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Research Article

Agriculture is Not Only based on Biology and Chemistry but also is Relating to Physics

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Abstract

Water is more than unusual. 70% of water occupies the ocean on the earth. Naturally, an animal, including a human being, cannot live without water as well as a plant's daily life. There are also many applications of water in industry. They employ water as solvent, for cleaning, coolant, and moisturization in the atmosphere. Now, water is essential in agriculture, of course, in which any kind of crops grow to absorb water in soils. Meanwhile, soils cultivate the bacteria and other germs in case. Furthermore, agriculture must be primarily affected by weather conditions, too. Our research proposes seeds that may germinate and sprout in rigorous conditions such as little water or even drought in which the water associates with the physics basically besides chemistry and biology. Namely, seeds can energy to absorb water as well as the frequency of light.

Keywords: *Photoblastic; negatively photoblastic; Dissociation of a Hydrogen Bond; Pico-sized water; Quantum Physics of Water*

Introduction

Generally, seeds require darkness to germinate, but sometimes it involves light that may depend on the frequency (energy). Photoblastic describes a seed whose germination is influenced by light such as lettuce [1]. Germination activates by a wavelength around 600 nm for some plants and more than 800 nm for some plants. Meanwhile, tomato likes negative photoblastic [2]. The explanation of how light affects some seeds and causes them to be in a state of readiness for germination and yet prevents other seeds from germinating if necessary is highly complex. It is mainly the light's effect upon a plant pigment called phytochrome [3] within the seed. The plant pigment relates to the type of light which the seed receives. As a generalization, light in the red wavelength usually promotes germination, whereas blue light inhibits it. Phytochrome plays the role of signal transduction in the receptor.

Therefore, we can regard the water may play the function of the light in the case. The germination and breaking dormancy of the seed elucidate depending on the plant. The factors are light, temperature and water. The light spreads from ultraviolet rays (wavelength of 200 ~ 380 nm) through far-infrared (wavelength of 10 ~ 20 μm). And temperature ranges are 288 ~ 303K). Of course, those conditions associate with the hormones of a plant as the chemical subject, but the frequency of light (energy) affecting the receptor of plant pigment. Firstly, embryo absorbs water and swells, then secretes gibberellin ($C_{19}H_{22}O_6$) [4] that is breaking of dormancy, although the detail is abbreviated at present. Meanwhile, the other hormone is abscisic acid ($C_{15}H_{20}O_4$) as a germination inhibitor [5] and induces dormancy [6]. Here we report the discussion from the total system of a plant or other a crop relating to light and water as well as chemical substances they possess. The water that we use is SIGN water, Spin Information Gauge-field Network, named by the author [7]. The water is assumed involving infoton that is an elementary-like particle, $<H^+ \sim \sim e^->$ with the supposed size 10 to 120 pM after hydrogen bonding dissociation. The nature of the SIGN water assumes to emit far-infrared beam and terahertz besides fineness.

Experimental Methods

The SIGN water containing infoton generates with pressurization more than 100MPa which starting material is a tap water without any additive. We cannot observe the infoton under even an electron microscope, although it exists stably at room temperature and atmosphere. We define infoton with Fourier Transfer-Infrared spectroscopy (FT/IR-6000, JASCO) and nuclear magnetic resonance spectrometer (R-90H, NMR-Hitachi Co. Ltd.). Radiation is measured by a high-purity germanium detector (HPGE; GC 3019, Canberra Industry Inc.) and Geiger-Müller counter (GAMMA-SCOUT GmbH and Co. KG).

The method of comparison between usual water and SIGN water is the usage of water itself directly. The technique provides for culturing mushrooms; one log using waste pieces of wood activated with SIGN water, then seed fungus are planted. And normal (control one) is used with tap water. Another technique for the bags of coffee is compared with the weak energy emission from SIGN water (supposed far-IR and terahertz). One bag puts on tap water at a distance of 10cm and another one on SIGN water.

Results and Discussion

Fineness of water and it's effect

First of all, any plant possesses aquaporin protein [8] three times than animal does, and only water can go through the protein as well known. The fineness of SIGN water is illustrated in figure 1 to show how it functions in a plant later.

