



CALIFORNIA SCIENCE & ENGINEERING FAIR 2018 PROJECT SUMMARY

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| Name(s) Anne K. Miyadi | Project Number 38743 |
| Project Title The Effectiveness of Agriculture Systems Comparing Traditional, Hydroponics, and Aquaponics on the Growth of Allium cepa | |
| Abstract Objectives/Goals Three different agricultural systems for growing crops were tested for their effectiveness. The hypothesis for this experiment was that Allium cepa (green onion) specimens cultivated in an aquaponics system would yield the tallest plants, those in a hydroponics system would be of a slightly shorter height, while those grown in a traditional soil-based, hand-watered system would be the shortest. Methods/Materials Supplies included plastic bins, PVC pipes, bulkhead fittings, clay bead media, pumps, aquarium tubing, a fish tank, 25 tilapia, water, all-natural gardening soil, 36 Allium cepa. Three separate and unique agriculture systems were constructed. In the traditional system, specimens were placed in soil and watered by hand. The hydroponics and aquaponics system had specimens suspended in clay bead media with identical pumps circulating water to and from the growbeds. The hydroponics system circulated water only. The aquaponics system included a separate tank of tilapia whose effluent was circulated as fertilizer. Results The Allium cepa grown in the traditional system were significantly smaller than those specimens grown in the hydroponic system, and in turn, both were smaller than those grown in the aquaponics system, proving the hypothesis correct. The specimens in the traditional system grew to a mean of 1.8 centimeters tall. In contrast, the specimens in the hydroponic system grew to a mean of 6.4 centimeters tall, approximately 3.5 times taller than those in the traditional system. Significantly, the specimens in the aquaponics systems grew to a mean of 9.4 centimeters, approximately 5.2 times taller than those in the traditional system. Conclusions/Discussion Hydroponics and aquaponics are vastly more effective than traditional agricultural systems. But the modest difference between aquaponics and hydroponics leads to the conclusion that fish effluent is only moderately beneficial. Hydroponics and aquaponics both offer more efficient growth. Rather than switching from traditional systems merely to try to maximize growth, farmers should consider using either hydroponics or aquaponics to also conserve water and space while growing crops more efficiently and effectively. | |
| Summary Statement I tested the effectiveness of different agricultural systems and learned that aquaponics is the best. | |
| Help Received I was advised by a friend who had personal experience in constructing aquaponics systems. | |