

ABSTRACT

Post embryonic life of higher plants begins with the germination of dormant seeds. Mature seeds of most of the higher plants harbour dormant embryos and go through the complex process of germination under favourable environmental conditions. The germination process involves dynamic physiological, cellular and metabolic events that are controlled by the interplay of several gene products and different phyto hormones. Micro RNAs (miRNAs) are a major class of endogenous small non-coding RNAs of 19-22 nucleotides length. They have been implicated in various aspects of plant development and physiology. Some miRNAs have been shown to be important in seed development and germination. However, global expression pattern and role of miRNAs during stages and conditions of seed germination remains elusive. Using functional genomics approach, we have identified 58 miRNAs that are differently expressed and regulate target genes during various stages and conditions of seed germination in *Arabidopsis*. Amongst them 15 differentially expressed miRNAs were validated by quantitative Reverse Transcription Polymerase Chain Reaction (qRT-PCR). We identified miRNA targets, annotated their functions and analyzed their expression patterns. In majority of the cases, we observed a strong correlation between expression pattern of miRNAs and their targets indicating role of miRNA mediated post-transcriptional gene regulation in seed germination. Interestingly, the expression of miR390, which regulate the production of a trans acting-small interfering RNA (ta-siRNA), called tasiR-*ARF* correlates with that of *Auxin Response Factor 2/3/4* (*ARF2/3/4*), targets of tasiR-*ARF*. We have showed that the germination efficiency and viability of seeds of ta-siRNA biogenesis pathway mutant allele *sgs3-11* are significantly altered under abiotic stress conditions, suggesting that both miRNAs, ta-siRNAs and their targets contribute to seed germination process under normal and stress conditions. Functional characterisation of miR165/166 using target mimic line seeds (*eTM-miR165/166*) suggests its role in seed viability and germination efficiency under normal and various abiotic stress conditions.