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# Electro-Magnetism in Battery Pot Plants with Heating Chambers for Heat Energy Transduction

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## ABSTRACT

Electro-magnetism for components and pot plants in interaction are studied with experiments and analysis. Experiments were done using a chamber for heat energy transduction in arrangements with battery electrodes in a pot. The process required heat to produce current and electric power together with the battery. This study also considered the performance in terms of more current and voltage. The largest device produced 0.16 mW. The function of the chamber is considered chamber amplification. This study also analyzed with Hamiltonian mechanics. An application outdoor was also presented to replace and understand the summer energy sources with electricity. By using this procedure, this study found that if a plant adapts, it develops durability of cold outside.



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## 1. INTRODUCTION

Electromagnetic field is a field that occurs due to the movement of electric current. Static electric current will only produce an electric field. When the electric current moves, a magnetic field will also be generated. An electric field can also be formed due to a changing magnetic field (Ross, 2017). Thermal energy is all the capabilities that occur due to the influence of heat. Thermal energy can be sourced from various sources, such as the sun, geothermal, fire, electricity, etc (De Moel *et al*., 2010).

As an alternative and complement to the traditional method of prolonging the season for outdoor growth with coverings to increase pressure and temperature, flower power is applied (Turner *et al*., 2007). The goal is to keep the plant alive as long as possible during winter, and the sub-ground part should survive until spring when temperature rises and normal condition returns. The arrangements were chosen based on the abilities of the system to grow the plant, to give energy transformations, to generate heat equivalents by moving sufficiently, and to observe the condition. Observation of the condition at the autumn session for certain plants was obtained:

(i) They packed plants close together, and/or use densification of individual stems to withstand cold.
(ii) They used relatively preferable conditions. A slope system in the planting can host a sound tuft shielded at a lower spot. A system planting on the top position, thus, a polarization of location into suitable condition.
(iii) They crept and hid for plants in all winter sessions. This cannot always be used in the pot where the space is limited.

## 2. METHODS

**Figure 1** shows the method how pot plants and electric components. Pot plants and electric components are studied, and devices that amplify the current are constructed. An application to increase power for outdoor cultivation is proposed. In the literature (Strömberg, 2021), battery plants producing electric power with amplifying Sun Catcher cups and magnetic induction were realized. Magnetic induction in a singular small pot, e.g. as in **Figure 1**, starts a low current (2 uA) when sparse or no light, and increases the Voltage from zero up to 0.4V.

**Figure 1**. Battery poy with WFB-capacitor, c.f. [1], metal cup (NPN-diode) collecting Solar Heat and electrodes in bog moss (not visible).

An advantage in autumn is that water does not evaporate from the pot. The plants were bred in two ways: One in a pot with roots and stems from other species, densely packed, and kept in the hot condition. Another pot is with Flower-Power-electricity (see **Figure 2**) (Strömberg, 2021). In winter, the energy can be increased by heating the cups as described previously.

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**Figure 2**. A suitable amount of Power was found for these, since they flourish in ground vegetation on the 26th November 2021 which is 2 months after plantation.

Since the cup when taking sunlight was found to give a larger value (0.057mA) (Strömberg, 2021), devices with several similar were constructed. These are Chambers or Heating chambers (known as NPN-chamber) consisting of two cups, facing each other at the open side (see **Figures 3** and **4**).

**Figure 3**. Heating chamber on a warm element.

At the bottom, there was an opening air. While hot air moves upwards, there will always be a temperature gradient. However, this is small and gives no contribution, compared to heat by convection. In the present study, the heat was supplied by a radiator bounding in one Chamber and by a bus can (see **Figure 5**) that is distributing heat from hot water. The largest value reached at 0.164 mA.


**Figure 4**. Two heating chambers on a can filled with hot water. They can act as a bus distributing heat to the inner cup of the Chamber.

