Over the course of time plants and microbes have developed both beneficial and detrimental relationships. The detrimental relationships that could possibly occur are caused by the infections fungi, bacteria, and viruses transmit. Once infection occurs, the pathogens that are transmitted suppresses the plants immune responses resulting in the death of the plant. However, recent studies show that some plants take up and digest microbes and in return the microbes are used as a source of nutrients. Agriculturally, pathogens are known to be problematic and have caused millions of dollars in damage to crops. In this study it has been found that a species of *Arabidopsis* (*Arabidopsis thaliana*) and a species of tomato (*Lycopersicum esculentum*) both possess the ability to consume non-pathogenic bacteria such as *Escherichia coli* and *Saccharomyces cerevisiae.* With these findings, agriculturists are looking forward to possibly discovering ways to produce plants that have the ability to consume microbes as a source of nutrients.

In order to determine if the plants were consuming the fungi and bacteria as a means for nutrients, a species of Arabidopsis and a tomato were grown in a growth media supplemented with fluorescent strains of Escherichia coli and Saccharomyces cerevisiae. Researchers then examined the roots from an Arabidopsis plant that doesn’t form symbiotic relationships with fungi and the roots of a tomato plant that possesses the ability form symbiotic relationships with mycorrhizal fungi, but hadn’t been exposed to bacteria of that nature in order to have an accurate representation of the relationship between the plants and the supplemented bacteria and fungi in the media. The *Arabidopsis* plant was incubated in an axenic agar culture while the tomato was incubated in a non-axenic culture. After the tomato was incubated for 12 hours and the *Arabidopsis* was incubated for four hours; *E. coli* and yeast were both found in the cells of the root hairs, the rhizodermis (outer-layer of roots), and the cortex (outer-layer of stem) in the mature zones of the roots of both plants. To specify the uptake process the Arabidopsis was incubated in a culture that had additional nano-silica beads fluorescent beads that were in similar size to the bacteria. At the end of the incubation process, none of the nano-silica beads were detected in the roots but a few beads were found attached to the root surface which suggest that the roots have the ability to recognize microbes and target them as a source for nutrients. Cross-sections showed that the microbes were present in the epidermis cells and cortex cell but separated by the Casparian strip suggests that microbes were confined to the root cortex cells, where they are degraded. In order to determine the effects that the microbes and fungi could have on the plants, the plants were monitored for several days. Day 3 of monitoring the tomato plant there were still some living cells present, there were also some cells that had altered shapes; after day 10 there were no more fluorescing cells and after day 14 only debris was found in the root cells. The Arabidopsis displayed beneficial results from consuming E. coli as it was found that the bacteria serves as a source of Nitrogen and also caused the cell wall to extend, in the tomato plant there was an excessive amount of nitrogen found in the leaves which was assumed to be caused by the bacteria. Both plants were compared to the controls and both plants looked the same phenotypically and had no problems with survival. Considering the plants had higher amounts of nitrogen than the control, it is safe to say that under ideal conditions the plants that consumed the bacteria will more than likely be healthier and grow better than the control.

For future studies the objective is to determine if the *E. coli* strands that are digested actually provide the plant with nutrients or if the nitrogen that the microbe expels is assimilated by the plants.

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