

Figures

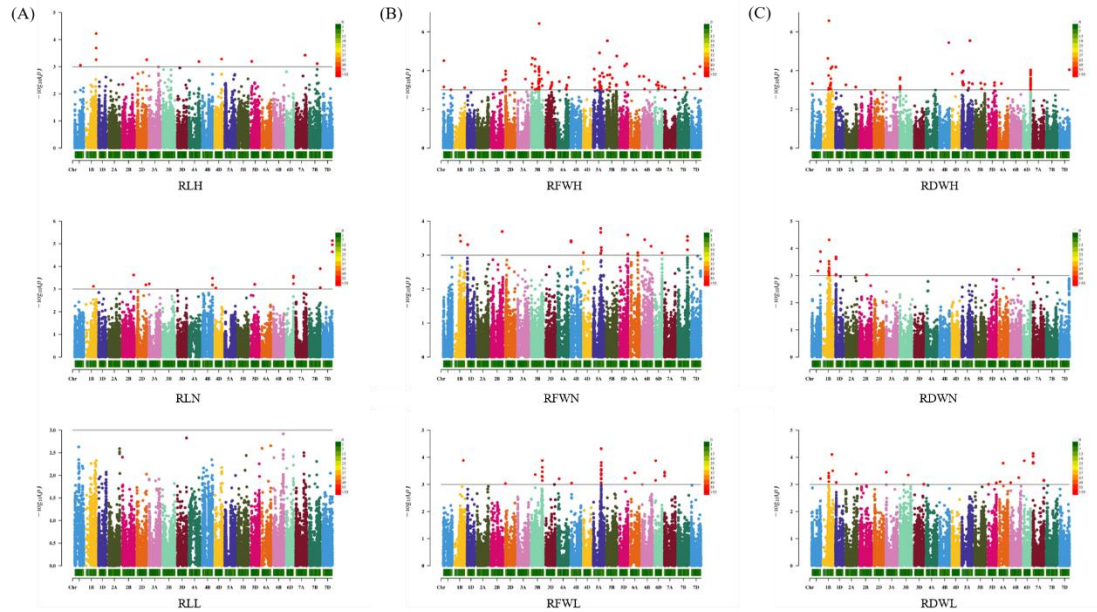


Figure S1. Manhattan plots for the three root and seedling biomass traits identified by genome-wide association study (GWAS) using BLUP values. The dashed line represents the significance threshold ($-\log_{10} P = 3.0$). Trait abbreviations: **(A)** RLH, root length in high nitrogen; RLN, root length in normal nitrogen; RLL, root length in low nitrogen; **(B)** RFWH, root fresh weight in high nitrogen; RFWN, root fresh weight in normal nitrogen; RFWL, root fresh weight in low nitrogen; **(C)** RDWH, root dry weight in high nitrogen; RDWN, root dry weight in normal nitrogen; RDWL, root dry weight in low nitrogen.