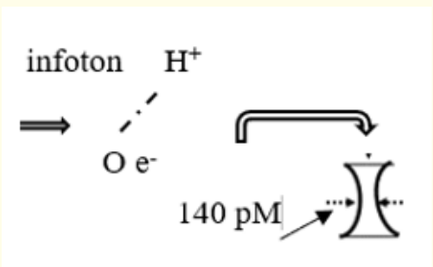

Figure 1: *Double cone shape is an aquaporin protein, and the narrowest part is 140 pM.*

During normal water (more size than 200 pM) comes the aquaporin, the inside pressure calculates 0.8Mpa. Meanwhile, the infoton $<H^+ \sim e^->$ (less size than 100 pM) in the water dissociated hydrogen bonds may easily pass. Usually, capillary action in a plant works against gravity force and travels up to vessel except for fern plant and gymnosperm.

We can take α-helix structure to coil of the RLC circuit (Figure 2) in a general electronic device such as the following equation; U; energy (Joule), L: inductance of a coil (definite value corresponding to a material of coil) and i indicates electric current.

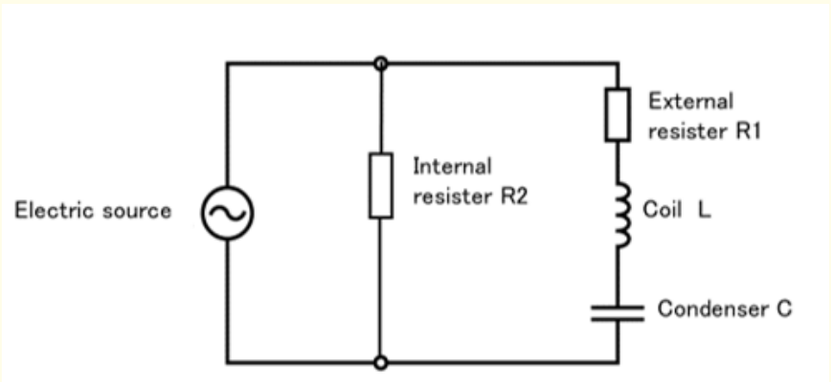

Figure 2: *Basic RLC circuit (resistor, inductance and condenser C).*

$$U = \frac{1}{2} L i^2 \text{ (Joule)} \quad (1)$$

In the circuit, condenser C corresponds to the skin in a body and surface tissues in a plant that contains water preserving semiconducting characteristics similarly. Thus, the coil works for a generation of energy when the organs possess a helix structure and "tube", i.e. energy is generally stored in the magnetic field of a coil, likened to acupuncture points ("tsubo" in Japanese) in the human body.

We discuss the functions and effectiveness of the energy to other substance. Figure 3 shows the microstructures of coffee powder.

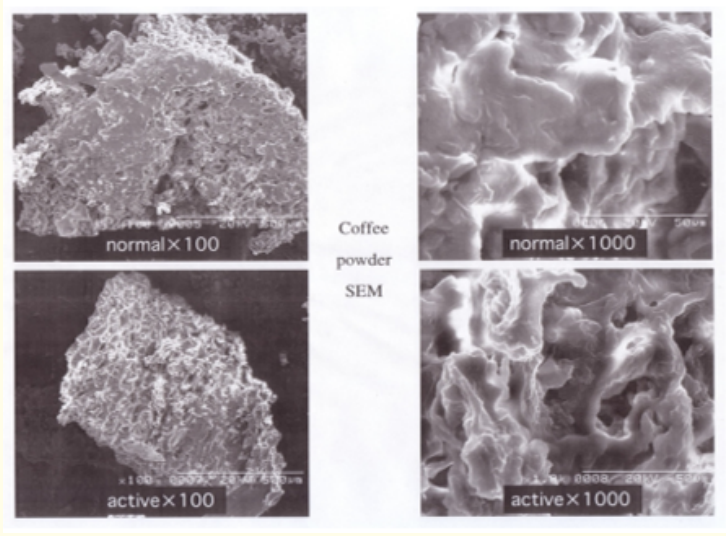

Figure 3: *SEM photographs of microstructures of coffee powder; upper two; normal powder and lower two; activated powder.*

The bags of the coffee powder are maintained at a distance of approximately 10 cm just over water for a couple of days. Far-infrared through THz emission from SIGN water may affect the air in the pore and on the powder, and nitrogen can be activated resulting in powder fineness in the appearance and better dripping in the activated powder with milder taste of the dripped coffee than normal.

