Drought response strategies and sensitivity of native vegetation in the Auckland Region

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Under climate change scenarios for New Zealand, seasonal drought is forecast to increase in intensity and frequency, increasing the occurrence and severity of soil moisture deficits across the country. Drought survival strategies and hydrology preference can influence species distribution patterns. Soil moisture is an important factor in the determination of seedling recruitment, as the limited root systems of seedlings make them susceptible to drought stress. Thus, impending climate change may alter plant community recruitment patterns and subsequent plant distributions. However, there is little information on the relative drought sensitivity of native plants in New Zealand. I assessed the physiological responses and drought sensitivity of 18 plant species found in native forests of the Auckland region. Seedlings were subjected to a 12-week manipulative dry-down experiment and assessed at four-week intervals for alterations in leaf gas exchange, and water potentials. Plant vigour was assessed with a wilting index throughout the experiment and harvested samples were assessed for foliar nitrogen content and ratios of above and below-ground biomass. The 18 species expressed three different drought response strategies: avoidance, tolerance, and drought intolerance. The species loosely defined positions along a continuum between two contrasting plant growth strategies: fast- growing species with high water use traits and low drought survival; and slower-growing species with conservative water use strategies and drought tolerance. Stem water potential was the best indicator of drought tolerance. Drought-habitat interactions demonstrated a broad pattern of drought-resistance mechanisms associated with plant species acclimated to drier ridgetop/disturbance habitats, and drought-intolerant species associated with comparatively wetter habitats. Species recommended as colonisers in restoration plantings were mostly fast-growing, drought-intolerant species. Findings from this study will contribute to literature focused on seedling recruitment in drought scenarios, as well as indicate which plant species commonly recommended in catchment rehabilitation planting are more drought resistant.