Earthing Plant Experiment for Schools

Posted on January 15, 2016 by Earthing Institute

The Earth is like a gigantic battery continually recharged by the sun, lightning, and heat from its molten core. And just like a battery in a car that keeps the motor running and the wheels turning, so, too, does the natural energy flowing through the surface of the Earth keep the biological machinery of global life running in rhythm and balance – for everything that lives on the land or in the sea.

Living things in Nature have a constant electrical connection with the Earth. Except for humans. Lifestyle has disconnected us from the battery. We rarely walk barefoot outside. We no longer sleep on the Earth. We don't use footwear or bedding made from hides. All such practices were part of ordinary living throughout virtually all of history and allowed humans to receive the Earth's electrical energy. Today we wear synthetic soled shoes – like common running shoes made from plastic and rubber – and we sleep in elevated beds, often many stories above the ground. So we have lost our electrical roots, so to speak.

The concept of Earthing, as put forward in the Earthing book, is that when humans lose contact with the Earth they will eventually suffer.

"Mr. Shoes" **"Mr. Barefoot"**

Just as electric systems are stabilized when they are grounded, that is, connected to the Earth, so, too, our bioelectric bodies become stabilized when we humans are grounded, meaning in direct skin contact with the Earth. Keep in mind that our bodies work electrically. Every movement and thought is based on frequencies and electric transmissions in the body. Think of systems like the heart and brain and immune system that operate electrically.

The Earthing concept further states that our bodies work better when we are connected. We sleep better, have less pain, and have more energy, and, in general, feel better, when we reconnect.

The Earthing concept can be put to the test by simply walking barefoot outside, like at the beach, or in a grassy park, or in your backyard.

It can also be put to the test with plants and flowers that have been potted or cut, and removed from the "electric nutrition" that they naturally have when growing in the ground outside.

Some people call this electric nutrition "vitamin G," G standing for ground.

In this paper, you will learn how to do a simple science experiment to prove plants removed from the ground do better when you give them vitamin G by reconnecting them to the Earth.

First you will read how to do the experiment. Below the instructions you can read further, if you wish, to learn how researchers at the University of Arizona did a series of sophisticated experiments to prove there's a difference between grounded and non-grounded indoor plants, that is, plants that are connected to the Earth with a wire, and those that are not.

How to Do an Experiment Comparing Grounded vs. Non-Grounded Plants

The Earthing plant experiment can be most readily done with cut flowers, such as sunflowers. Usually within ten days, you can observe the difference in vitality and life between grounded and non-grounded plants.

You can also experiment with potted plants; however, it will take much longer to see the effects of growth differences between grounded and non-grounded plants indoors.

What You Will Need

- 1 or more cut flowers, such as sunflowers.
- 2 or more similar vases, depending on how many flowers you will be experimenting with. Examples: 2 vases for 1 grounded flower and 1 non-grounded flower, 4 vases for 2 grounded flowers and 2 non-grounded flowers.
- 1 or more Earthing Plant Experiment Kits (each containing two items: a basic outlet checker to test the ground of a wall outlet, and a combination 10-foot Earthing cord attached to a 6-inch stainless steel ground rod). You will need 1 kit for each grounded flower.) **The kit is free for school/class-related experiments from Earthing.com (1-760-778-1200)**.

- Digital camera (such as cell phone camera) to record changes.