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## 3. RESULTS AND DISCUSSION

In the present Section, results for the Chambers in **Figures 3** and **4** are gathered. Plant arrangement with chambers was done with a heat source. As shown in **Figure 3** which is taken on 30 August 2021, the hot condition can be obtained when using 0.73 V and 101 uA. Then, on Tuesday 31 August 2021, when the colder condition, slightly warm condition was obtained under the process using 0.88 V and 113 uA. The device gets loaded and keeps power. The heating chamber was tested on a larger plant in a metal pot and no cup. Heated with dry air reached at 0.7 V and 31 uA.

The heating chambers collect current. Partly in the same manner as the cup, this condition is in line with reference (Strömberg, 2021). Each chamber is an NPN-diode. A tube was equipped with a non-homogenous heat distribution inside. **Figure 4** presents the largest device. This was heated by adding hot water to the electrically isolated can.

As pointed out in tutorial training of solar panels, the cells may be put both parallel and in series. Therefore, measures on a device with chambers in the serial coupling. Specifically, it is between the electrodes of a pot that is compared with the same parallel. For the double device shown in **Figure 4**, the current was 0.148 mA serial and 0.164 mA parallel. The parallel coupling simplifies the attachment to plant batteries. Then, it may be stated that all current moves between the two circuits (i.e. pot and heating chamber).

To describe the condition in the chamber, a Hamiltonian (Sneddon, 1980), with the phase portrait is considered (see **Figure 5**). This contains general oscillations. If it is elongated, the lower point represents a large value. The non-linearity condition in the Love formula corresponds to that the loaded particle is delayed in a potential which reduces the velocity until it is released. In detail, it can be derived from when the electron rotates in a cloud that it belongs to. Such a condition is a part of the velocity. The results showed that the equation can be written as w = c.rm and m = -1/3. This is obtained from the solution for rotation in a central field assuming no other potential. Also, the r-dependency is in between that inside a cloud of r2 and the Coulomb potential of 1/r.

Inside the chamber, the foil and metal surfaces acted as capacitors, and eventually, the current of particles reach the line at the emitter side. In some applications (e.g. to produce electric power), it is beneficial when this condition has a large value. To visualize time dependency for the location x and velocity y (see **Figure 5**), the Love formula was integrated with the script lsode in Octaveonline (see **Figure 6**) (Sekhi *et al*., 2021).

