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Title of Entry	: Role of Nitric Oxide in Cadmium and Arsenic toxicity in Oryza sativa L. root system
Presenting author	: Piacentini Diego
Presenting author email	: diego.piacentini@uniroma1.it
Co author 1	: Ronzan Marilena
Co author 2	: Massimi Lorenzo
Co author 3	:
Co author 4	:
Co author 5	:
Co author 6	:
Co author 7	:
Co author 8	:
Co author 9	:
Co author 10	:
Co author 11	:
Co author 12	:
Co author 13	:
Co author 14	:
Affiliation presenting author	: Department of Environmental Biology, Sapienza University of Rome, Rome, Italy
Affiliation 1	: Department of Environmental Biology, Sapienza University of Rome, Rome, Italy
Affiliation 2	: Department of Chemistry, Sapienza University of Rome, Rome, Italy

Affiliation 3	:
Affiliation 4	:
Affiliation 5	:
Affiliation 6	:
Affiliation 7	:
Affiliation 8	:
Affiliation 9	:
Affiliation 10	:
Affiliation 11	:
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Abstract	: Cadmium (Cd) and Arsenic (As) pollution has become a serious factor limiting the growth and productivity of Oryza sativa L. and a risk for human health. Roots are the first organs affected by these pollutants, showing growth inhibition and altered cellular differentiation (Fattorini et al., 2017 doi: 10.1016/j.envexpbot.2017.10.005). Cd and As alter root architecture negatively interacting with hormone biosynthesis and transport, e.g. with auxin (Ronzan et al., 2018, doi: 10.1016/j.envexpbot.2018.04.008). Auxin homeostasis during root formation is regulated by a coordinated action between synthesis and polar transport, both essential for proper initiation and development. Nitric oxide (NO) is a signal molecule involved in a plethora of plant physiological and developmental processes, being a key component in hormone-regulated processes, e.g. those auxin-regulated (Corpas and Barroso 2015 doi: 10.3390/plants4020240). A function for NO in both plant abiotic and biotic stresses tolerance is also emerging. The aim of this work was to study NO role during root system formation in rice seedlings exposed to Cd or As, and to investigate NO possible interaction with auxin. To the aim, element and morphological analyses were carried out in rice roots exposed or not to Cd/As and to the NO-donor Sodium Nitroprussiate (SNP). The transcription levels of OsYUCCA2 gene, involved in auxin biosynthesis, and OsPIN5 and OsAUX1 genes, involved in auxin transport, were analysed after Cd/As/SNP treatments. The auxin distribution was also monitored by histochemical analyses in roots of OsDR5::GUS seedlings exposed to the toxic elements and/or SNP. Our results show that the exogenous NO significantly reduced Cd and As accumulation in the roots. NO alleviated the Cd toxic effects during root formation, but not those due to As. Cd and As altered OsYUCCA2, OsAUX1 and OsPIN5 expression. The further addition of exogenous NO modulated these expression changes. A positive role of NO in restoring auxin distribution in rice root system, after Cd/As treatments, was shown by the use of OsDR5::GUS system. All together the results highlight that NO alleviates Cd and As toxicity in rice root formation interacting with auxin biosynthesis and transport.

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