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The effects of the degree of soil cover with an impervious sheet on the establishment of tree seedlings in an arid environment

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Abstract Low precipitation and high evaporation rates hinder the establishment of tree seedlings in arid environments. The objective of this study was to assess the effect of covering different fractions (0, 30, 70 and 100%) of the wetted area surrounding seedlings of *Acacia saligna* (Labill.) H.L. Wendl. with a black polyethylene sheet on the seedlings development and water use. The cover treatments were applied to plots with and without *Acacia* seedlings. Within the mulched areas at all depths, soil temperatures close to the edges were lower than at the corresponding depth close to the center, but still higher than in the non-mulched plots. In plots with *Acacia* seedlings, the total soil water losses were similar among treatments. However, the cumulative evaporative losses near the soil surface were lower with larger mulched areas. During early growth stages, roots grew deeper in the 30% mulch treatment and more laterally in the other mulched treatments. The non-mulched treatment produced the smallest root system. Larger canopies developed in the mulched treatments and the gross water use efficiency increased with the increasing fraction of the mulched area. Optimum utilization of stored soil water and seedling development were attained with the 70% mulch treatment.

Keywords Afforestation · Evaporation · Relative growth rate · Rooting patterns · Water use efficiency · Water uptake

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