Use of Surfactants to Promote Agricultural Sustainability and Soil Fertility in Arid Climates

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The purpose of my experiment is to explore sustainable solutions to solve the global environmental issue of desertification. Arid climates foster conditions for dry, compact soil, possibly leading to drought. This water-repellent behavior is a result of surface tension; the surface water resists infiltration of the soil due to the cohesive nature of water molecules. I hypothesize that the utilization of surfactants can have a reverse effect on the surface tension of dry and compact soil, leading to increased infiltration by water to solve desertification and infertile land. To test my hypothesis, I used four dry soil samples (one control and three experimental groups). Before adding any wetting agent, I tested the initial moisture levels using a soil moisture meter that operates on a scale of 1-10 wfv (water fraction by volume) to get a baseline of 0 wfv for each soil sample. For experimental groups, I made three types of wetting agents with different surfactants found in common household products to form a 1% concentration solution: Sodium borate, sodium laureth sulfate, and sodium lauryl sulfate. This experiment was conducted over three days to test the efficacy of each surfactant to see the progression of water infiltration. As per the test results, I concluded that my hypothesis was proven correct as the change of moisture levels of the control compared to the experimental groups ranged from 5-9 wfv. This difference is crucial for lands to absorb the water that would previously be "pooling" at the surface of the water.

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