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Altering of plant growth and physiology of rice (*Oryza sativa* L.) at vegetative stage under elevated arsenic in soil

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Arsenic (As) is a class one human chronic carcinogen and also not an essential element to plant growth and development. More importantly, the bioavailability of As and its consequent accumulation in rice grains could increase under flooded conditions. A poly-tunnel experiment was carried out to investigate the effect of As in soil on plant physiology and plant growth in the vegetative stage (40 days from seed sowing). A factorial experiment was conducted with treatments of 10 mg As kg⁻¹ with controls, by using commercially growing traditional and improved ten rice cultivars. Pearson correlation coefficient (r) was used to analyze the data statistically. Plant growth, in terms of its height (r = -.746), tiller count (r = -.809) and, shoot biomass (r = -.886), was strongly and negatively correlated with As level in the soil. The tiller count decreased under As stress by 46% and 52% in traditional and improved varieties, respectively. The total shoot biomass of traditional varieties decreased by 65% while a 62% drop was observed in improved varieties, with the application of As. The plant height was reduced by 28% in traditional varieties and by 21% in improved varieties under the elevated As level. Arsenic level in the soil showed strong negative correlations with the total chlorophyll content in the leaf blades (r = -.913) and, it directly affected photosynthesis. The chlorophyll content was decreased by 31% in traditional varieties and 25% in improved varieties with the addition of As. The chlorophyll content in rice plants showed strong positive correlation with plant growth parameters, such as tiller count (r = .804), Plant height (r = .614) and total biomass (r = .914). These findings suggest that high As in the soil could impair photosynthesis leading to a significant reduction of rice plant growth.

Keywords: *arsenic; photosynthesis; plant growth; vegetative stage*



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