International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2018; 6(4): 3248-3253
© 2018 IJCS
Received: 22-05-2018
Accepted: 28-06-2018

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A review: structured water technology: its effect on productivity of agricultural crops

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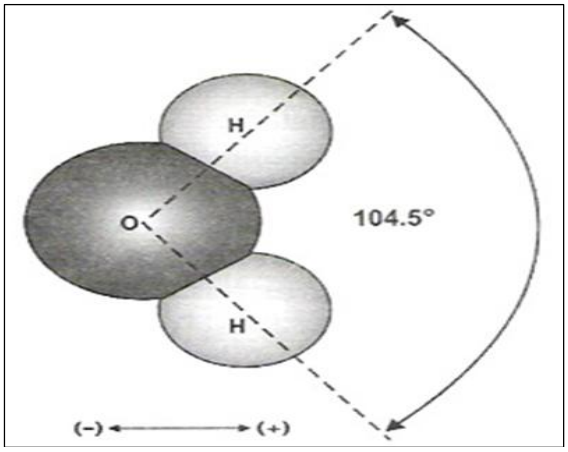
Abstract
Water is one of the most essential components of the plant body, regulates the body's temperature, cushions and protects vital organs. Structured water is hexagonal in structure because it has six sided molecules. Hexagonal water has a 109.5^0 angle - a wider angle which creates a 3 dimensional pattern where each water molecule serves as the donor and the acceptor of 2 electrons. Structured Water Technology changes the Physical & Chemical parameters of natural water, resulting in improvement of filtration properties and increase dissolving properties of water. Irrigation with magnetized water increased leaf fresh weight (22%), stem fresh weight (19%), root fresh weight (47%), total fresh weight (24%), leaf dry weight (20%), stem dry weight (20%), root dry weight (47%), total dry weight (22%), leaf area (26%), SLA (6%), LAR (4%), RWR (18%), stomatal conductance (22%) and WUE (22%) as compared to ordinary water in cowpea crop (O. Sadeghipour, P. Aghaei, 2013). Irrigation of chick-pea plants with magnetic water significantly increased number of pods per plant, pods weight (g plant^{-1}), number of seeds per pod, 100-seed weight(g), seed yield (g plant^{-1}), straw yield (g plant^{-1}), biological yield (g plant^{-1}) compared to irrigation with tap water (Hozayn M, Abdul Qados AMS. 2010).The irrigation of sugar beet plant with magnetized water increased significantly beet quality by increasing sugar concentration by 4.07%, TSS by 1.04%, quality by 2.91% and recoverable sugar by 8.25% compared to beet plants irrigation with normal water (Hozayn *et al*. 2013).

Keywords: Structured water, magnetized water, hexagonal water

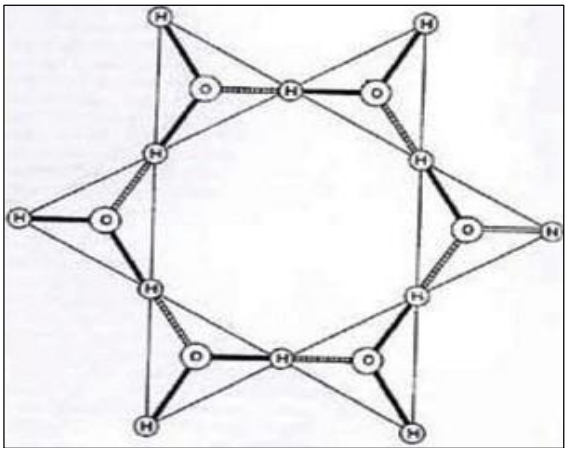
Introduction
Water is one of the most essential components of the plant body. It regulates the body's temperature, cushions and protects vital organs. It constitutes more than 90% of protoplasm by volume and weight. Water scarcity presents this century's biggest challenge for humankind. Most fresh water in the world (roughly two-thirds) is used for growing crops. Agriculture thus is the largest sink for fresh water on this Planet. 'How to grow food with less water' is perhaps the most fundamental question in exploring sustainability from a scientific standpoint. The understanding of unconventional methods needs much greater and urgent attention than is being given at present. One such method is the structuring of water into crystalline patterns, also known as the fourth phase of water or structured water.