Procedure

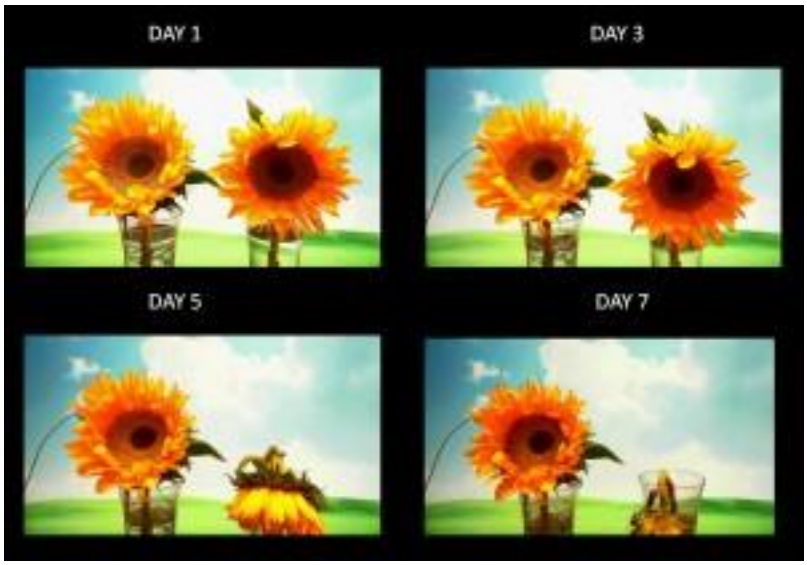
1. Obtain cut sunflowers.
2. Set up 2 or more vases. Fill halfway with water.
3. Place vases in same area with similar lighting and no direct sun, and with access to a grounded/earthed electrical wall outlet.
4. Check outlet first for proper ground using provided outlet checker.

5. Insert male end of Earthing cord into the ground/earth port (third hole) of the wall outlet. Place the other end, which is attached to the ground rod, into vase or planter of flowers to be grounded.

6. For non-grounded flowers, simply place each in its own vase half-filled with tap water.

7. Take picture of group of flowers on a daily basis. Note changes in grounded vs. non-grounded flowers on each day after changes become apparent.

Examples of how grounded vs. non-grounded flowers may look:



Optional potted plant experiment

1. Locate potted plants as above.
2. Place ground rod into soil of pots to be grounded. Push in as far as possible. Insert other end of attached wire into the ground/earth port of wall outlet.

3. Take picture of group of potted plants on a daily basis. Note changes in grounded vs. non-grounded flowers on each day after changes become apparent.
4. Water soil in pots as needed. Add fertilizer to all pots, if desired.

In 2012, researchers at the University of Arizona conducted a series of experiments on grounding and plants. The details and results of these experiments are presented here.

Earthing and Vitality:

Replicated Electrical Grounding Effects Photographed in Plants

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In this report we document for the first time basic science effects of earthing on the growth and vitality of indoor plants. These predicted effects can be readily observed with the naked eye (and photographed).

A number of basic studies in human subjects and applied studies in patients have been conducted to test the hypothesis that being electrically connected to the Earth (physically grounded) can have effects on vitality, health, and healing in living systems. The basic science studies have revealed positive effects on neural (e.g. brain waves), endocrine (e.g. cortisol), muscular (e.g. electromyogram), cardiovascular (e.g. heart rate variability) and cellular (e.g. blood viscosity) systems. The applied studies have documented significant self-reported effects of decreased pain, improved mood, better sleep, and increased energy, as well as changes in physiological indexes such as infrared imaging indicative of decreased inflammation and increased peripheral circulation as well as wound healing.[2]

Unlike most plant and animal species who spend virtually all of their lives in direct electrical contact with the earth, humans living in technologically advanced societies have evolved a lifestyle which results in their being electrically disconnected from the Earth as much as twenty-four hours a day.

Ober and his colleagues[1] have hypothesized that chronic electrical disconnection from the Earth results in a relative deprivation of "free" electrons naturally provided by the Earth, and that this sustained "electron deficiency disorder" has measurable effects on our vitality, health and healing.

Among other conclusions, they posited that Earthing/electrical grounding increases the total number of electrons (electrical charge) surrounding individual blood cells which maintain their essential physical separation. This negatively charged/cellular physical separation effect promotes the blood cells' ability to optimally function both biophysically and biochemically.

In theory, the natural availability of abundant Earth electrons should increase the vitality and wellbeing of plants as well as animals. Besides the straightforward applied predictions of positive effects of Earthing for the growing and preserving of plants (including foods and flowers), there are a number of practical advantages for conducting basic science experiments with plants. These advantages include:

(1) low cost,

(2) ease of measurement (e.g. some of the predicted effects can be observed with the naked eye and photographed with digital cameras),

(3) simplicity of blinding (e.g. using sham cables),

(4) ready availability of research subjects (i.e. seeds and plants).

