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Research Article

Why Chlorophyll Exists in a Plant from Viewpoints of Water

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Abstract

We learn any plant possesses chlorophyll for photosynthesis. Here, we introduce oxygenic photosynthetic organisms that use water as an electron donor resulting in reduction of carbon dioxide. SIGN water contains the detailed information transferring it to another substance and changing its properties with the information. The water reduces the material and has characteristics to change the nucleus. The property is based on pico sized water and leads to the development of germination and growth of a plant. Furthermore, we find the generation of chlorophyll based on the nuclear change starting from water absorbance in roots to leaves.

Keywords: chlorophyll; SIGN water; pico-sized particle; reduction; nuclear change

Introduction

The structure of chlorophyll was determined by R.M. Willstätter (1913). They have actively studied since then. Furthermore, R. Hill found to form oxygen by chloroplast taking out of cells artificially (1938). Any plant possesses the chlorophyll for photosynthesis [1], and the function of chlorophyll is well known in textbooks. We do not introduce the details of popular themes like an aldehyde (R-CHO) and the Calvin cycle relating to carbon fixation in photosynthesis [2]. Photosynthesis research shows related materials like photosynthesis pigments have been studied [3]. The molecules themselves are ubiquitous; chlorophyll, carotenoids, and phycobilin.

As the material relating to light, pheophytin is also essential, which plays a crucial role in electron transfer. Pheophytin changes with long-wavelength wave, but no change with short-wavelength [4]. The difference comes from no Mg in chlorophyll under the acid condition. Meanwhile, photosystem II relates dissociation of water and oxygen generation, which they reported the study of in the Mn_4Ca clusters for artificial photosynthesis [5].

There is an exciting theme relating to photosynthesis, and cyanobacteria

Prokaryote and thylakoid membranes play a role in photosynthesis and electron transfer to respire. It is worthwhile to notice cyanobacteria which we experienced changing radioactive cesium to stable barium in the contaminated soils in Fukushima.

We discussed why cyanobacteria reduced radioactivity from the soils and withered [6]. Meanwhile, photosystems I and II (PSI and II) are reaction centers that capture light to drive oxygenic photosynthesis associated with cytochrome b_6f complex [7, 8], although we do not introduce the system.

Here we report the essential points, such as chlorophylls themselves. There are mainly two types of chlorophyll, named *a* and *b*. Then, we show the items limited to our discussion from the viewpoints of quantum chemistry and physics. The chlorophylls differ in the composition of a side chain (it is $-CH_3$ in *a*, while it is CHO in *b*). Each chemical formula [9] depicted in Fig. 1; Chlorophyll *a* possesses the chemical formula; $C_{55}H_{72}O_5N_4Mg$ and chlorophyll *b*; $C_{55}H_{70}O_6N_4Mg$. By the way, pheophytin molecular formulas; $C_{55}H_{74}O_5N_4Mg$ (*a*)

and $C_{55}H_{72}O_6N_4Mg$ (*b*). We assume the reason why chlorophyll has magnesium, not other elements, and manganese in photosynthesis II from the viewpoints of quantum chemistry.

Methods

We use the activated smoked charcoal powders by SIGN water (Spin Information Gauge Network) named by Sugihara [2015]. They make them by smoking from wood- chips and at 1073 K for 15 min. The size of the power is approx. one μm. They pack 350g in a vinyl bag and activate it in the SIGN water container for one day; the powder receives SIGN water information which forms by emitting the activated LED lights for one day (Fig. 1).

We make the partitions in the rice field (15 × 20 m) to divide into four blocks with a plastic wall (Fig. 2). We distribute the charcoal powders every block; 1) 350g, 2) 700g, 3) 1050g, 4) 1400g.

Results and Discussion

We tried germinating a plant and cutting flowers in a vessel, apple tree, and mulberry tree [10]. But, in the rice field, we have not tested the rice seedlings. The plant growth, rice harvest, and taste will be necessary. Another evidence is the growth under solar beam for four months. We wish to measure the real-time changes of chlorophylls.