What is Structured Water?
Structured water is water in it's natural, balanced state, both energetically and materially, yet, cleansed of matter and energy that isn't congruent with nature, simply means water that is arranged in a crystalline pattern at the molecular level (Prof. Gerald Pollack from the University of Washington). Structured water is hexagonal in structure because it has six sided molecules. Hexagonal water has a 109.5^0 angle-a wider angle which creates a 3 dimensional pattern where each water molecule serves as the donor and the acceptor of 2 electrons.

What is Corrupted Water?
Corrupted water can be defined as water in an unnatural, imbalanced state, both energetically and materially, deficient in life enhancing minerals and polluted with life depleting energy. Bore well water is energy deficient and imbalanced because its maturation process is interrupted when pumping it from the aquifer. Sanitizing chemicals used to "purify" water introduce corrupt energies into water. Water loses its energetic qualities by flowing through straight pipes. Dams create corrupted water by interrupting the natural flow.



Normal Water



Structured Water

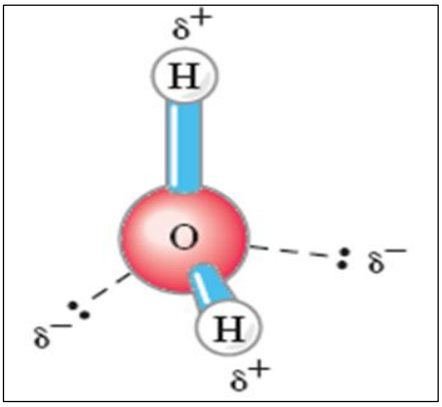
What is structured water technology?

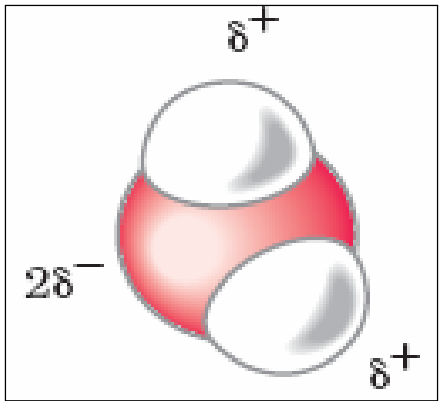
Structured Water Technology changes the Physical & Chemical parameters of natural water, resulting in improvement of filtration properties and increase dissolving properties of water. Agricultural sciences take an interest not only in the common and valued crop-farming factors, but also in those less expensive and generally underestimated, though more pro-ecological ones, such as magnetic and implosion technology. Structured water Technologies are natural energy generators that correct corrupt electromagnetic frequencies and enhance natural electromagnetic frequencies. These technologies employs an innovative application and advanced understanding of the vortex phenomenon utilizing the dynamic characteristic of water itself to create a unit that works at the molecular and electromagnetic level. These units alter the molecular structure of the water, which activates it and allows it to absorb healthful frequencies. Structured Water Devices create soft water without taking the life-enhancing minerals like calcium and magnesium out of the water. These units use rare earth minerals and quartz compression to produce radiant energy frequencies that effectively reduce the surface tension and cluster size of water. This accelerates water's ability to hydrate plant tissues, penetrate soils and conserve water.

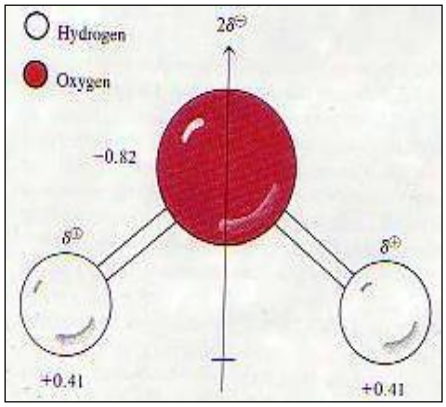
The magnetic field changes water properties due to displacement and polarization of water atoms. Therefore magnetic fields magnetize the water's ability to soak solid matter will be increased. Magnetic field changes the physicochemical properties of water; these changes include decreasing water surface tension and increase viscosity. (Faten Dhawi, 2014) [7].