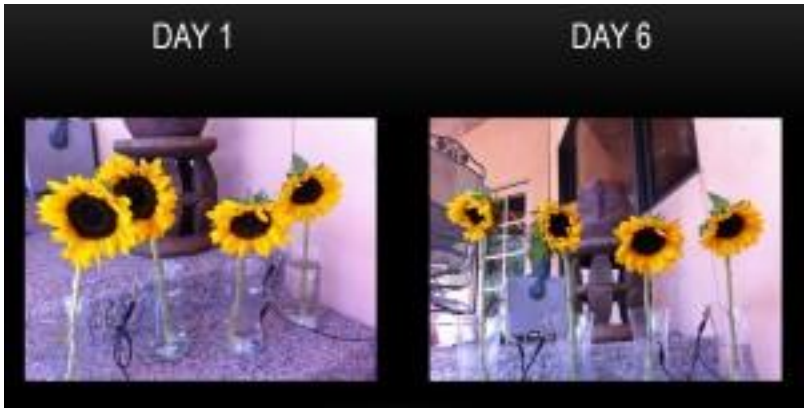
Experiment 1: Blinded Studies with Cut Sunflowers

Our first studies employed cut sunflowers purchased from a local supermarket.

Two matching electrical cables were prepared. A 14 gauge wire was connected to the grounding (round) prong of a three pronged plug; a second 14 gauge wire was similarly placed in an identical three pronged plug but intentionally not electrically connected to the grounding prong. The resulting two cables (genuine grounded and sham grounded) were visibly indistinguishable. Two large alligator clips were connected to the free ends of each wire.

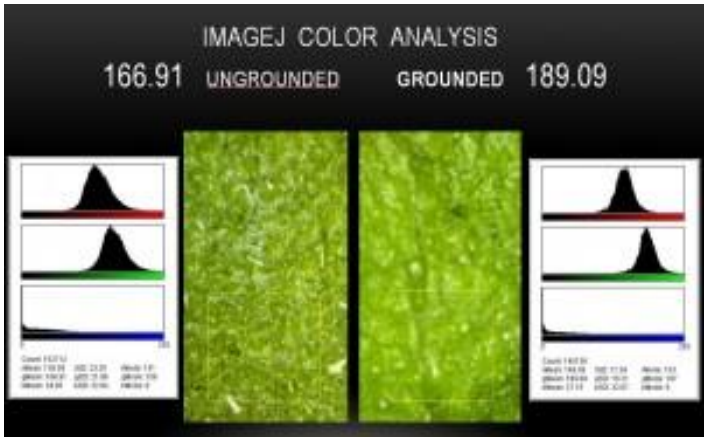
Four cut sunflowers were placed individually in vases and filled with tap water. The four vases were arranged in a row. Stainless steel wires were connected to the alligator clips and inserted into the vases. Hence, two sunflowers were electrically grounded and two were sham grounded. The experimenter was blind to which of the flowers were grounded. The bare stainless steel wires extended the full length of the vases and ended in a circle at the bottom of the vases. The experimental setup is shown in Figure 1 below.

Photographs were taken over six days with an iPhone 4 camera. Photographs for days 1 and 6 are displayed in Figure 2 below.



It can be seen that at day 1 the four flowers were visibly similar in shape and size. However, by day 6 the two flowers on the left were noticeably more wilted than the two flowers on the right. When the conductivity of each cable was checked with a digital ohm meter, it was found that the electrically grounded cable had been attached to the two flowers on the right (the less wilted flowers in day 6) and the sham cable had been attached to the two (the more wilted flowers in day 6) on the left.