The pigments in chlorophyll *a* molecule absorb light energy, comparatively higher frequency, within the violet, blue and red wavelengths while mainly reflecting green (Fig. 5). Then the electrons excite and reduce a substance. Chlorophyll *a* gives the energy of blue to chlorophyll *b*, then photosynthesis proceeds. Meanwhile, chlorophyll *b* primarily absorbs blue light [4], and it is more soluble than chlorophyll *a* in polar solvents because of its carbonyl group.

Activated LED Lights for a substance

LED lights are activated by SIGN water first, and then the LED lights may give the infoton information to any substance emitted with the lights (Fig.1).

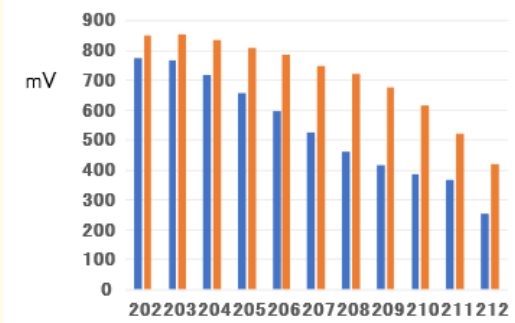

Figure 1. ORP change of water emitted by activated LED for Feb.2 through Feb.12.

Another method to evaluate pico sized water smallness

Here is also the indirect way to consider SIGN water, although there is no way to know the size of water directly. We employ H-NMR and FT-IR spectroscopy to judge the water's smallness compared with tap water, and rather than SIGN water. One example indicates in Table 1.

Deionized water	*FID/T_2 1.0*
Tap water	0.9
Rice field in Kumamoto*	0.61
SIGN water	0.45

* Rice field in Kumamoto is activated with the SIGN rope.

Table 1: Evaluation values of pico sized water smallness showing FID/T_2 described with free induction decay (FID) and relaxation time (T_2).

Solar beam in the rice field

In Niigata prefecture (latitude: 37.9 degrees and longitude: 139.0 degrees), average day of sunshine duration in a year: is 1606 (18%). The area with the value of 18% in Niigata is worse in Japan. The time to harvest is early October. Based on the evidence, the rooting of rice plants and harvest are much better than that of standard field, and taste is also better. These results are reasonable due to the better absorbance of water because of the pico size.

We will follow the plant growth every month before harvest.

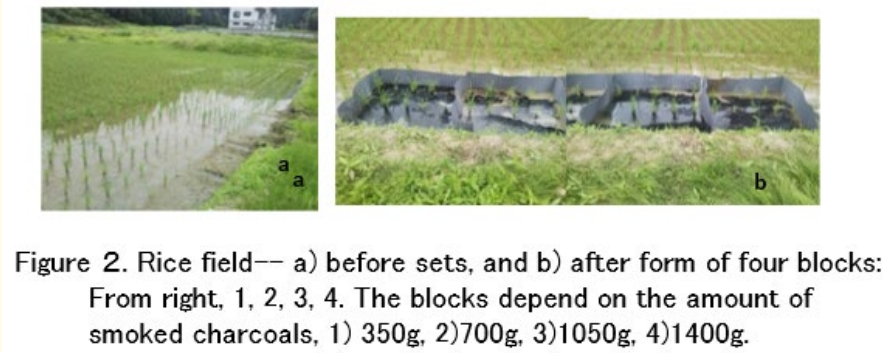

Figure 2. Rice field-- a) before sets, and b) after form of four blocks: From right, 1, 2, 3, 4. The blocks depend on the amount of smoked charcoals, 1) 350g, 2)700g, 3)1050g, 4)1400g.

Figure 2: Shows the field of the smoked charcoal powders possessing infoton information provided by SIGN water.

We will confirm the infoton information from the smoked charcoals by the water in the rice field. One example is the activated water with SIGN ropes in the Kumamoto rice field shown in Table 1. We have employed the activated ropes in the Fukushima rice field to reduce cesium in the contaminated soils and rice plants [10].