Structure of Water

"Water molecule" is dipolar. The net charge of water molecule is zero. But O-H bond is polar because O is more electronegative than H. Sharing of electrons between H and O is unequal. The charge on O = -0.82 and on H = +0.41. This charge separation produces permanent dipoles.







Structured water technology used in agriculture

1. Mag Green Structured Water Technology

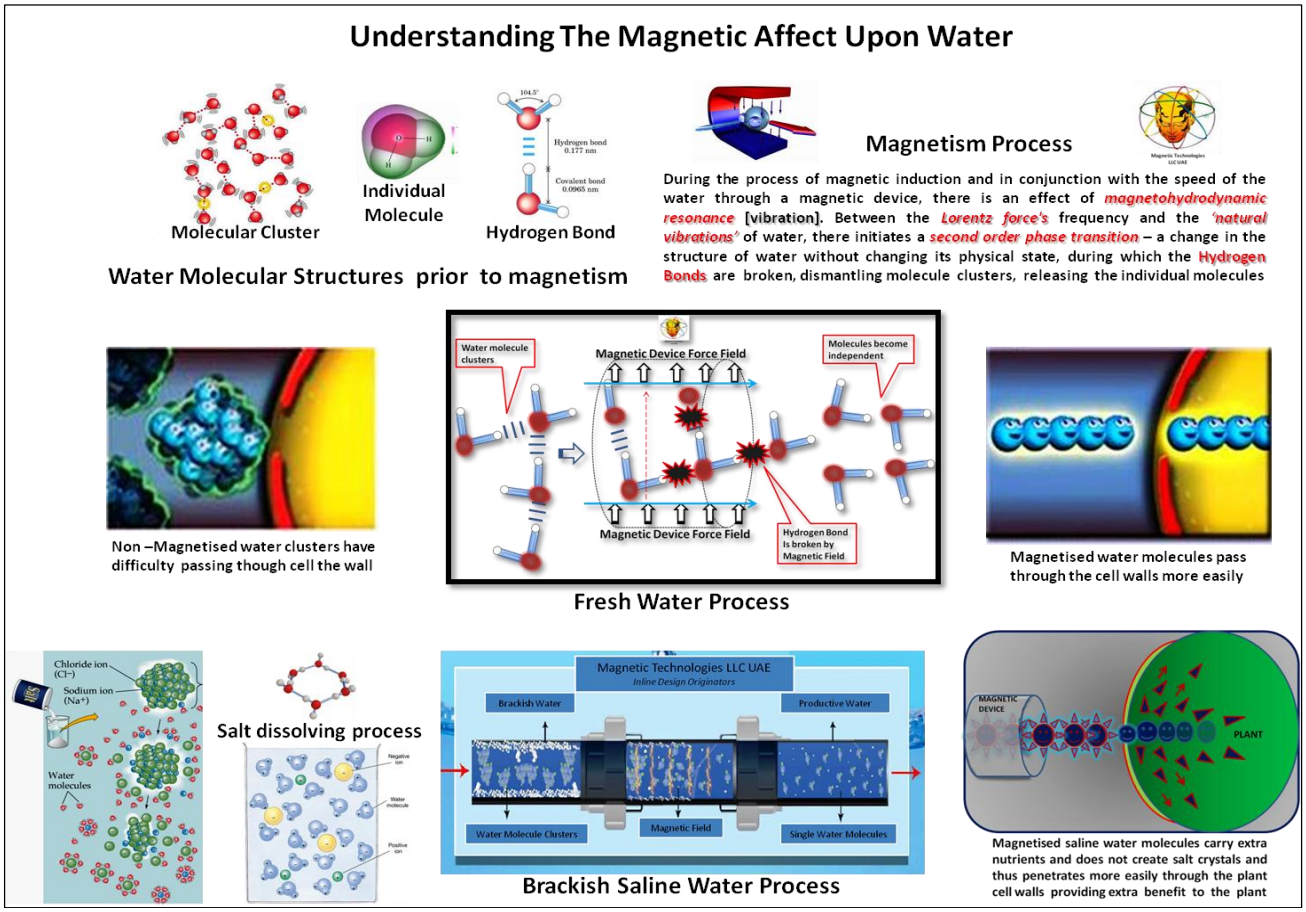
Magnetic Technology is the outcome of more than 30 years of constant research, observation and implementation. The research was initiated by 52 leading research institutes in Russia led by Prof. Yuri Tkatchenko, who is continuously working on this technology from the U.A.E. This technology derived from research in Russia during the 70's and 80's and since 1995, the research work is still continue from the UAE even after the scientists relocated from Russia, creating the Magnetic Patriarch Company Magnetic Technologies LLC. UAE.