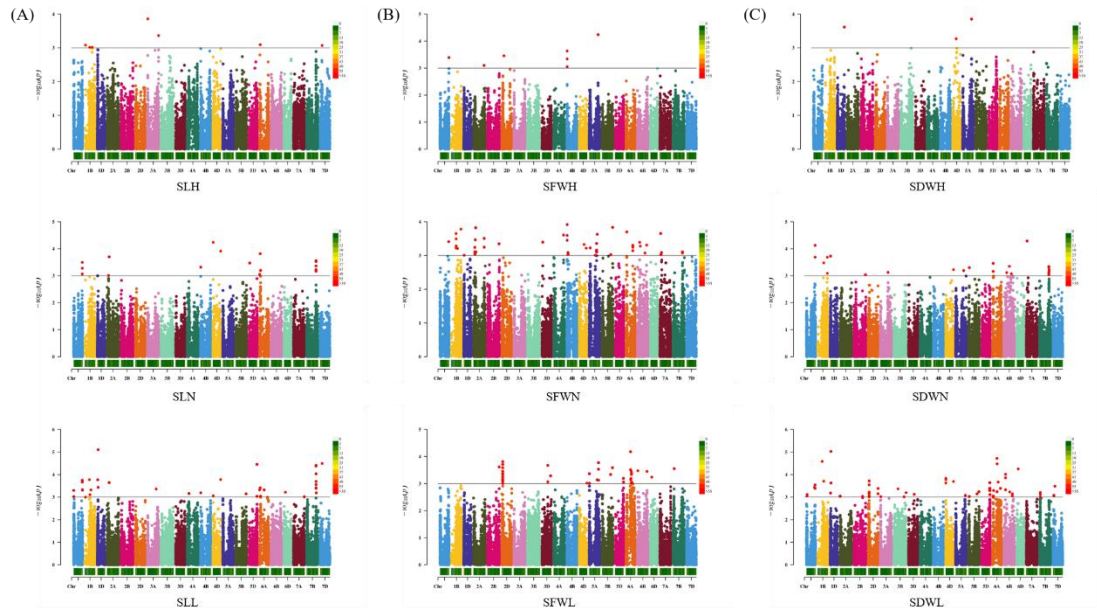


Figure S2. Manhattan plots for the three root and seedling biomass traits identified by genome-wide association study (GWAS) using BLUP values. The dashed line represents the significance threshold ($-\log_{10} P = 3.0$). Trait abbreviations: **(A)** SLH, shoot length in high nitrogen; SLN, shoot length in normal nitrogen; SLL, shoot length in low nitrogen; **(B)** SFWH, shoot fresh weight in high nitrogen; SFWN, shoot fresh weight in normal nitrogen; SFWL, shoot fresh weight in low nitrogen; **(C)** SDWH, shoot dry weight in high nitrogen; SDWN, shoot dry weight in normal nitrogen; SDWL, shoot dry weight in low nitrogen.

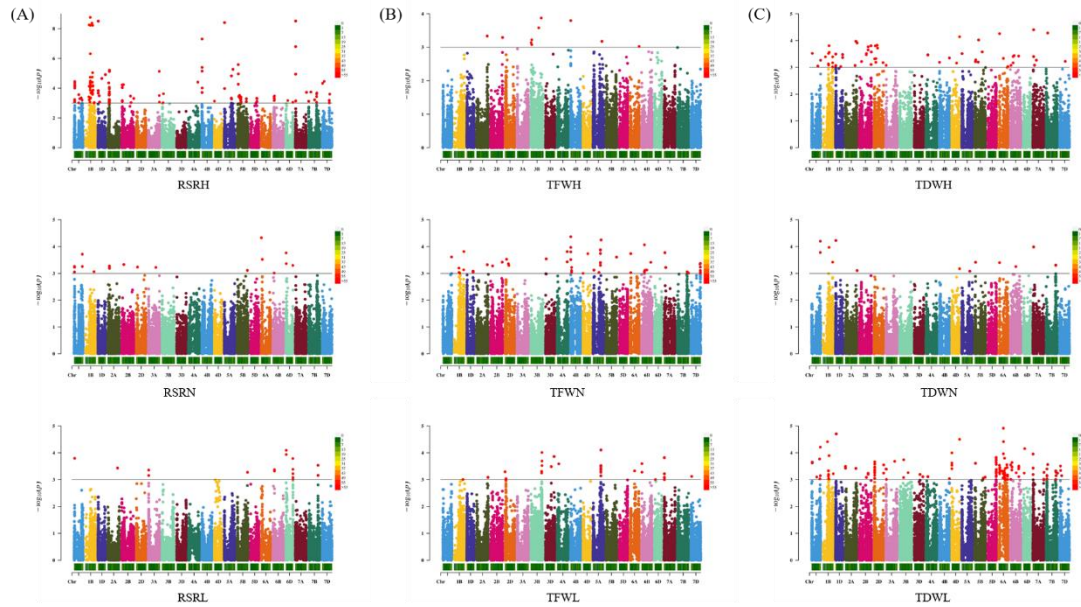


Figure S3. Manhattan plots for the three root and seedling biomass traits identified by genome-wide association study (GWAS) using BLUP values. The dashed line represents the significance threshold ($-\log_{10} P = 3.0$). Trait abbreviations: **(A)** RSRH, root-shoot ratio in high nitrogen; RSRN, root-shoot ratio in normal nitrogen; RSRL, root-shoot ratio in low nitrogen, **(B)** TFWH,

total fresh weight in high nitrogen; TFWN, total fresh weight in normal nitrogen; TFWL, total fresh weight in low nitrogen; (C) TDWH, total dry weight in high nitrogen; TDWN, total dry weight in normal nitrogen; TDWL, total dry weight in low nitrogen.

