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Development of a methodology to accelerate a spontaneous grass colonization in a tailings storage facility under semiarid mediterranean climate type

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Phytostabilization of massive mine tailings (>400 he) under semiarid environments is challenging, particularly when no organic amendments are locally available and no irrigation is possible. Increasing tendency for reprocessing old tailings to recover valued metals further pioneer the need for simple but effective plant covers. The choice of plant species and form of management are thus very important.
CODELCO-Chile chose the Cauquenes post-operational tailings storage facility (TFS; 700 ha), that will be reprocessed for copper and other elements in the near future, to evaluate efficacy of the phytostabilization technology under semiarid conditions in central Chile. Surface application of a polymer (Soiltac TM) has been used for wind control of tailings but phytostabilization is considered as a best cost-effective alternative. A field study was performed to define a management program to improve the establishment and cover of an annual native grass (Vulpia myuros var. megalura), a spontaneous colonizer of the TSF. Considered management factors were control of macro herbivores (with and without fence), macronutrient improvement (with and without application of N-rich foliar fertilizer), and improvement of seed retention in the substrate (with and without small-scale rugosity; with and without lived wind-breakers; with and without mechanical wind-breakers). Each treatment was replicated three times and established in 2 m x 2 m quadrats. Plant response variables were monitored after 1 and 2 grass growing seasons.
Application of N-rich foliar fertilizer and any wind control mechanism for seed retention in the substrate were effective for significantly improving both grass cover and biomass production in time, irrespective of macro-herbivore control. Seed production was significantly improved when macro herbivores were excluded and was positively and significantly correlated to vegetative biomass production. When applying this management program for tailings phytostabilization at large-scaale, surface ploughing of tailings would be a cheaper alternative for seed retention in the substrate than lived or mechanical wind-breakers.
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