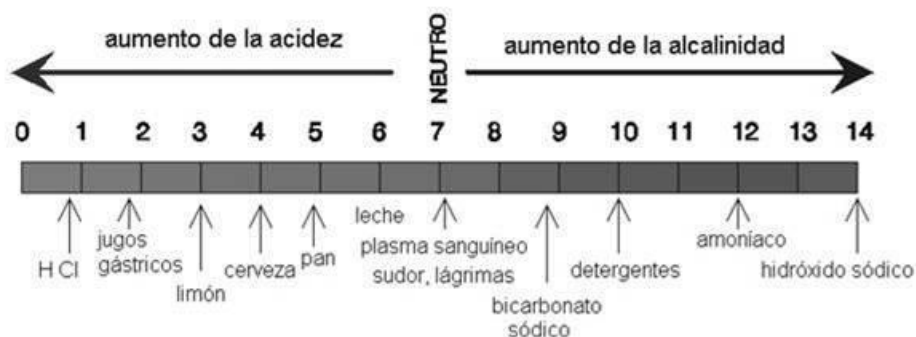


Figure 1 Importance of pH in different types of solutions or products

(3) Positive ions are also called "exchangeable ions," since they can be exchanged for other ions present in soil solution.

(4) CEC – Cations Exchange Capacity (a Cation is a positively charged ion). This is a soil characteristic that describes the total amount of exchangeable cations that the soil can retain.

A higher ICC indicates an increased ability of soil to absorb and retain nutrients and therefore, increased availability to the plant.

Most commercially important plants develop at neutral pH (6.5 - 7.5). When the seed germinates, water is 80% by weight and the pH is neutral.

As the plant develops, the natural processes of growth make our plant more acidic and it dehydrates. If we add to these natural processes, products normally used such as: fertilizers, pesticides and herbicides, we have created an Acid-prone system.

It is also true that most of the processes of organic material decomposition are acidic and produce toxins, but in a balanced environment these toxins are manageable (and even necessary), being easily neutralized by processes of biogeochemical cycles.

The root cause of the problem is when conventional agricultural processes (of reaction), lead us into habits of improper over use of fertilizers and pesticides, creating an ideal ecosystem for pathogens growth, but toxic to all of us.

This is NOT cost effective for either Farmers or the Ecosystem.

The Importance of Maintaining a Balancing pH

The relationship of nutrition to the alkalinity of the interstitial space (surrounding all cell and tissue of the plant including the sap) is extremely narrow.

Ideally, we have to maintain a slightly alkaline pH for good health of our plant.

A pH of 7 is neutral, neither acidic nor alkaline. Plants are designed to maintain a pH of fluids between 7 and 7.5 and altering this pH it will affect the exchange of oxygen and nutrients between the fluids and tissues.

When nutrients with water create a slightly acidic environment, the plant enters into a state of emergency, doing everything possible to restore the ideal balance. This is done by overusing fluids and essential minerals, which generates an acidification of the tissues.

The vast majority of the enzymes need an environment with a pH between 6 and

8 to function correctly, therefore keeping the fluids above pH of 6 is extremely important.

PH is mainly affected by: age of the crop, the amount of fertilizer and / or pesticides used and the quality or abundance of water consumed. A lot of diseases are associated with tissue acidosis. However, it is an interesting aspect that diseases do not survive in an alkaline environment where tissues are well oxygenated

ACIDOSIS SYNDROME

Negatively charged ions (anodes), gather at the positive pole creating acidic water.

This slightly acidic water is used in insecticides, and fungicides, with the intention of destabilizing the ideal medium for the proliferation of the pest, thus influencing their chemical resistance allowing the chemicals to perform much faster.

However, we must also consider that there are more effective methods available, which do not interfere with the growth process of the crops.

As we said earlier, plants consume large amount of water daily and 90% transpires as a result of uptake and transformation processes of nutrients.