There are some examples of effects relating to germination and growth due to the fineness of SIGN water. Before that, the abscisic acid, gibberellin and auxin are described in figure 4.

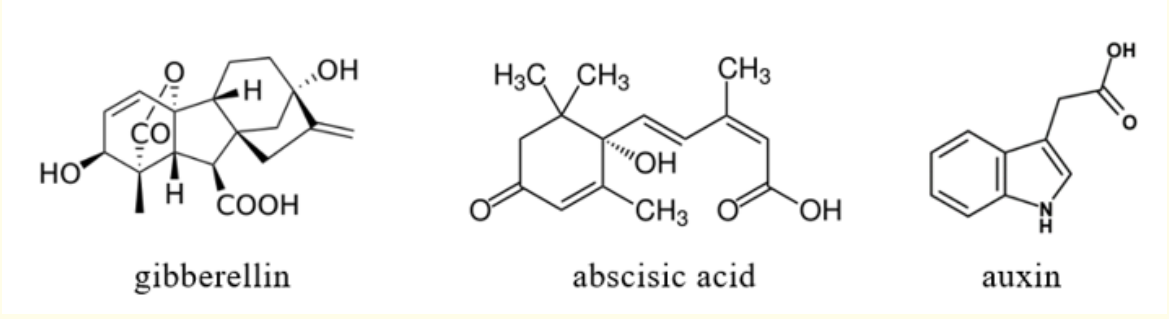

Figure 4: *Two kinds of hormones relating to a plant-germination, and auxin for growth.*

Now that phytochromes also can sense light, and cause the plant to grow towards the light, this is called phototropism [9]. At the same time, we have to discuss the mechanisms relating to the frequency of the light (i.e. energy) and to absorbing water to vessel from the soil in physics. Roots come up in the grounds where the water can incorporate with an osmotic pressure through the capillary action. The osmotic pressure is 0.1 ~ 0.2 MPa (~1 atmosphere) around the roots. Furthermore, auxin is a hormone to promote the growth of a plant; i.e. play a cardinal role in the coordination of many growths and behavioural processes in plant life cycles.

How does light affect the germination of seeds? Before that, it is better to figure out the molecular formulas of gibberellin and abscisic acid to the styles as follows. Because it may help to regard the mechanisms the functions of the substances in terms of physical points and a whole system relating to the light of solar in a crop, not only chemical and biology; namely, $C(CH)_7(CH_3)_4(C=O)_2(COOH)$ and $C_7(CH)_3(CH_2)_2(CH_3)_4(C=O)_2(OH)_2(COOH)$ for abscisic acid and gibberellin, respectively.

Here is a protein associating with a light-receptor just shown in figure 5. The effect on the receptor of light that any plant possesses will be discussed later.

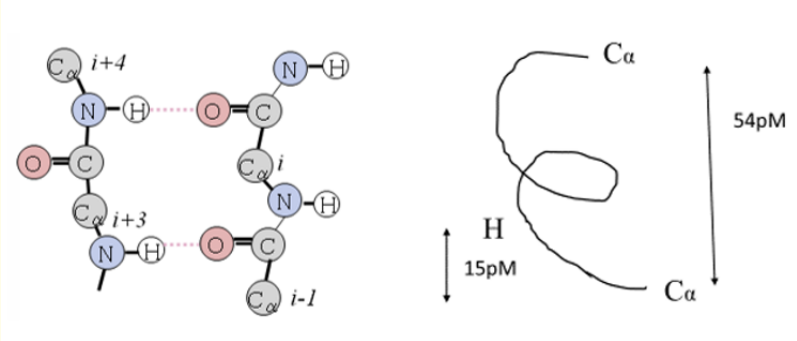

Figure 5: *α-helix structure of a reserve protein in endosperm; The bond of C=O of No. i group forms hydrogen bonding with N-H in No.i+4 group. Cα; α carbon.*

Germination and growth-Osmotic pressure, capillary action and pressure going via aquaporin protein as a total system

It is crucial to make seeds take into the water from soils. And seeds must overcome the potential which consists of matrix potential (surface tension between soil's surface and water), osmotic potential (formulated in van 't Hoff equation as below) and pressure potential in xylem (generated by absorption of water from outside). Thus, water moves soil to leaves against gravity force.

van 't Hoff equation:

$$\Psi_\pi = -MiRT \qquad (2)$$

The gibberellin moves from embryo to aleurone layer in seeds, and then the reserve protein dissociates. The nitrogen atom of the N-H bond in figure 5 seems to be activated with infoton $<H^+ \sim e^->$ easily because the smallest bonding energy (3.9eV) among other bonds such as C-H (4.3 eV), O-H (4.6 eV) and C=O (8.3 eV) in order of the lower energy.

