Popular summary

Lignin is one of the most abundant renewable materials on Earth. It is found in plant biomass and is produced in large amounts as a by-product of forestry, paper, and agricultural industries. Despite its abundance, most lignin is still burned for energy rather than converted into higher-value products. One promising approach is to use microorganisms that can break down lignin-derived compounds and transform them into useful chemicals.

This project investigated whether the bacterium *Azotobacter vinelandii* can utilize compounds that are commonly released when lignin is broken down. Two strains of the bacterium were cultivated with a range of lignin-derived aromatic compounds, and their growth and substrate consumption were monitored over time. Chemical analyses were used to determine which compounds were consumed and whether intermediate products were formed during cultivation. The results showed that *A. vinelandii* could consume several lignin-derived compounds. However, not all compounds were equally suitable. The two bacterial strains behaved similarly in terms of which compounds they could consume, but one strain generally grew faster and reached higher cell densities.

Overall, this work improves our understanding of how *A. vinelandii* responds to lignin-derived compounds and identifies both strengths and limitations in its metabolism. The findings provide a foundation for future efforts to engineer this bacterium for sustainable biorefinery applications, helping transform plant waste into valuable products instead of simply burning it as fuel.