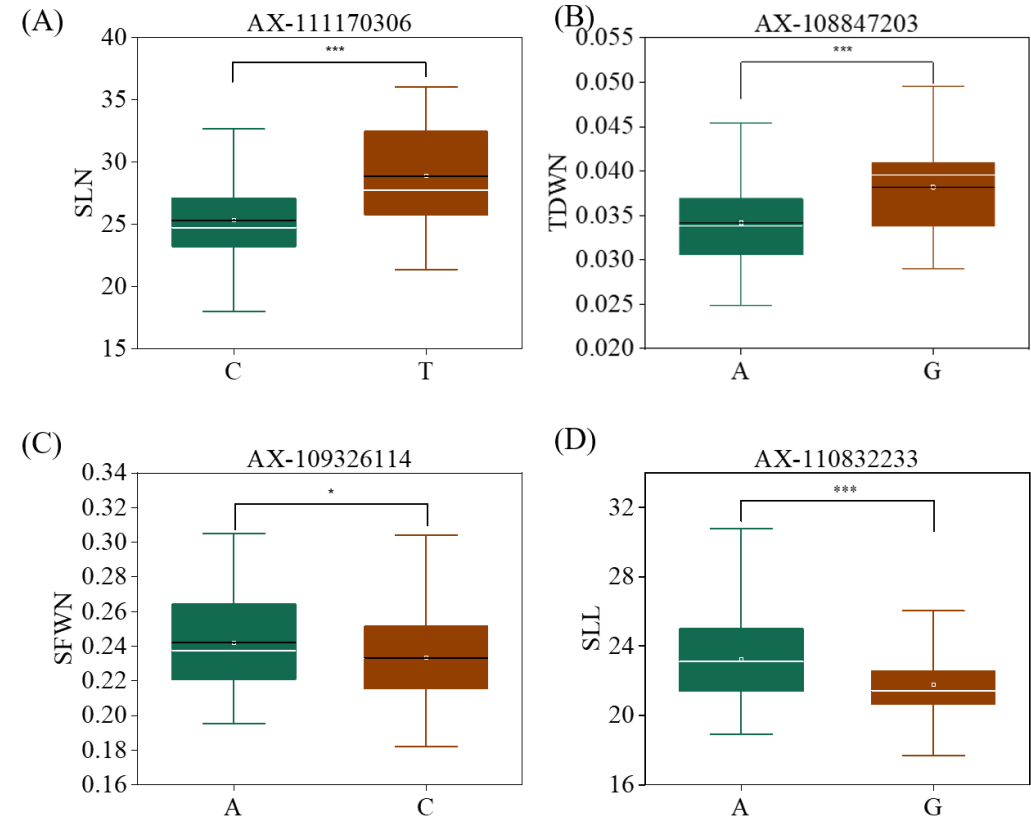


Figure S4. Comparison of the allele effects of SNPs. Trait abbreviations: (A) SLN, shoot length in normal nitrogen; (B) TDWN, total dry weight in normal nitrogen; (C) SFWN, shoot fresh weight in normal nitrogen; (D) SLL, shoot length in low nitrogen. * $p < 0.05$, *** $p < 0.001$.

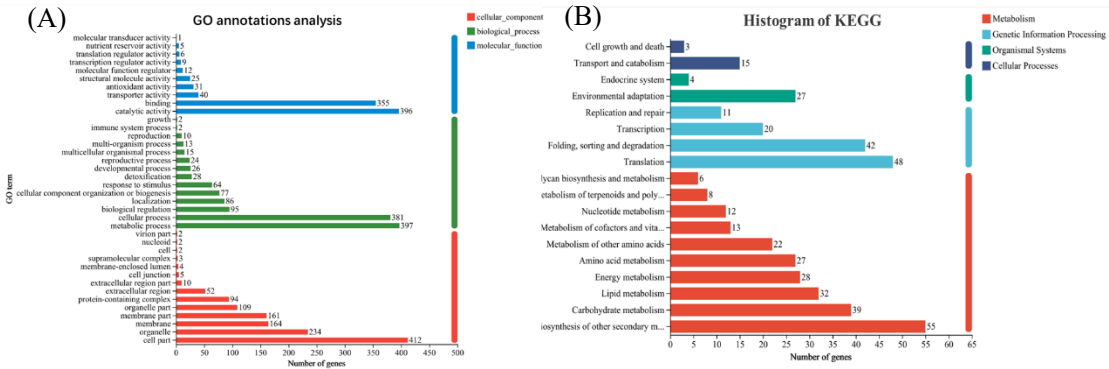


Figure S5. GO and KEGG annotation analysis of candidate genes. (A) GO annotation analysis of the candidate genes; (B) KEGG annotation analysis of the candidate genes.