Light extinction coefficient in *Arundo donax* L. under contrasting growth conditions

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Summary

Arundo donax L. (AD) is a perennial rhizomatous species with high bioenergy potential, capable of producing up to 40 t DM ha^{-1} yr^{-1}, with applications in phytoremediation and greenhouse gas mitigation, and the ability to adapt to marginal environments. In crops, canopy interception of solar radiation is described by the Beer–Lambert law, which relates the fraction of intercepted radiation (fPARi), leaf area index (LAI), and the light extinction coefficient (k), reflecting radiation attenuation within the canopy and affecting radiation use efficiency (RUE). This study aimed to estimate k in AD under two growth conditions: potential (irrigation and fertilization, T1) and actual (without irrigation or fertilization, T2). Non-linear methods (non-linear least squares, LSE; maximum likelihood estimation, MLE) and a logarithmic approach (Log) were compared using periodic fPARi and LAI data from the fifth growth cycle (2023–2024) at the Experimental Farm of the Faculty of Agronomy-UNCPBA (Azul, Buenos Aires). LSE and MLE provided robust and consistent estimates of k between 0.37 and 0.46, higher in T1, with significant differences between T1 and T2 in MLE, whereas Log systematically overestimated k (up to 0.48 in T1 and 0.42 in T2) due to distortions from the logarithmic transformation in erectophile canopies like AD. These differences reflect changes in canopy structure, with T1 showing lower radiation penetration to lower layers. LSE and MLE providemore accurate and robust estimates than Log, and are preferable for modeling radiation interception in AD.

Key words: radiation interception, leaf area index, non-linear models, logarithmic model