There are some examples of effects relating to germination and growth due to the fineness of SIGN water. Germination of a plant is a complex process depending on organs, but an essential substance is water and we have to consider physics for it's absorbing mechanism.

Any embryo absorbs water due to osmotic pressure first as discussed previously. The pico-sized water is beneficial to be absorbed rather than usual water for the purpose as well as nutrients are apt to contain much solving in fineness water.

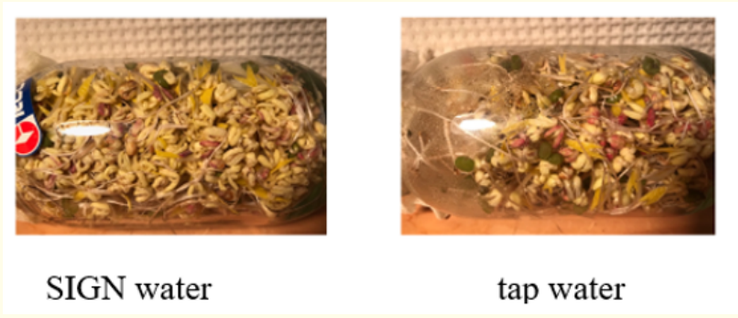

Figure 6: *Soybean sprout after nine days cultivated; left, with SIGN water and right; with tap water.*

We discuss the growth of flower along with the difference between usual water and SIGN water [10,11].

Many plants native to temperate zones depend on seasonal temperature changes to set the stage for growth, although we do not refer to the temperature in this paper.

Light-visible sunlight to radioactive radiation

Some seed does not sprout without light. The light promotes germination with the wavelength of 650 to 680 nm but is suppressed with the wavelength of near-infrared around 740 nm usually. The light-sensing is controlled by the phytochrome of one of hormones as discussed below [12]. The usual ratio of far-red light to red lightR/FR) is approximately1.15 in the sunlight outside. When plants block the sun, the rate downs 0.1 - 0.4, a light germinating seed detects the difference resulting in an appropriate circumstance for the growth.

Until seeds encounter specific sets of germination triggers, they remain dormant. For many agriculturally essential plants, germination depends on moisture, temperature, oxygen and light. We focus on the sunlight here. Photo-dormant plants use degrees of light or darkness to determine the best time and location for growth. Tiny tobacco seeds, for example, don't sprout in darkness, so growers spread them on the surface of moist seed flats under controlled lighting [13].

Phytochromes are one of pigment-protein and a class of photoreceptor to detect red and far-red region. Recent advances have suggested that phytochromes also act as temperature sensors [14]. They regulate the germination of seeds (photoblasty), the synthesis of chlorophyll and the elongation of seedings. Phytochromes consist of a protein, covalently linked to a light-sensing bilin (one of biological pigments). Furthermore, the pigment-protein functions the network of a diatom photosystem II-light-harvesting antenna. Such as astaxanthin $C_{40}H_{52}O_4$, although we do not refer to it more.

Figure 7 indicates that the onion can take roots in the water, and there are more in the SIGN water which means better absorbance of water due to pico-sized particle of infoton.

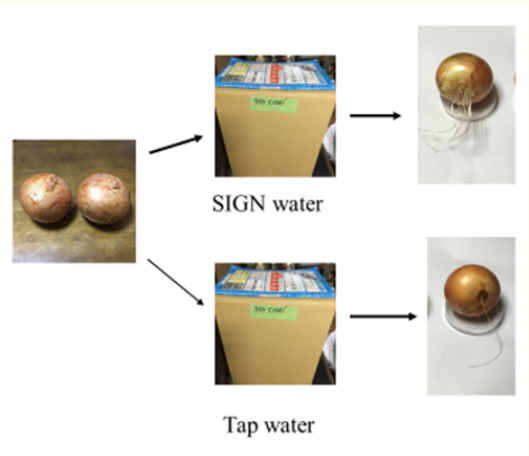

Figure 7: *Growth of onion's roots in the non-light box at room temperature for two weeks. upper; in SIGN water, lower; in tap water.*

An onion is a light inhibited seed, therefor an onion in tap water is supposed to grow more. However, an onion in SIGN water appeared more roots due to the function of far infrared and terahertz rather.