These dehydration processes make the plant acidic, if we add more acid water, the plant will seek to eliminate these impurities by dehydrating itself even more, using precious liquids near the surface of the soil, from the cells, then using the phloem and finally the xylem.

This situation cannot be solved by simply adding regular water which has a pH between 4 and 6, because we are adding more acidic waste to the already accumulated acid and this will further weaken the plant immune system. At this point, the plant will start using up the reserve of calcium enzymes in order to neutralize the effect of toxins.

This decreases cell elongation, reduces stomata regulation and metabolic processes of absorption of other nutrients as well as enzymatic and hormonal processes, which then generate small, deformed chlorite leaves, poor growth, root developmental delay, damage to the fruit and opening the door to any disease that could further weaken the crop or simply lower production.

This is not profitable for Farmer or to the Agro Ecosystem.

ACIDIFICATION = DISEASE

The longer we keep our planting within acid ranges, the lower the amount of oxygen in the tissues, compromising cellular activity increasing free radicals (5) that will lead to greater accumulation of hazardous deposits which over time will

cause disease, creating the ideal environment for recurring pest attack, thus justify the vicious circle of pesticides use.

WATER ALKALINE WITH ZUMSIL

The soil, plants and soil-plant system, is a complicated matrix, much more that the human body, especially considering the soil-plant-ecosystem.

We will call this relationship: Agro Ecosystems which are open systems, in a constant state of change: humidity, temperature, pressure, sunlight, fertilizers, pesticides, radiation, etc.

All systems tend to stability and this trend manifests through chemical reactions, physical, biological, individually combined or as a chain reaction, which are all interconnected to each other and usually occur simultaneously (precipitation, dissolution, synthesis, oxidation, evaporation, leaching, polymerization, etc., etc.).

However, in nature there are certain processes that are considered DOMINANT and it is also possible that each component of the system contains its own dominant process, but it is the element WATER present in all three components of the agro ecosystem, and is very possible that may control the behavior, content and concentrations of each element of the system.

(5 Free Radicals: Hazardous oxygen atoms with positive charge ("Reactive Oxygen Species") that are desperately hungry for negative charges (electrons).

By adding ZumSil ®, Active Ionized Silica (SiO_4H_4), to common water, not only do we add silicon to water but also add an excess of electrons (OH^-), which define the attractions between the atoms, reducing the size of the water molecular groups, which changes the chemical and physical aspects of the water to be used.

This change generates a series of benefits that current scientific knowledge has not yet been able to define how they are performed.

Numerous studies conducted by Dr. V. Matichenkov (6) have determined that water alkalized with ZumSil ®, reduces the toxicity of heavy metals by generating a thermodynamic reaction where Monosilicic acid forms insoluble silicates with heavy metals.

We call this a dominant process of precipitation.

However, a second process occurs whereby Monosilicic acid forms soluble complexes with minerals such as Fe, Ca, Mg, P, K, and this is called a process of complex formation.

In Ca, a very interesting situation occurs: if there are large amounts of Ca, the relation of Ca with Monosilicic acid changes, from complex formation, to precipitation.

To summarize: in Nature, there are many biogeochemical processes taking place simultaneously, however the direction of the transformation of the system is "managed" by dominant processes and ZumSil ® activated waters make these processes a lot more effective.

ADANTAGES OF USING ZUMSIL ® IN WATERS:

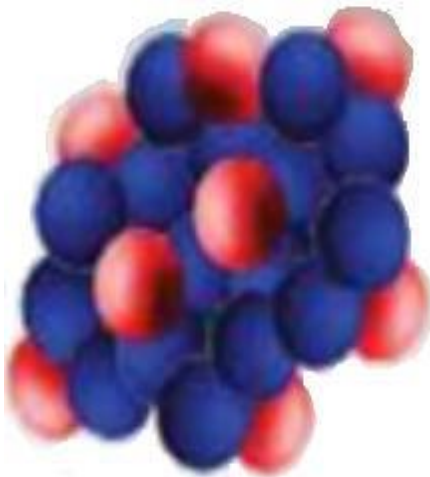
1) Hexagonal Water of small's molecular clusters:

a. The groups of water are usually 13 to 15 molecules. Water Hex is a group of 6 molecules of water, which is the most stable and natural in nature.

b. A cell can contain 70.000 molecules of which 65% are hexagonal water clusters. Diseased cells are associated with lower amount of hexagonal water molecules.