What mag green structured water technology do…

Passing water through Mag Green Devices change its structure. This technology changes the Physical & Chemical parameters of natural water, resulting in improvement of filtration properties and increase dissolving properties of water. These changes results in an increase ability of soil to get rid of salts and get better assimilation of nutrients & fertilizer in plants during vegetation period.

How this mag green structured water technology works…?

Mag Green Structured Water Technology enhances nutrient mobility in soil and increases extraction & uptake of Phosphorus (P), Potash (K), Nitrogen (N) and iron (Fe) by plants. Magnetic Technology increases the efficiency of added fertilizers.

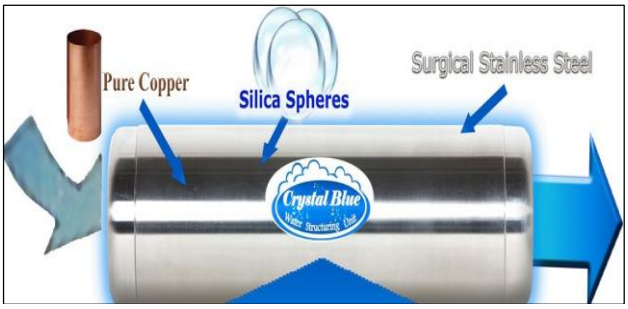


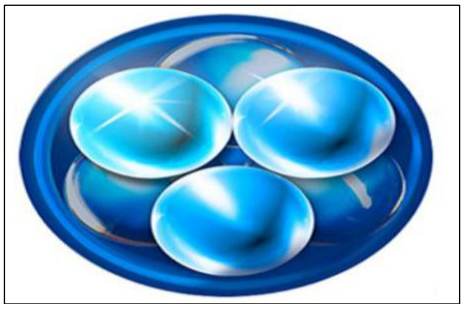
2. Crystal blue structured water technology

Crystal Blue Water Structuring Units are natural energy generators that correct corrupt electromagnetic frequencies and enhance natural electromagnetic frequencies. This alters the molecular structure of the water, which activates it and allows it to absorb healthful frequencies. Crystal Blue Water Structuring Units was inspired by the science of implosion technology that was first developed by the great Austrian naturalist, Viktor Schauberger.

Material used

1. Stainless steel: - outer layer of unit.
2. Mineral mixture: - constitutes inner layer of unit.
3. Silica spheres: - middle of the unit.
4. Pure copper rod: - in the middle of the sphere stack.





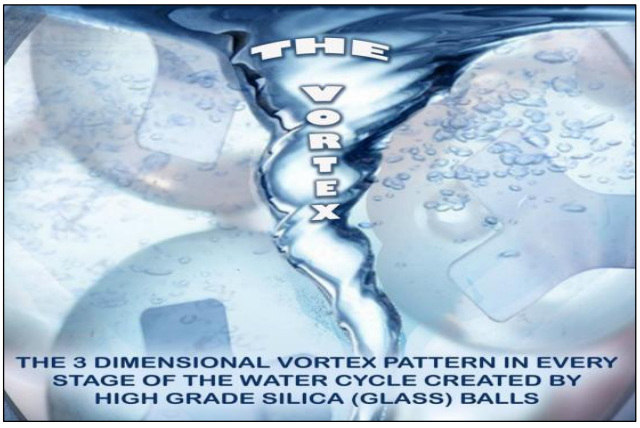
How the unit works…..?