Take away radiation affect-another energy of light

Mycelium is the part of a fungus or fungus-like bacterial colony, consisting of hyphae.

In cellular biology, there is an active transport which movement is against the concentration gradient through a cell membrane. An active transport is processed using cellular energy to achieve this movement by adenosine triphosphate (ATP) and an electrochemical gradient.

In fact, this energy is supposed that proton and electron (i.e. infoton) cause with ATP which is similar to radiation reduction of purple non-sulfur bacteria.

As shown in figure 8, it is interesting why the mushrooms do not indicate radioactivity. We will discuss this point in the following. The ^{134}cesium and ^{137}cesium contribute to radiation in the mushroom's case mostly. The cause of radiation reduction is similar to the results that the purple non-sulfur bacteria changed radioactive cesium to stable-element barium [15]. Namely, the bacteria may produce proton and electron from -OH radical by anabolic reaction. The anabolic reaction is one of the carbohydrate metabolisms from glucose-1-phosphate of the product due to decomposition of glycogen. We also previously reported the radiation reduction based on the β-decay of cesium. The example is a neutron-decay in a nucleus as follows:

$n \rightarrow p + e^- + \text{anti-}\nu$ ($p + e^- = A + A_{<Cs>} = A_{<Cs>} + A_{Ba}$) ---- in consideration that neutron mass is close to that of infoton, i.e. $<H^+ \sim e^->$------

$^{137}Cs + (\simeq n) \rightarrow {}^{138}Ba + e^- + \nu$.

In the case of proton-decay:

$p \rightarrow n + e^+ + \nu$ ($A + A_{<Cs>} = A + A_{Ba}$)

$^{137}Cs + \rightarrow n (\simeq H^+ \sim e^->) + {}^{137}Ba + e^+ + \nu$.

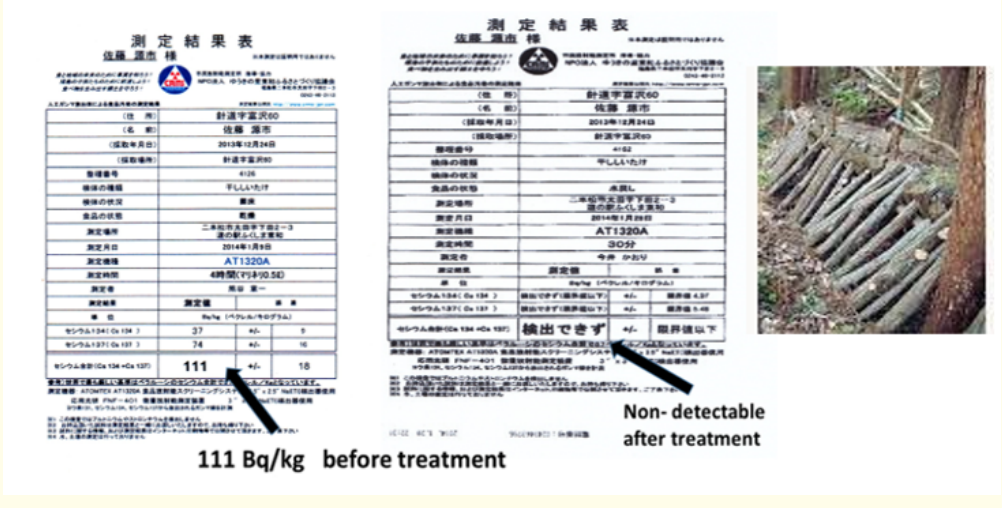

Figure 8: *Radiation reduction for mushrooms on a log processed with SIGN water as compared with tap water.*

Conclusion

The fineness of SIGN was discussed for playing the role to a plant (from absorption by seed to go up to leave) resulting in easier movement of the water in the system. The system itself is also discussed in an analogical way to the electric circuit of an electronic device in terms of energy storage of the light-receptor in a plant and seed. Furthermore, it was introduced that SIGN water itself emits far-infrared and terahertz, and functions in stead of sunlight in a certain case. Finally, we also discussed radiation of one of electromagnetic waves in consideration of radioactive reduction by mushroom.

Acknowledgement

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Conflict of Interest

There is no conflict of interest.

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