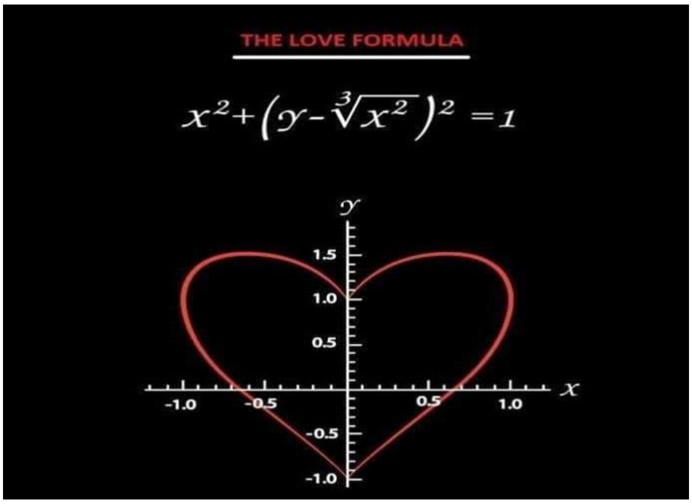


**Figure 5**. The Love formula. Here it is considered as a Hamiltonian H(x,y)=1.

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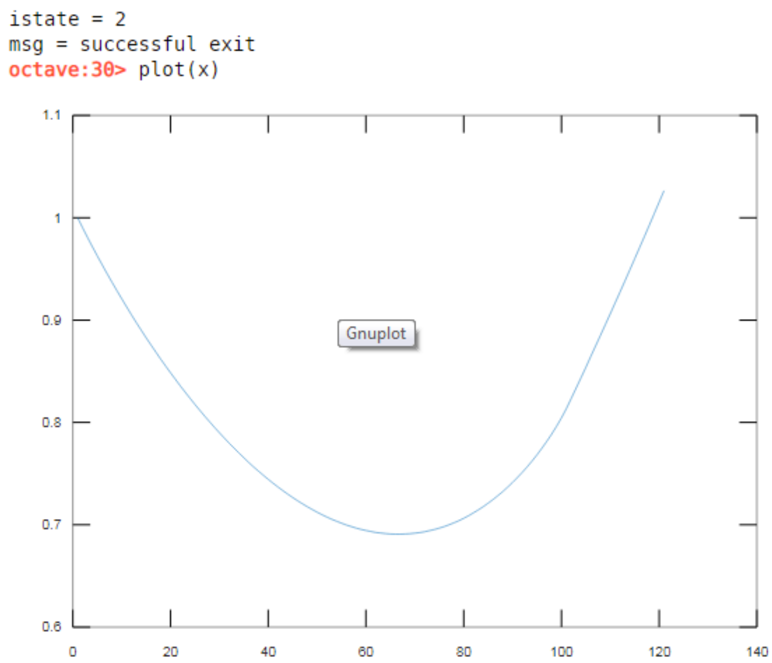


**Figure 6.** Momentum y, versus location x for the Hamiltonian of the Love formula from Figure 5. fvdp = @ (T, Y) [-(1-Y^2) ^0.5 + Y^0.67]; [x, istate, msg] = lsode (fvdp, 1, [0 :0.01:1.1]) plot(x).

Three out of three successful arrangements were obtained (see **Figure 2**). We found low new growth inside an equipped battery pot. At another point, the upper parts densify and grow. The condition in the hot pot without electricity is pending due to the absence of room.

In the application, the can with chambers starts electricity with current and load transportation. It delivers heat in a surrounding. Hence, an application is a cultivation outdoor at low temperature. Hitherto, outdoor breeding has been done with the components in Figure 2 and no additional heat. Applications in outdoor cultivation in the cold season were evaluated. Enhanced growth is subject for publications (Sekhi *et al*., 2021), and here this study focused on some herbs (Kassahun, 2020) at temperatures well below 0˚C. Involving aspects for chemical compounds (such as N, P, and K), larger-scale studies for the response at chilling down to 0°C for mangrove are given in other literature (Yan *et al*., 2021). Thus, it is analyzed how they can recover between the cold hours. Given the results for magnetic fields, it is also possible that plants may energize and raise the temperature in an acoustic pressure provided by loudspeakers or devices producing harmonics at wind load.

## 4. CONCLUSION

Components for energy collection in arrangement with micropower in pot plants were constructed and evaluated. Concerning electricity, while no dynamic condition, the soil may stop transporting loads (after a while also when wheat). The voltage alone is often transformed by magnetic induction. Here, when the current was increased also the voltage raised. The ability to produce higher power by upscaling the number of devices and down-scaling the sizes, further investigations must be done. It was noted that indoor conditions, the method is suitable for breeding certain young plants. But, if it is used all time, it might be noxious and they remain small. Some upgrown healthy do not profit, it only withstands a while at the lower limit without amplification. In particular, two species remained healthy with less need for light. The current was increased with so-called heating chambers. Apart

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from being an NPN-junction, the function is probably due to a temperature gradient providing dynamics transferred to electricity. In modeling Section 4, this was described as a balance of potential energy and kinetic energy. Applications in outdoor cultivation in the cold season were evaluated. Enhanced growth is subject for publications, and here this study focused on some herbs (at a temperature of less than 0˚C). Involving aspects for chemical compounds (such as N, P, and K), larger-scale studies for the response at chilling down to 0'C for mangrove are possible. Thus, it is analyzed how they can recover between the cold hours. Given the results for magnetic fields, it is also possible that plants may energize and raise the temperature in an acoustic pressure provided by loudspeakers or devices producing harmonics at wind load.

## 5. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. Authors confirmed that the paper was free of plagiarism.

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