ABSTRACT

The atmospheric concentration of CO_2 is constantly and rapidly increasing and this is expected to provide a fertilization effect on plant productivity. However, this effect is only observed initially because plants acclimate to these conditions upon long-term exposure. This is believed to be due to lower sink strength and nitrogen (N) limitations. In this context, the interaction of *Arabidopsis thaliana* and the beneficial bacteria *Enterobacter* sp. SA187 was studied to observe its potential of improving plant development by avoiding the photosynthetic acclimation to elevated CO_2. RNA sequencing and qRT-PCR analyses showed overexpression of genes related to N uptake, assimilation, biosynthesis and response to ethylene, salicylic acid and jasmonic acid. For a number of selected genes, it was possible to validate the observed RNA-seq based changes in their expression by qRT-PCR. The beneficial effect of *Enterobacter* sp. SA187 on *Arabidopsis thaliana* ecotype Col-0 and mutant *coi-1* under e[CO_2] was confirmed through growth phenotyping. On the other hand, SA187 interaction with mutant lines *sid-2*, *ein-2* did not show any beneficial effect . These results led us to conclude that *Enterobacter* sp. SA187 might improve plant development under elevated CO_2 conditions through alleviating sink strength, N uptake and N assimilation limitations as well as by modulating plant hormonal status. Thus, establishing a beneficial plant-microbe interaction appears to be a good strategy for improving plant growth and development under elevated CO_2 conditions.