



CALIFORNIA SCIENCE & ENGINEERING FAIR 2018 PROJECT SUMMARY

Name(s) Eshan Rachapudi	Project Number J1123
Project Title Plant Water Conservation	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Each year, droughts cause health issues and economic damage that affect millions of people around the world. Even California, a developed state, suffered a severe drought between 2011 and 2016, which caused crop damage, nearly 102 million trees dying, and reduction of water levels in lakes and the water table. Deforestation in many parts of the world is making this problem worse. We need to plant millions of young trees, but these plants need to be watered until their roots can grow deep enough to get water from the ground. The goal of the project was to develop a low-cost device that can extract moisture from the air and convert it to water, which can be given to young plants outdoors, or to indoor plants. Eighty percentage of the time each day the device should generate at least twenty-five ml of purified water.</p> <p>Methods/Materials The materials used included calcium chloride which is an inorganic, hygroscopic compound useful for absorbing humidity from the air, lye, a sodium hydroxide neutralizer, porous carbon electrodes for removing the salts, a hydrometer to test salinity and other materials required for design, construction and testing of the device. The design includes three stacked boxes, with calcium chloride in the top box, sodium hydroxide in the middle box, and the bottom box with electrodes that collects the liquid. The methods included a fan to blow the humid air onto the calcium chloride, testing the amount of lye needed to make the pH of the water close to seven so that it is not too basic or too acidic, and testing how well the electrodes removed the salts from the liquid.</p> <p>Results The device was able to follow three major steps where it was able to extract moisture from the air using calcium chloride, neutralize the extracted liquid using lye, and remove some of the salts from the liquid using carbon electrodes.</p> <p>Conclusions/Discussion The device extracted liquid from the moisture in the air and removed some of the salts. More research is needed to remove the remaining salts before the water can be given to plants. Further knowledge in chemistry and physics is required to convert the extracted liquid into salt-free water. For example there could be other chemicals for extraction or neutralizing with less salt in the extracted liquid. Special electrodes or filters may also be required to remove the large amount of salts.</p>	
Summary Statement The purpose of this project was to invent a low cost device that would extract the humidity in the air and convert it to water that could be given to plants.	
Help Received I received help from two science teachers, Mrs. Mackewicz and Mrs. Avadhani, who explained the chemical reaction CaCl_2 and H_2O and guided me to do research on Sodium Hydroxide to overcome the challenges encountered during testing of the project. My father taught me to use a drill and jigsaw	