The farmer processes the rice plant in the field for May, then waits for the rainy season in June. Therefore, we tested to spread the activated smoked charcoal powders in June shown in Fig.1. We will follow the growth in July. Previously, we checked the roots rice in the activated field [10].

Germination of narabo vegetables

We developed a germination experiment using SIGN water at room temperature without sunlight (in a dark room).

Figure 3: Narabo vegetable germination test; left, normal water and right, SIGN water.

Germination of white radish sprouts

We compared germination in the activated container and the normal one shown in Fig.4. Any people experienced the same results with soybeans a couple of years ago. It is a remarkably different grade of germination five days after planting.

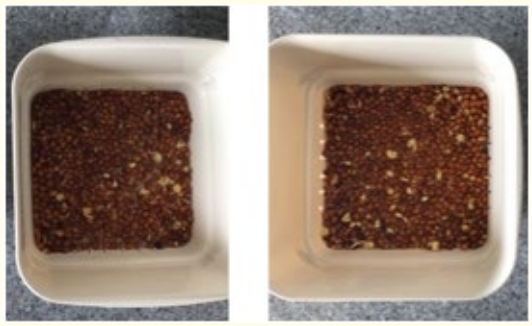

Figure 4: White radish sprouts germination test.
Left: Normal container, and Right: Activated container.

The meanings of Sun light and without sunlight
Quantum chemical mechanism of chlorophyll functions

First, we note photosynthesis (under sunlight) is shortly well known. Chlorophyll *a* gives absorption peaks at 430 nm and 662 nm, while chlorophyll *b* gives peaks at 453 nm and 642 nm, as indicated in Fig. 5 [*Chlorophyll - Wikipedia*].

The wavelength of 430 nm ~ 662 nm corresponds to purple to blue, which is higher in the region of the visible light. The energy is necessary to absorb water in the ground through roots, not only surface tension against gravity. Besides, a plant possesses an aquaporin protein three times more than an animal. The narrowest part of aquaporin is only two angstroms (Å), which may function as an element change such as sodium from magnesium and potassium to calcium by this pressure inside aquaporin protein. We will discuss it qualitatively later.

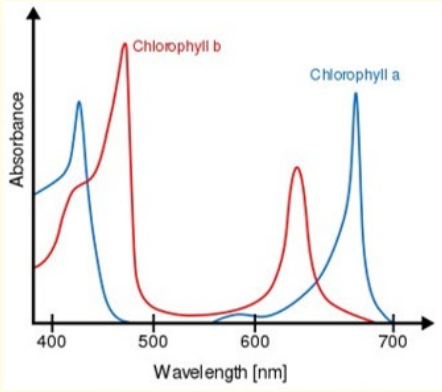

Figure 5: Photo ranges which a plant needs in common photosynthesis.

On the other hand, we look at the chemical formula of the substances showing nitrogen bonding with Mg^{2+} in Fig. 6.

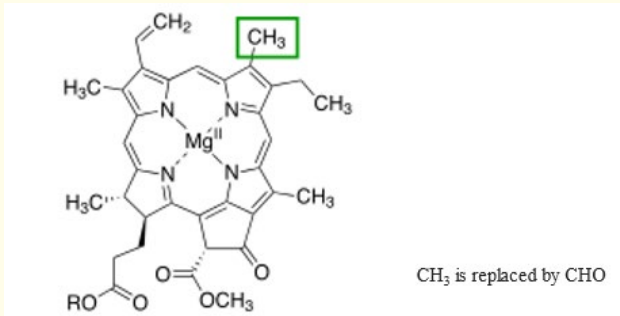

Figure 6. $C_{55}H_{72}O_5N_4Mg$ chlorophyll *a* $C_{55}H_{70}O_6N_4Mg$ chlorophyll *b*

Chlorophyll *b* is a form of two chlorophylls and helps photosynthesis by absorbing light energy. According to chlorophyll's spectra, chlorophyll *a*, 430 nm (2.88eV) provides the energy of the chlorophyll *b*, (1.87eV). The difference of 1.01eV may use to pass water through aquaporin where the narrowest part is approx. 2Å (8×10^{-9} m).

