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Research Update

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The role of microorganisms in fresh cut flowers.

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Introduction

Bacteria are ubiquitous microorganisms that live in nearly every environment known to man. Flowers, both preharvest and postharvest, provide a unique ecosystem that allows microbes like bacteria and fungi to flourish. Before harvest, bacteria and fungi live on the stems, leaves, and roots of plants, and in the soil. These microbes can be beneficial, harmful, or neutral. Beneficial microbes promote plant growth by increasing nutrient availability in the soil and providing protection against pathogens. Neutral microbes coexist with plants, and generally do not harm or help the plant. Harmful microbes cause diseases like blight, root rot, rust, and cankers.

Harvesting a flower from its mother plant changes the environment of the flower, and the ecosystem in which it lives. The cold chain of flower transport helps maintain the dormancy of this ecosystem, and slows microbial growth during transport. Once the flowers have reached their destination and are placed in vase water at room temperature, a new ecosystem begins to form. This time, the ecosystem includes the flower, the microbes living on the flower stem and leaves, the microbes living in the vase water, and the air around the arrangement. Research has shown that the initial community of microbes in vase water includes bacteria that are often found in the soil. As the vase water ages, the community transitions to soil bacteria and fungi that prefer a wet environment (Figure 1). As the vase water reaches the end of its life span, fungi, like mold and mildew from the air, begin to predominate. The vase water of cut flowers represents a new ecosystem with new challenges for the flower and microbes living in it.

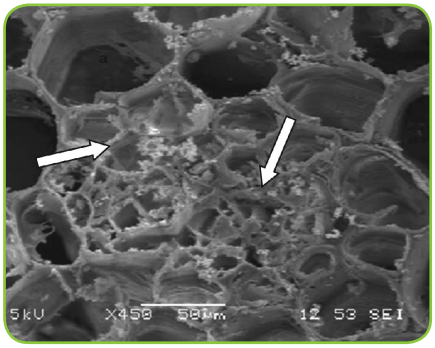

Figure 1. Cross section of the base of Dendrobium "Darren Glory" (DDG) cut orchid flower stem in distilled water. The section was taken after five days in vase solution. Arrows show microbial colonies within xylem. Source: Almasi, et al. (2015) Bragantia, 74(4), 457-466.

Each species of cut flower responds differently to the microbes coexisting in their vase water. For example, flowers like gerbera and chrysanthemums have a low tolerance for high concentrations of bacteria, which may clog the cut end of the stems. Carnations and alstroemeria have a higher tolerance for bacteria in the vase water, as their stems do not clog as easily. Roses fall somewhere in the middle for tolerance to bacteria (Figure 2). Some bacteria produce exopolysac-

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Figure 2. Rose with bent neck, a common occurrence due to reduced hydration caused by vascular blockage.

charides, a thick, sticky substance that can accumulate at the base of a stem. Bacteria use exopolysaccharides to build a sticky, slimy layer of protection around themselves. Unfortunately, bacteria like to live near the source of nutrients, like the base of a cut flower stem (Figure 3). Therefore, this sticky, slimy house for bacteria is often built at the base of the stem – the primary location through which the flower takes up water.

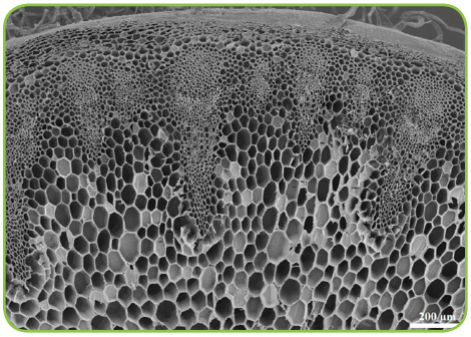

Figure 3. Micrograph from electron microscopy of gerbera flower stems cut using a stainless-steel blade and critical point drying with CO2. Bar – 200 µm. Source: Poliana et al. (2015) Advances in Ornamental Horticulture and Landscaping 21 (1), 17-26.

Conclusion

Good flower processing habits and techniques will reduce the risk of clogged flower stems and limit the concentration of microbes in solution. Good habits include using sanitized vases, sanitized cutting tools during harvest and processing, and high quality water. Flower food helps maintain a healthy solution to hydrate and sustain fresh cut flowers.

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