

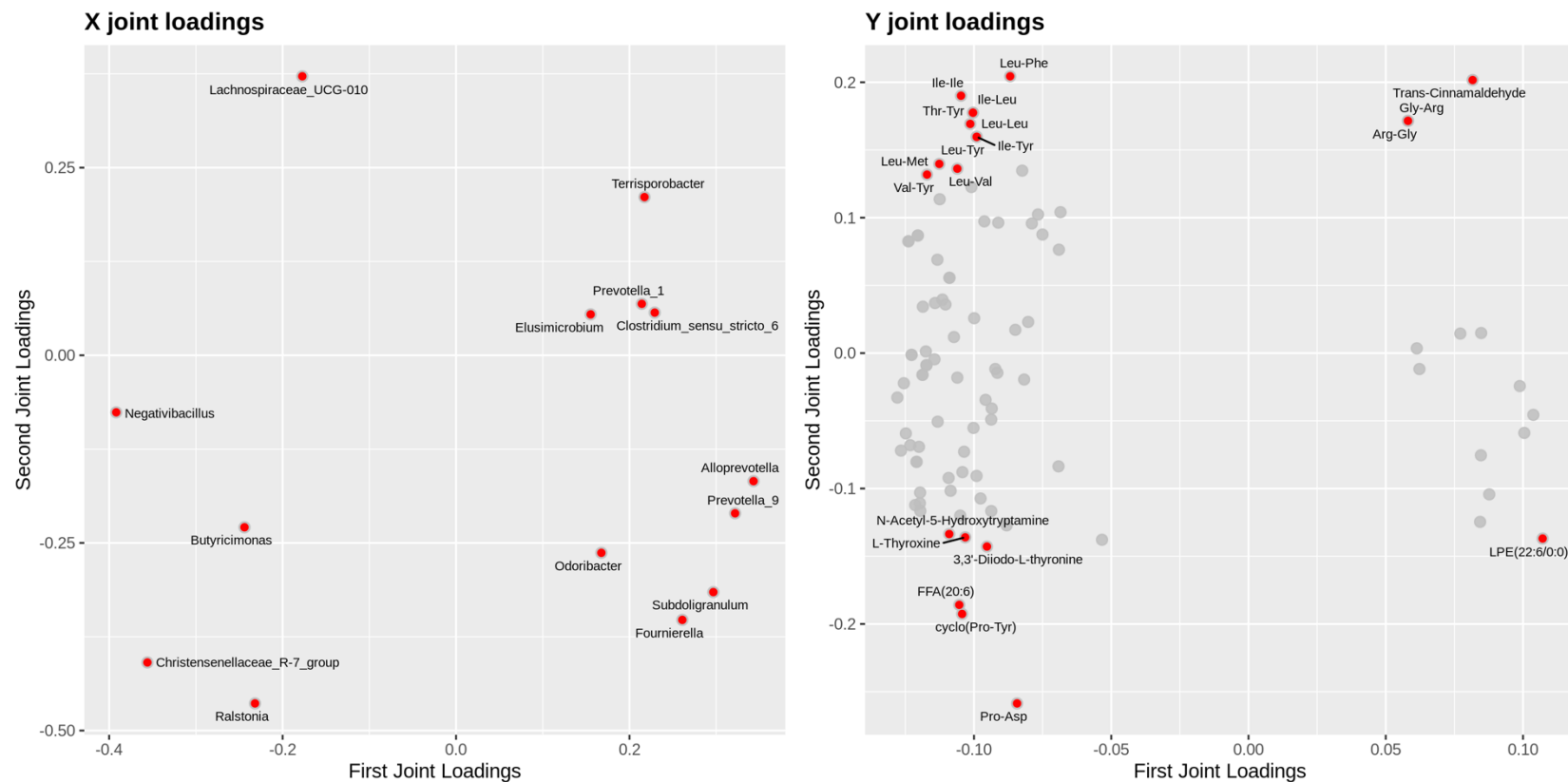


Fig. S3 O2PLS-based joint loading plots illustrating shared variation between the X and Y datasets. The left panel shows the joint loadings of X variables (microbial features), whereas the right panel shows the joint loadings of Y variables (metabolite features) on the first two joint latent components. Each point represents a variable projected into the joint latent space, with coordinates corresponding to its loadings on Joint Component 1 and Joint Component 2. Red points indicate variables selected based on the 15 highest absolute loading values, highlighting the most influential contributors to the joint structure. Grey points represent all remaining variables included in the model. Variables located in the same quadrant exhibit similar loading patterns, whereas those in opposite quadrants exhibit opposite directions, suggesting contrasting contributions to the shared variation structure.