A database of plant traits for major planting tree species in Japan

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Recent increases in air temperature and extreme weather events requires impact assessments of climate change not only on natural vegetation but on plantation forests. To understand the responses of plantation forests to climate change and to provide a reliable set of parameters for models, we are now constructing a plant trait database for two major planting species, Japanese cedar (Cryptomeria1 japonica) and Japanese cypress (Chamaecyparis obtusa), which account for 44% and 25% of total plantation area in Japan. Given their habitat preferences, Japanese cedar is conventionally planted in wet and nutrient-rich sites with a broader mean annual temperature (MAT) range, while Japanese cypress is planted in dry and nutrient-poor sites with limited MAT range. Here, we introduce outlines of our database and some analyses using the database.

The database consists of mostly publications found by search engines such as "google scholar" and "web of science", and also includes local publications that are unavailable from internet. Traits are either physiological, biochemical, anatomical or morphological, which amount to 180 features. Data are broadly collected from studies performed under various internal (leaf age, tree age, leaf position in crowns, etc.) and external conditions (seasons, ambient temperature, soil types, etc.) to obtain spatial-temporal patterns of each trait.

As of Dec, 2017, our database contains 20,000 data entries for 180 traits from 236 datasets. The traits with the highest entries are mass-based photosynthesis (879), mass-based leaf nitrogen content (875) and mass-based leaf potassium content (620) in Japanese cedar, while they are stem surface respiration rate (333), mass-based leaf nitrogen content (282) and mass based-leaf potassium content (224) in Japanese cypress. The database is also rich in traits related to plant-water relations, with 301 and 117 entries for midday water potential in Japanese cedar and Japanese cypress, respectively, and with at least 50 entries for each of parameters of PV-curve in both species. Between the two species with contrasting habitat preference, differences were found in a series of traits, especially in morphological and anatomical features, such as tracheid length, basic wood density and stomatal density. In general, Japanese cedar have characteristics of fast growing species and is more optimistic about water use, compared to Japanese cypress. We also compare these traits with those of other major gymnosperms in the world using the TRY database.