In this study we investigated the fertilizing effect of ammonium nitrate on microbial nitrogen transformation processes comparatively in the rhizosphere of an exploitative (*Dactylis glomerata*) and a conservative (*Festuca rubra*) gramineous plant. We performed a greenhouse experiment using a sandy and nutrient-poor soil and applied four different amounts of fertilizer to five plants per pot in five replicates, respectively. The plants received 40% of the fertilizer after 7 days and 60% after 21 days of growth. After 6 weeks of plant growth, functional genes involved in nitrification (bacterial and archaeal *amoA*) and denitrification (*nirK*, *nirS*, *nosZ*) were quantified in the rhizosphere by real-time PCR and soil ammonium and nitrate concentrations were determined. The soil ammonium concentrations were close to the detection limit. Likewise, nitrate could not be determined in any fertilizing treatment for *Dactylis*. In contrast, the nitrate concentrations increased for *Festuca* with rising amounts of fertilizer. While no difference in abundance of ammonia-oxidizing archaea was observed, increasing gene copies of ammonia-oxidizing bacteria with elevated fertilizer rate for both plants were measured. Concerning the denitrification genes, e.g. a clear trend of increased *nirK* copies in the rhizosphere of *Festuca* compared to *Dactylis* was detected which corresponded to the soil nitrate contents. Thus, we observed clear differences between the exploitative and the conservative plant in nitrogen uptake and consequently detected different abundance pattern of nitrifying and denitrifying microbes in the rhizosphere.