The two primary forces that work upon water to structure it are:

1. Motion: - The vortex that is created by silica spheres, is a picture of perfect motion.
2. Energy: - The EMF spectrum that is created by mineral layer, reveals the fullness of light which is energy.

Water Vortexing

- When water begins passing through perfectly arrayed silica spheres it creates vortex.
- In a vortex the inner layers of water flow much faster than the outer layers and that the velocity at the centre of the vortex is infinite.
- The hydrogen bonds in the water molecules begin to stretch as these layers expand and contract.
- This opens the molecular structure of water for a constant interchange and exchange of electrons.



Water Energizing

- The mineral mix (compressed under pressure exceeding 13 tons/square inch of the crystalline material) produces a voltage across its opposite faces (piezoelectricity).
- Copper rod acts as an electrical attractant to conduct the piezoelectricity more effectively.
- It draws the electrical energies and mineral frequencies into the centre of the unit where the open molecular structured water is flowing.
- This feature further serves to charge the water with an abundance of natural energy.

Effect of structured water on production of field crops

Growth Parameters

Irrigation with magnetized water increased leaf fresh weight (22%), stem fresh weight (19%), root fresh weight (47%), total fresh weight (24%), leaf dry weight (20%), stem dry weight (20%), root dry weight (47%), total dry weight (22%), leaf area (26%), SLA (6%), LAR (4%), RWR (18%), stomatal conductance (22%) and WUE (22%) as compared to ordinary water in cowpea crop (O. Sadeghipour, P. Aghaei, 2013) [26]. Similar enhancing effect of magnetized irrigation water were reported on snow pea and chick pea (Grewal and Maheshwari, 2011) [8], flax and lentil (Abdul Qados and Hozayn, 2010 a, b) [2] and wheat (Hozayn and Abdul Qados, 2010 b) [1]. This improved growth may lead to an early canopy cover and a better competition against weeds, and thus more efficient use of nutrients and irrigation water. Positive effects of magnetized water on growth of root, stem and leaf of cowpea are very important since they appear to induce an improved capacity for nutrients and water uptake, providing greater physical support to the developing shoot. Better root growth and development in young seedlings might lead to better root systems throughout the lifetime of a plant (De Souza *et al.* 2006) [5]. The enhancement in leaf area and SLA in the plants irrigated with magnetic water must have increased photosynthetic rates due to the greater interception of light and the greater amount of assimilates available for vegetative growth (O. Sadeghipour, P. Aghaei, 2013) [26]. That irrigation chick pea plant with magnetized water significantly increased tested growth parameters as compared to pots which irrigated with tap water. Photosynthetic pigments (Chlorophyll a, Chlorophyll b, total chlorophyll a + b and carotenoids), were significantly increases in from irrigated plants with magnetized water as compared to irrigated plants with tap water. (Hozayn M, Abdul Qados AMS. 2010) [1]. Magnetic water increased significantly fresh and dry weight of leaf, stem, and root of broad bean as compared to tap water, these results are in line with those of (De Souza *et al.* 2006) [5]. Moussa (2011) [18] observed that pretreatment of seeds with magnetic field or irrigation with magnetic water increased leaf, stem and root fresh and dry weight of common bean.

