

SILVICULTURE

CHEMICAL SITE PREPARATION AND INTERACTIONS WITH KOA NURSERY STOCKTYPES AND EDAPHIC CONDITIONS

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Abstract

Restoring Hawai'i's native koa (*Acacia koa*, A. Gray) forests are top conservation and forestry priorities; providing critical habitat services and high-value timber products. Efforts to restore koa forests, however, are directly impeded by extensive kikuyu grass (*Pennisetum clandestinum* Hochst. ex Chiov.) swards occupying deforested montane landscapes. In a field study, we implemented a combination of grass suppression and seedling stocktypes to measure outplanting performance in a naturalized site on Ulupalakua Ranch property on Maui. Seedlings were grown in a nursery in two different root container sizes (111, and 207 cm³) and subsequently outplanted into grass-dominated plots that were either untreated or suppressed with a high-rate herbicide combination of imazapyr and glyphosate (1.7 kg a.i. ha⁻¹, respectively), 30 days prior to planting. Across all treatments, seedling survival was high (>95%). The larger stocktype was persistently larger and at 30 months after planting was 10% taller with an 18% greater root collar diameter. Concurrently, initial grass suppression resulted in trees that were 34% taller with 66% larger root-collar diameters, 30 months after planting. Corresponding to the larger sizes, were significantly higher leaf area indices (2.6 vs. 1.8 m² m⁻²), indicative of higher photosynthetic capacity and canopy closure. Grass suppression increased soil temperature and soil moisture in the first year, followed by a dramatic drop in soil moisture on the second year, which corresponded with an apparent log-phase growth response of koa after the first year in establishment. These results demonstrate how the combination of fundamental silvicultural practices in the nursery and the site can accelerate tree growth to meet restoration goals in shorter time intervals. This is a first report of koa (a leguminous species) tolerance to a high-rate, pre-plant application of the herbicide active ingredient imazapyr.