

Rhizobia are soil bacteria that can live freely in the soil, as well as engage in specific symbiotic relationships with leguminous plants. Chemotaxis in the model rhizobium *Sinorhizobium meliloti* allows the organism to recognize its hosts and preferentially move towards nutrient rich areas in the soil. It possesses multiple and more diverse chemoreceptors when compared to the well-studied enterobacterial system, including six transmembrane and two cytosolic proteins to sense nutrients and host-derived substances. We aim to identify signaling molecules exuded by the alfalfa host and their corresponding bacterial chemoreceptors. Amino acids, organic acids and quaternary ammonium compounds are among the compounds exuded by alfalfa. We established that the chemoreceptor McpU is a universal amino acid sensor and McpV a chemoreceptor for small organic acids. Furthermore, we discovered the existence of bacterial chemotaxis to quaternary ammonium compounds (QACs) such as choline and betaines, which are known to serve as nutrient sources, osmoprotectants, and cell-to-cell signals. The chemotactic response to QACs is mediated through direct binding to McpX.