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Effect of the sprinkler irrigation on the space-time dynamic of translocation of As and Cd in the system soil – rice as a function of the pollution level of the soil

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Among the factors affecting the bioaccumulation of As and Cd in rice, a key role is played by the nature of irrigation methods. The sprinkler irrigation method, optimized for rice in Sardinia, Italy, applied to several rice genotypes over a number of crop years has produced no significant differences in yields, exhibiting also a number of environment-friendly features. In addition, our studies show that the adoption of sprinkler irrigation causes, in comparison to data obtained from rice grain irrigated by traditional irrigation method, an extraordinary As reduction (ca. -98%) and a meaningful Cd reduction (-20%) on rice grains. Since our previous experiments were accomplished on unpolluted soils, the aim of this study was to verify if the sprinkler irrigation is able to mitigate the bioaccumulation of both elements in rice grain cultivated also in soils heavily polluted by As and/or by Cd. Rice genotype (Carnise) has been cultivated using sprinkler irrigation in four soils at different pollution levels by As and Cd (up to 60 mg/Kg each). Beyond As and Cd, also the amounts of Cr, Cu, Hg, Mo, Mn, Ni, Pb, Se, Tl and Zn have been measured by ICPMS, GFAAS and FAAS techniques, along five different phenological phases, in soils and different parts of rice plant. Sprinkler irrigation allowed to obtain - also on heavily polluted soils from As and Cd - rice grain with concentration of such elements largely below the limits set for them by EFSA and EC (0.2 mg/Kg for both elements).

Biography

Gavino Sanna is Associate Professor of Analytical Chemistry at the Department of Chemistry and Pharmacy, University of Sassari, Italy. Scientific interests in chromatography, ICPMS, electroanalysis, food chemistry and analysis, environmental monitoring and analysis, role of the irrigation techniques in the bioaccumulation phenomena of toxic elements in rice. Reviewer of many tens of Journals of Analytical Chemistry, Food Chemistry, Environmental Chemistry. Enrolled in the Editorial Board of Analytics, SM Analytical and Bioanalytical Techniques and Advances in Food Science and Engineering. Author of ca. 200 among papers, patents and communications.

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