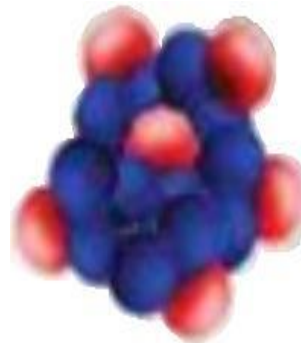
c. Small groups of molecules make different waste metabolic processes of absorption of nutrients and their transformation, are easier to dissolve and expel, delaying the senescence processes.

d. The application of any agricultural inputs (pesticides, fertilizers) penetrates easily on the ground, being able to lower doses by 20 to 40%. Even with pesticides that are acid, it is recommended for implementation.



ACIDIC WATER

- Contains Micro-particles between 15 and 30 molecules limiting its Absorption capacity by plants
- Contributes to soil acidity and to plants' Diseases related to acidosis.



WATER + ZUMSIL

- * Contains Micro-particles between 4 and 6 molecules of easy penetration and better absorption
- * It helps re-establish an Optimum pH level, allowing Plants to fight - off diseases

2) Abundant mineral assets:

- a. ZumSil treated waters contain a greater number of dissolved minerals and micro clusters.
- b. Minerals are better absorbed assets thus increasing plant's nutrition & decreasing energy expenditure used in the processes of photosynthesis.

3) Good Food:

- a. Maintain the balance of bacteria flora and increases decay (Saprogenic) of certain probiotics. (7)
- b. Control of pathogenic microorganisms and prevent disease.
- c. It alone can restore the health of the crop and help to multiply flora in the agro ecosystem.

4) Removes oxygen or free radicals:

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- a. Having an excess of electrons block the reactive oxygen. (8)
- b. It stimulates the plant to produce greater amounts of flavonoids, tocopherols and carotenoids.

(7) If pesticides eliminate a pest killing or fungus or bacteria responsible (along with others are not responsible), the probiotic prevents the problem, enriching the bacterial micro flora positive, or for life, which work by colonizing and taking territorial exclusion to pathogen and creating a security zone

(8) The highly reactive oxygen atoms and unstable (free radicals) are released when during the generated metabolic processes in cells to produce energy, but also influences external absorbed when the plant receives pesticides or radiation. The instability of free radicals is because they have lost one of its electrons and try to replace it taking it from other atoms. This creates a chain reaction that causes extensive damage at the cellular level, since when have greater oxidation power accelerating the processes of senescence and / or predisposes the plant to disease..

Benefits of using water alkalized by ZumSil ® in Crops

- Promotes cell growth and crop development.
- Decreases abiotic stress (salinity, heat, excessive rain, frost, etc.)..
- Increased fructose and glucose content (Brix).
- It reinforces the viability of the plants, minimizing the damage from insects and fungi.
- Increases beneficial occurrence of Trichomes in the leaf tissue defending against insects.
- Improves absorption of sunlight by plants.
- Increase availability of potassium, nitrogen, calcium and phosphorus in the agro ecosystem.

- Increases the concentration of chlorophyll per unit area in leaf tissues.
- Stimulates the activity of worm-compost, peroxidase and polyphenoxidase
- Following yeast infection
 - Strengthens skin tissue with an outer layer of silica 2μ , protecting and hardening the outer fabric.
 - Promotes more efficient use of CO₂ by plants.
 - Monosilicic acid controls and induces the formation of secondary & tertiary roots
 - Immobilize heavy metals in soils and plants.