Maximizing Growth of Lactuca sativa with a Polyculture in Aquaponics

Benstead, Katherine (School: Niles Township West High School)

Around 815 million people around the world suffer from hunger (World Hunger, 2016). The purpose of this experiment is to increase vegetable production of aquaponics systems. Aquaponics is a method of growing plants and fish together in which the fish produce waste nutrients that plants need in order to grow. The plants act as a filter and allow the water to be recycled through the system. This experiment aims improve upon aquaponics by increasing plant production using a combination, or polyculture, of different species of aquatic animals in the same system. 5 recirculating systems were used, in which water was pumped up from 37 L fish tanks to flow through the plant bed resting above, where the water was filtered, then fell back into the fish tanks. The experimental groups included one tank that held 8 goldfish (Carassius auratus), one that held 2 crayfish (Procambarus clarkii), and one that held 4 goldfish and 1 crayfish (a polyculture). Plant growth and nutrient content of the water was recorded. The crayfish wastewater produced plants that grew to 2.02 cm in average leaf length after 12 days, mirrored by the goldfish wastewaters' plants of 2.07 cm. Sprout height and number of leaves was also recorded and indicated that the polyculture would yield greater plant growth in the future. A polyculture presents a viable addition to modern aquaponics because goldfish and crayfish produce similar levels of plant growth individually and it would provide two individual food sources in one system. Goldfish and crayfish serve as models for alternative nutritious and economically viable aquatic animals, such as tilapia and freshwater prawns, which can form scalable systems that can be implemented at various sizes, potentially feeding a small community.

Awards Won: