



CALIFORNIA STATE SCIENCE FAIR 2011 PROJECT SUMMARY

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Project Title Plantricity: The Effect of a Direct Electric Current on the Germination of Seeds and Growth of Seedlings	
Objectives/Goals The purpose was to determine how treatment of seeds in water with direct electric current (DC) before planting and duration of treatment would affect their germination rate and growth of seedlings (Part A), and how application of low values of DC to stems and roots of seedlings as well as placement and polarity of electrodes would affect their development (Part B). Abstract Methods/Materials In part A, seeds of radish, beans and cucumber were treated in water with 20mA DC at 0, 0.1, 1, 10, 100 min and planted into a soil mixture for 5-9 days before measuring. An additional experiment for larger groups of cucumber seeds for 1min treatment was done to calculate the germination rate. In part B, seedlings of sweet pepper were treated for 40 days with DC by applying 1.5V with the cathode or the anode attached to the apical part and the reference electrode to the soil, and with both electrodes applied to the soil. A relative increase in length of stems and number of leaves and buds was measured and calculated. Results In part A, 1 min treatment of cucumber seeds demonstrated a strong increase in the germination rate of treated seeds ($99.2\pm 1.3\%$) compared with the non-treated ones ($90.4\pm 4.5\%$) and the increase of root/shoot lengths of seedlings. A positive effect of DC on germination viability of beans in unfavorable conditions was observed. In part B, plants with electrodes applied to the roots/soil demonstrated a significant increase in stem lengths measured in % to original ($35.4\pm 1.8\%$). The insertion of anodes to the stems also showed an increase ($26.3\pm 1.0\%$), while no effect was observed for insertion of cathodes to the stems. The significant increase of the number of leaves and buds was noticed in the same two groups. Conclusions/Discussion The results indicate: 1) DC treatment of cucumber seeds increases their germination rate and induces growth of seedlings; 2) DC treatment can increase germination viability of beans; 3) the sweet pepper seedlings develop faster under exposure to DC with negative electrodes connected to the stems and with both electrodes applied to the roots. These results can be explained by the activating effect of DC on plant hormones that stimulate a metabolism of seedlings and by the intensified nutritional cations uptake while roots of plants are exposed to DC or negative electrodes are applied to stems. The found results can be used in agriculture.	
Summary Statement We researched the stimulating effect of direct electric current on the germination of seeds and growth of seedlings.	
Help Received Father helped with experimental design setup, mother assisted with drawings. Science teacher, Mr. Tim Smay, corrected our project paper.	