To the naked eye, the pedals of the grounded flowers on day 6 (on the right) appeared to be somewhat brighter (yellower and greener) than the pedals of the ungrounded flowers (on the left). Sample pedals were photographed with a digital microscope (ProScope). Averaged composite red-green-blue (RGB) values were calculated using ImajeJ software (available from the National Institutes of Health at http://rsbweb.nih.gov/ij/download.html). As displayed in Figure 3 below, the average green values were higher in a representative pedal from a grounded flower compared to a representative pedal from an ungrounded flower.



We repeated the genuine grounded/sham grounded cut sunflower blinded experiment 3 times (in the last experiment, the total number of vases was increased to 12; 6 genuine grounded and 6 sham grounded; the vases were arranged on a multi-shelved bookcase (in rows of 4). The positions (both orders and directions) of the vases were varied from experiment to experiment. The predicated reduced wilting effect in grounded flowers compared to ungrounded flowers was observed approximately 85% of the time. We hypothesized that individual differences in vitality between sunflowers prior to the experimental conditions (genuine versus sham grounded) might be an important moderating factor; the next two experiments tested this hypothesis.

Experiment 2: Blinded Study of Sunflowers Grown in a Controlled Greenhouse Laboratory

To address the individual difference hypothesis, and also to investigate possible effects of Earthing on the sprouting and blooming of sunflowers, we conducted a blinded experiment employing a professional greenhouse laboratory maintained by the Agricultural & Biosystems Engineering Department at the University of Arizona. This department has a large of suite of relative climate (temperature and humidity) controlled greenhouse laboratories with computer controlled irrigation and twenty-four hour computer monitoring of interior and exterior temperatures and humidity.

Single sunflower seeds were planted in standard soil in individual metal plant pots with holes drilled in the bottom. Each pot was placed in a plastic tray to insure that the pots were insulated from the metal tables (as well as from each other).

In the sprouting phase, the pots were watered via a computer controlled mister and placed in one of two circular areas on a metal misting table in the middle of the laboratory. Each area had 16 pots. In the blooming phase, the pots were watered via a computer controlled tubing system and placed in one of two sets of rows (on tube irrigation tables to the left and right of the middle misting table).

Two sets of cables with alligator clips were created from 25-foot extension cords. Wires from individual alligator clips were soldered to the extension grounded wire every 18 inches. One cord had alligator clips with green colored rubber covers, the other cord had clips with red colored rubber covers. These matched cords with alligator clips were then plugged into smaller 10-foot extension cords; one of these cords was electrically grounded, the other one was sham grounded (the wire to the grounding plug was cut). The experimenters were blinded to which cord (green or red covered clips) was electrically grounded.

The seeds were planted on June 8, 2012. The first sprouts appeared on June 14. Four sprouts appeared in the circular set with the green covered clips; 1 sprout appeared in the set with red covered clips. Figure 4 below shows the two sets of pots at a moderate sprouting stage.

You can see that at this stage 12 of the pots on the right (green covered clips) had obvious growing plants and 10 of the pots on the left (red covered clips) had similar (though on the average, somewhat smaller) growing plants. Individual differences in size of the young plants from pot to pot are clearly apparent.

On July 13, 2012, the blooming plants were moved from the middle misting table to outer tube irrigation tables. Twelve pots had bloomed with the green covered clips; 10 pots had bloomed with the red covered clips. The green covered clip pots were placed on the west side of the laboratory; the red covered clips pots were placed on the east side of the laboratory.

Figure 5 below shows the green covered clip pots (displayed on the right) and the red covered clip pots (displayed on the left). These photographs were taken from the south end of the laboratory, looking northward. You can see that at this stage 7 individual sunflowers were clearly blooming on the right photograph compared with 4 on the left photograph, and the latter were visibly somewhat smaller. Again, individual differences between pots are obvious.

Figure 6 below displays a later blooming stage where each pot had multiple sunflowers at various stages of bloom.

These photographs were taken from the north end of the laboratory, looking southward. For ease of viewing the green covered clips are again displayed on the right and the red covered clips on the left. Individual differences within plants and between the pots are obvious and complex. However, careful viewing reveals that the plants displayed on the right side, on the average, appear somewhat larger and fuller in appearance, than the plants on the left side.

