Arenosa gene expression

**Background information**

*Arabidopsis arenosa* populations exist in different habitats, and exhibit a range of differences in flowering time, cold sensitivity, and perenniality. Sensitivity to cold is an important trait for perennials, plants that live longer than one year. It is common for perennials to require a period of prolonged cold in order to flower. This mechanism, known as vernalization, allows perennials to synchronize their life cycle with the seasons such that they flower only once winter is over. Plant response to low temperatures is under genetic control, and mediated by a specific set of cold-responsive genes.

In a recent study, researchers used RNA sequencing (RNA-Seq) to investigate how cold responsiveness differs in two populations of *A. arenosa*: TBG (collected from Triberg, Germany) and KA (collected from Kasparstein, Austria).[1] TBG grows in and around railway tracks, while KA is found on shaded limestone outcrops in wooded forests. As an annual, TBG has lost the vernalization response and does not require extended cold in order to flower; in the wild, TBG plants usually die before the onset of winter. In contrast, KA is a perennial plant, in which vernalization is known to greatly accelerate the onset of flowering.

Winter conditions can be simulated by incubating plants at 4 °C for several weeks; a plant that has undergone cold treatment is considered vernalized, while plants that have not been exposed to cold treatment are non-vernalized. Expression data were collected for 1,088 genes known to be cold-responsive in TBG and KA plants that were either vernalized or non-vernalized; the expression data were obtained from three specimens from each population that were exposed to cold treatment, and three that were not.[2]

**Format of data**

Each row corresponds to a gene; the first column indicates gene name, while the rest correspond to expression measured in a particular plant sample. Three individuals of each population were not exposed to cold (non-vernalized, denoted by nv) and three were exposed to cold (vernalized, denoted by v). Expression was measured in gene counts; as a result of normalization between samples, the counts are not integers. A high number of transcripts indicates a high level of gene expression.

[1] Baduel P, et al. Habitat-Associated Life History and Stress-Tolerance Variation in *Arabidopsis arenosa*. *Plant Physiology* 2016: 171: 437-451.

[2] The data have been normalized between samples to allow for comparisons between gene counts.

[3] Recall that the apply() function was introduced in Lab 3 of this chapter; refer to the Lab Notes for an explanation of the function syntax.