

# Impact of Aluminum ( $Al^{3+}$ ) on the Photosynthetic Efficiency of Guaranazeiro Cv. Seedlings. BRS-Amazonas

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**Abstract:** In acidic soils, the bioavailability of  $Al^{3+}$  (Aluminum Ions) increases, which enhances the phytotoxic effects of this element on plants. Although the toxic effects of aluminum on various species are well known, information regarding the effects of  $Al^{3+}$  on the photosynthetic activity of guaraná plants is scarce. Therefore, we evaluated whether increasing Al concentrations interfere with chlorophyll fluorescence and chlorophyll index in guaraná seedlings of the Cv. BRS-Amazonas variety. The experiment consisted of five levels of  $Al^{3+}$  (0; 0.25; 0.5; 1.0 and 2.0  $cmolc\ dm^{-3}$ ), arranged in a completely randomized design with four replications. After 120 days of plant exposure to the treatments, we measured the relative chlorophyll index (RCI) and chlorophyll fluorescence variables ( $F_v/F_m$ ,  $PI_{abs}$ , and  $PI_{total}$ ) in the second pair of leaves from the main branch and from the plant apex, in the morning (7:00 AM to 10:00 AM). The results revealed that the evaluated photosynthetic variables ( $F_v/F_m$ ,  $PI_{abs}$ ,  $PI_{total}$ , and RCI) were significantly negatively affected ( $P < 0.05$ ) by the increased  $Al^{3+}$  levels in the growth substrate. The results of this study demonstrate that aluminum, in increasing concentrations, has an adverse effect on the photosynthetic variables of guaraná plants of the Cv. BRS-Amazonas variety. The reductions observed in the evaluated parameters suggest that aluminum directly interferes with the efficiency of the plants' photosynthetic apparatus due to the reduction in electron transport in photosystem II. This effect is particularly evident at aluminum concentrations starting from 0.25  $cmolc\ dm^{-3}$ , where most of the photosynthetic variables were severely compromised.

**Keywords:** Phytotoxicity, *Paullinia cupana*, Soil acidity, Photosynthesis.

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