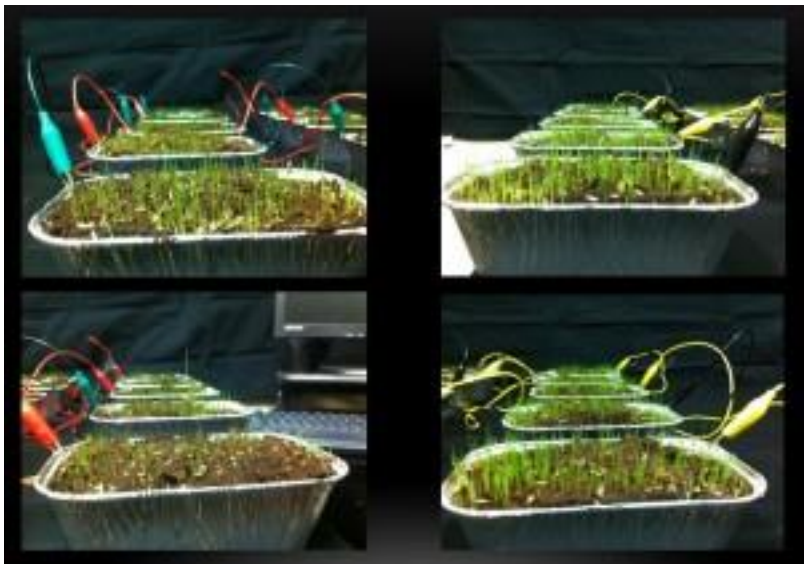
When the cables were disconnected and checked for electrical conductivity, it was discovered that the green colored covered clips cable had been plugged into the electrical grounded 10-foot extension cord, and the red colored clips cable had been plugged into the visibly matching sham grounded extension cord.

In sum, the findings from the blinded greenhouse laboratory experiment indicate that electrical grounded sunflowers appear to sprout, grow and blossom with somewhat greater speed and vitality, on the average, that sham grounded control sunflower. Moreover, individual differences between plants (and in the multi-flower stage, within individual plants) moderate the Earthing effects observed.

Experiment 3: Blinded Seed Growing Studies in a Controlled Indoor Laboratory

To substantially increase the number of subjects/seeds per experiment, the paradigm was shifted to grass seed. We used commercially available Scotts Turf Builder EZ Seed because of its standardized combination of high performance seed, premium continuous release fertilizer, and Scotts' super-absorbent growing material. Approximate two cups of EZ Seed were placed in individual aluminum trays. A total of 16 trays were employed per study; 8 were electrically grounded and 8 were sham grounded using the original two cables in Experiment 1 (with eight alligator clips now attached per cable). The trays were arranged in 2 rows of 4 trays per condition (electrical grounded and sham grounded). Both conditions were placed on the same rectangular table top.

Whereas Experiment 1 (cut sunflowers in vases run outdoors) and Experiment 2 (individual sunflower seeds planted in metal pots run indoors in a greenhouse) employed natural lighting which varied over the 24 hour day/night cycle, Experiment 3 (grass seeds planted in metal trays run indoors in a windowless laboratory room) employed artificial fluorescent lighting which was constantly on (on twenty-four/seven) for the duration of the studies. Figure 7 below displays the results of this experiment after 1 week.



For ease of presentation, the two rows of 4 trays per condition are re-displayed above and below each other for one condition (on the left) and the other condition (on the right).

Close inspection reveals that in this study, the sprouting of the seeds in the 8 trays on the right appear, on the average, somewhat taller, fuller, and greener than the sprouting seeds of the 8 trays on the left. Individual differences in the size of individual seedling within a given tray are apparent.

When the cables were checked for conductivity, it was determined that the electrically grounded cable had been connected to the 8 trays on the right, and the sham grounded cable had been connected to the 8 trays on the left.

Experiment 3 was repeated two more times. One study had the grounded cable connected to 8 trays on the left; the other had the grounded cable connected to 8 trays on the right. The observation was replicated of visibly greater growing in the 8 trays that were electrically grounded, when compared with the 8 sham grounded trays.

