



**CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY**

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Project Title Oil in Soil: A Study into a Method of Agricultural Water Conservation	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Does adding oil to the top layer of soil reduce water loss from the soil? In arid regions such as southern California, water conservation is a vital issue. Applying the concepts of capillary rise and interfacial tension, this project focuses on using vegetable oil as a way to reduce water evaporation from soil by slowing the flow of underground water to the soil surface.</p> <p>Methods/Materials Dry soil was ground into a fine powder. 3000g of the dry soil was mixed with 500g of water to create pre-moistened soil. 200g of the pre-moistened soils were placed in each of 15 cups. The 15 cups containing the moistened soils were split into three trials of 5 variables (3 X 5). 50g of dry soils treated with 0, 2.5, 5.0, 7.5, and 10 g oil (PAM cooking spray) were added to the top of each of the 15 cups to form the top layer of soil. The sample containing 0 g of oil was used as the control. All of the samples were placed outside during the daytime in the same location. The mass of each sample was recorded daily. Mass loss signified water loss.</p> <p>Results The water loss in the samples treated with vegetable oil was significantly lower than that in the control without oil. The amount of water lost was inversely associated with the amount of oil added into the top layer of soil. However, there was no significant statistical variation in water loss between samples treated with different amounts of oil</p> <p>Conclusions/Discussion Vegetable oil in the top layer of soil changes the interfacial tension between the top layer of soil and water in the lower layer of soil (the lower layer was not treated with oil). It also increases the interfacial tension with water inside the tiny holes in soil that act as capillaries for the water to rise through. Vegetable oil therefore counteracts the force (capillary rise) pushing water towards the surface. As a result, less water is lost due to evaporation. Treating topsoil with biodegradable vegetable oil is a possible and superior alternative to the current water conservation methods such as plastic tarp coverings, which are not biodegradable and require more labor to deploy and maintain. The best concentration of oil in the top layer of soil in an agricultural application is 5%, because at this level, the physical properties of soil are maintained while water loss is reduced by 25%.</p>	
Summary Statement This project seeks to study the relationship between the amount of vegetable oil in the top layer of soil and the amount of water lost from that soil, so that water can be more efficiently conserved in agriculture.	
Help Received	