Yield attributes and yield

Irrigation of chick-pea plants with magnetic water significantly increased number of pods per plant, pods weight (g plant^{-1}), number of seeds per pod, 100-seed weight (g), seed yield (g plant^{-1}), straw yield (g plant^{-1}), biological yield (g plant^{-1}) compared to irrigation with tap water (Hozayn M, Abdul Qados AMS. 2010) [2]. Similar results were observed on rice when irrigated with magnetic water (Tian *et al.* 1991 and Nasher 2008) [27, 21]. When wheat crop irrigated with magnetized water significantly increased in all yield and yield components compared to control treatment. The increases reached to 24.56, 31.33 and 27.68% in seed, straw and biological yield per teller over the control. Similar results for different plants; (Rochalska M. 2005) [25] found that magnetic force treatment increased the yield and yield components in sugar beet (*Beta vulgaris* L.) and increased yield of potato (*Solanum tuberosum* L.) (Rakosy-Tican *et al.* 2005) [24]. additionally, studies by Atak *et al.* (2003 and 2007) [3] involving magnetic force impact on soybean (*Glycine max* L.) confirmed that magnetic force significantly increased yield and yield attributes. Irrigation of broad bean plants with

magnetic water increased significantly the yield production. At harvest stage, the effect of magnetic water and normal tap water on number of branches/plant, number of legumes/plant, were increased significantly compared to control treatment (tap water). These results are the logical to improvement growth parameters, growth hormone, photosynthesis, and translocation efficiency, these results are in agreement with that of De Souza *et al*. (2006) [5]. The irrigation cucumber with magnetized irrigation water significantly increased the yield (kg/m^2) as compared with untreated irrigation water. Similar conclusions were also obtained by Tian *et al.* (1991) [27] who concluded that the irrigation with magnetized water increased rice yield. Harari and Lin (1992) [12] on muskmelon, Bogoescu (2000) [4] on cabbage, Khattab *et al.* (2000) [15] on gladiolus, Podlesny *et al.* (2008) on pea, Maheshwari and Grewal (2009) [20] on snow pea, celery and pea plants, Abdul Qados and Hozayn (2010) [2] on flax and Hozayn and Abdul Qados (2010) [2] on chickpea were reported similar results.

Quality Parameters

The sucrose concentration in the sugar beet is the major factor affecting white sugar yield. Tha irrigation of sugar beet plant with magnetized water increased significantly beet quality by increasing sugar concentration by 4.07%, TSS by 1.04%, quality by 2.91% and recoverable sugar by 8.25% compared to beet plants irrigation with normal water (Hozayn *et al*. 2013). Several investigation showed the beneficial effect of the electric and magnetic field on yield and some features of the technological quality of sugar beet roots (Hernandez *et al*. 2010; Kacharava *et al*. 2009) [13, 16]. When broad bean plant irrigated with magnetic water increased significantly total available carbohydrates (Monosaccharide, Disaccharides, polysaccharides) contents compared to irrigated with tap water (El Sayed HEA. 2014) [6]. The increasing of protein contents in broad bean plants irrigated with magnetic water was accompanied with increasing growth promoters (IAA) (El Sayed HEA. 2014) [6]. In this respect, Kuba and Kakimoto (2000) [14] found that IAA effect on DNA replication. The stimulatory effect of magnetic water significantly in the nucleic acid (DNA and RNA) contents in broad bean compared with the using tap water (control), similar results also have been reported by Ozge *et al.* (2008) [22]; Mihaela *et al*. (2009) [19]; Moussa (2011) [18]. The irrigation of broad bean plant by magnetic water exhibited an increase in potassium, calcium, phosphorous contents in all parts (roots, stems, leaves and seeds) of broad bean plant compared with the control (tap water) plant, whereas, sodium content tended to decreased significantly in all plant parts (roots, stems, leaves and seeds) irrigated with magnetic water than tap water (control) plants. These results agreement with that of Harsharn *et al.* (2011) [11]; they observed an increase in potassium content in pea after irrigation with magnetic water. Also, Moussa (2001) [17] demonstrated that, there is a direct effect of potassium upon translocation efficiency, because potassium ion (K+) is known to be one of the three largest constituents in sieve tube sap. Potassium may play a role on the synthesis of endogenous plant hormones (Haeder *et al*. 1981) [10].

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