The calculated energy to pass there may be 0.8 MPa, corresponding to 0.04 eV. A lot of aquaporin cells may use the difference of energy.

Rutherford researched the water oxidizing enzyme photosystem II in terms of its mechanism. This enzyme has become the focus of attention because cheap water splits catalysts [11, 12].

Another essential function is a reaction of H_2O and CO_2 when a little leaf appears; namely,

$$H_2O + CO_2 \rightarrow HCHO + O_2 \rightarrow C_6H_{12}O_6 + O_2.$$

Furthermore, the following reaction may be possible when we employ SIGN water;

$$2\ H_2O \rightarrow O_2 + 4\ (H^+ + e^-).$$

Meanwhile, oxidation-reduction potential is +0.81eV corresponding to about 20 THz, and emitting far-infrared through THz. Furthermore, this reaction may easily generate hydrogen utilizing electron tunneling in biological oxidation-reduction [13, 14]. There are many kinds of research to evolve oxygen connecting to crystal structure [15] and O=O bond formation [16]. Furthermore, they study the mechanism of water oxidation relating to photosystem II [17, 18, 19, 20].

Water splitting by cyanobacteria

As mentioned, cyanobacteria reduced radioactivity [6, 21]. They may dissociate water in the body. They researched the photosynthetic thylakoid membrane acting as light-driven water: plastoquinone oxidoreductase [14].

In our case, radiation from cesium gives the energy to infoton, then infoton $<H^+ \sim e^->$ can move into the cesium nucleus to change to stable barium. That is our idea for radiation reduction [6].

Why magnesium exists in chlorophyll?

It is a difficult question. We suppose that sodium changes to magnesium under the high pressure in the deep sea like 60 MPa;

$$^{24}_{11}Na + <H^+ \sim e^- > \rightarrow {}^{25}_{12}Mg.$$

Here is another possibility; $^{22}_{11}Na + 2 <H^+ \sim e^- > \rightarrow {}^{24}_{12}Mg.$

$^{24}_{11}Na$ is a radioisotope (RI) with a half-life time of 15 hours (β^+ emitter), and $^{24}_{11}Na$ is another RI (a half-life time of 15 hours 2.6 years, β^- emitter).

Stable isotopes of magnesium are $^{24}_{12}Mg, {}^{25}_{12}Mg,$ and $^{26}_{12}Mg,$ and their abundances are at 79 %, 10%, and 11%, each containing twelve, thirteen and fourteen neutrons.

By the way, $^{23}_{11}Na$ is abundant 100% in the Earth's crust. Sodium contains eleven protons and one neutron.

Fresh food keeping without light

We can see the keeping the spinaches fresh in a refrigerator for one week, shown in Fig. 7. The spinaches can breathe in a dark atmosphere and do not need to absorb water from roots. The mechanism may be assumed to be due to nitrogen in a refrigerator and a bag, because the SIGN water activates in a fridge and light technology.

Figure 7: Spinaches without sun light (in refrigerator) for one week.

As we report in Fig. 3. and Fig. 4., a plant may not necessarily need sunlight to grow, especially in germination. They develop roots in soils to absorb water first; then, they want sunlight. We have not tried germination of rice in a dark room, although we use the actual rice field under the solar beam shown in session 3 (Solar beam in the rice field).

Conclusion

We discuss the chlorophyll associated with light and without light. A plant grows without sunlight and we tried some vegetables. Germination functions forming roots and keeping vegetables fresh without sunlight under the SIGN water (or SIGN LED light). We may suppose that the SIGN field emits far-infrared through terahertz resulting in water splitting and oxidation-reduction. Finally, infoton in the SIGN water may play a role in reducing a substance, and we propose forming magnesium in chlorophyll by involving it in a nuclear reaction.

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