Experiment 4: Time Lapse Videos of Pairs of Grounded and Ungrounded Sunflowers in a Controlled Indoor Laboratory

Primarily for demonstrational and educational purposes, we embarked on a series of studies collecting time lapse videos of pairs of sunflowers (one electrically grounded, the other not grounded). The studies involve indoor lighting 24/7.

One laboratory room used ceiling fluorescent lighting with a large screen computer monitor as a back drop. The other laboratory used professional umbrella lighting with blue cloth as a back drop. The rooms were interior and had no windows with direct light exposure.

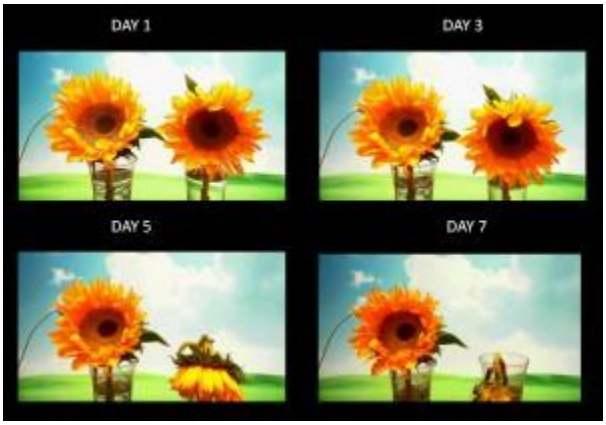
Time lapse videos were created using HD quality webcams running HandyAvi software on Windows XP netbooks.

Figure 8 below shows the laboratory room which employed fluorescent lighting and a computer monitor back drop.

You can see that two time lapse computer systems were used; one webcam (mounted on the tripod on the table between the two computers) recorded a close up of the two flowers the other webcam (mounted on a tripod on the floor behind and to the left of the front chair, the webcam and tripod not visible in the picture) afforded a wider angle view of the entire setup.

These studies were mostly conducted non-blinded so that the viewer could easily see which of the 2 vases had been grounded. Chicken wire mesh was used to line the vases (to insure high conductivity in the grounded flowers); only 1 alligator clip and cable were used.

Figure 9 below displays 4 sample images from a time lapse video recorded over 7 days (days 1, 3, 5, 7). The recordings were continued until one of the flowers literally drooped. The wire indicates that grounded flower was on the left. The effect of Earthing is visibly apparent.



In some demonstration experiments, only the grounded vase included the chicken wire (example above); in other demonstration experiments, both vases included the chicken wire. We discovered that what mattered was the electrical connection to the ground, not the presence of the chicken wire per se. The Earthing effect comparing pairs of matched sunflowers was observed approximately 85% of the time.

Discussion

This set of four experiments illustrates the apparent effects of electrical grounding on the growth and vitality of plants (i.e. sunflowers and grass). Though individual differences between (and within) individual plants are an important moderating factor, replicated effects can be visibly observed across plants and are easily photographed.

Though the importance of electrical connection has been established in these multiply replicated (genuine versus sham grounded) blinded experiments, the experiments do not inform us as to the mechanism (s) involved. It is intriguing to wonder whether the nutritional and health benefits of plants would be enhanced (or at least better maintained) if they were electrically grounded. For example, should vegetables and fruits be electrically grounded on shelves in supermarkets?

In sum, the present report illustrates how controlled basic science experiments in plants can complement basic and applied experiments in humans investigating the potential benefits of Earthing for vitality, health, and healing.

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References

1. Ober C, Sinatra ST, Zucker M. *Earthing: The Most Important Health Discovery Ever!* Laguna Beach, California: Basic Health Publications (Second edition); 2014.
2. Chevalier G, Sinatra ST, Oschman JL, et al. Earthing: Health implications of reconnecting the human body to the Earth's surface electrons. J Environ Public Health. 2012:291541. http://www.hindawi.com/journals/jeph/2012/291541/