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|  | **Introduction**  The effects of Electromagnetic fields have been studied throughout the recent years as possible harmful effects have been realized. These fields have been shown in laboratory settings to produce mutant or cancerous cells. These effects affect plant and animal life alike. For our research project we will analyze the effect on low level EMF frequencies upon various species of plant life�s root systems. This closely relates to every day life because these low level EMF�s are similar to those put out by house hold appliances. Other projects have studied "radiation" produced by appliances, but our project specifically centers around the difference between the root system of a control group and an experimental group.  **Safety**  There is a growing public debate about the safety of electric power lines and the electrical equipment that we use every day in our homes and workplaces. The news media regularly covers many areas of the controversy over the possible health effects of electromagnetic fields. Not long ago, a lawsuit was filed alleging that a Florida woman's brain cancer was caused by electromagnetic radiation from a hand-held cellular telephone. Although the filing of a lawsuit proves nothing (thousands are filed every week, and this one was promptly dismissed by a court), the lawsuit made national headlines for weeks and caused cellular telephone industry stock prices to decline on Wall Street.  In addition to stories about lawsuits, there have been numerous media accounts of medical research concerning EMFs, some of them confusing and seemingly contradictory. And there have been news stories about activist groups fighting the construction of new power lines or cellular telephone towers in their neighborhoods.  **What is Radiation?**  Radiation is a broad term meaning the transmission of energy in the form of waves through space or through a material medium and also the radiated energy itself. The force field associated with radiation is the region throughout which the radiation is measurable. Sometimes electromagnetic radiation is called EMR, while electromagnetic fields are frequently referred to as EMF. EMR and EMF refer to the entire range of the electromagnetic spectrum, from extremely low frequencies to radio waves. In practice, EMF is used more often than EMR because "radiation" sounds scary and its use may create confusion with more dangerous radiation from X-ray machines and radioactive material. In news reports and articles written for the general public EMF is used loosely to indicate the low frequency electromagnetic fields coming from power lines, home wiring, appliances, TVs and computer displays.  Electric fields exist whether or not an electrical device is on or off. Magnetic fields, on the other hand, are present only when electrical devices are on and when current runs through them. Magnetic fields are what we are using primarily in our experiment. Hence the use of an electromagnet.  When scientists talk about electromagnetic fields, they're talking about several very different forms of energy. Electric power lines produce low frequency fields and appliances operating at a frequency of 60 Hz.Low-frequency energy is forms of non-ionizing radiation.3 The frequency is too low to produce enough photon energy to ionize atoms. In contrast, ionizing radiation which is not produced by power lines or radio transmitters can cause severe and well-documented health hazards. Nuclear weapons produce enormous amounts of ionizing radiation, while small, carefully controlled doses of ionizing radiation are used in medical X-ray equipment, for example.  Much is now known about the biological effects of this kind of energy, but there is much more that we do not yet know. Before World War II, scientists knew that non-ionizing radiation could produce thermal (heating) effects. At high power levels, EMFs can cause cellular heating, which may result in hazards such as the muation of cellular DNA and mutation of enzymes. Most ordinary household appliances and transmitted radio signals produce EMFs far weaker than those required to produce thermal effects.  **How to do it**  Using a specifically designed observation chamber we were able to easily analyze the effects of EMF�s over a set period of time. This chamber was set-up to be a thin terrarium like environment that would allow observation of the continued progress of the root system with the electromagnetic waves being produced from a low powered device. We hoped to induce a change in the root system formation and compare the observed change to a previously prepared control group. An electronic device that has been know to create low frequency EMF�s, in this case an electric train transformer, was placed on a timer to submit the plants to a 5 hour period of radiation on daily intervals.  If there is no consensus about safe energy levels, and if EMFs are difficult to measure, what can we do to minimize the potential hazards of EMFs and the damage that EMF�s can do to rapidly growing organisms such as plants, specifically their root systems. We decided to test the affects of magnetic fields on plants roots to see if the EMFs produced from the train transformer is enough to change the normal growth of the beans root system.  **Why we chose it**  When we went to choose a topic we were not sure eaxactly what to do but we wanted it to involve plants. After hearing about the 1999 project on EMP we decided we wanted to teat its affects on the root system of a plant. This presented the problem of creating the EMF in the soil close to the root system of the plants. We remembered how to make an electric magnet from our grade school years so we decided to make it using wire and a Bolt. The next major problem was finding a power supply. Mr Theil should remember all of the whining about the power supply burning up or noot being strong enough. We finally decided to use a train set transformer to power it and this ran wonderfully. Now we had a EMF producer affecting the roots. After looking around we could not find anyone else that did this experiment so we did not know what to expect.  When we started this experiment we were not sure what type of seed to use so we narrowed our choice down to beans. There were so many types of beans we decided to pick the one with the quickest life cycle. We chose Greencrop beans because of there 51 day life cycle. We also chose beans because of there central root system and the fact that they are easy to grow. | |
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