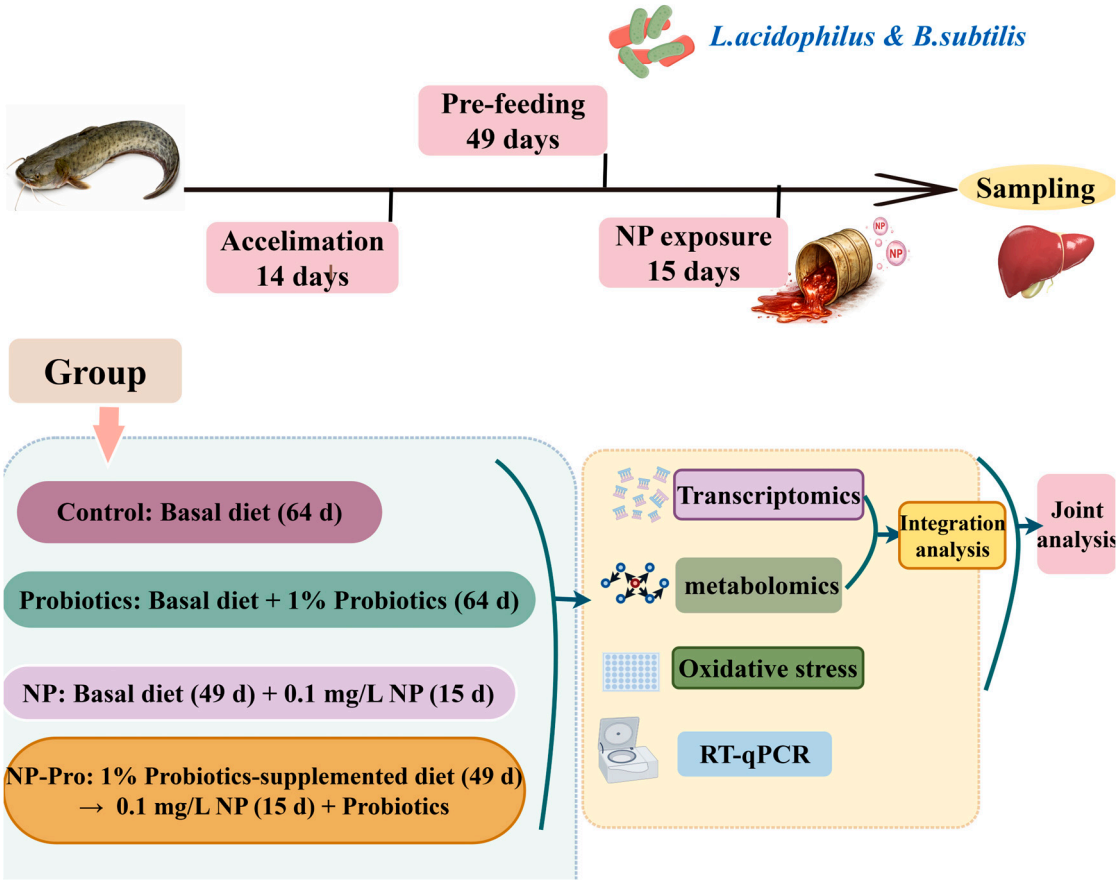


Supplementary Figure S1. Experimental design. Schematic timeline of the 14-day acclimation, 49-day pre-feeding, and 15-day NP exposure across four groups (Control, Probiotics, NP, and NP-Pro). Liver samples were collected for integrative analyses of transcriptomic, metabolomic, and oxidative stress data, with RT-qPCR validation.