Orals SSS2.2/BG2.14

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Arid Lands Restoration & Combat of Desertification: Theory and Practice in Vegetation Reestablishment and Sustainable Land Management (co-organized)

Co-Conveners: Cristina Branquinho, Janet Hooke, Christoph Külls, María José Marqués Pérez, Gudrun Schwilch

Orals / Thu, 01 May, 08:30–12:00
Posters / Attendance Thu, 01 May, 17:30–19:00
Poster Summaries & Discussions: PSD9.2

Thursday, 1 May 2014
Room B6
Chairperson: Benz Kotzen

08:30–09:00 EGU2014-1521
Africa's Great Green Wall Initiative: a model for restoration success (solicited)
Nora Berrahmouni and Moctar Sacande

09:00–09:15 EGU2014-1621
Vegetation interaction with runoff and flash floods; implications for restoration of drylands
Janet Hooke, Jenny Mant, and Peter Sandercock

09:15–09:30 EGU2014-11829
Introduction and domestication of woody plants for sustainable agriculture in desert areas
Oren Shelef, Elaine Soloway, and Shimon Rachmilevitch

09:30–09:45 EGU2014-7053
Molecular and chemical features of the excreted extracellular polysaccharides in Induced Biological Soil Crusts of different ages
Federico Rossi, Chen Lanzhou, Yongding Liu, Alessandra Adessi, and Roberto De Philippis

10:30–11:00 EGU2014-1481
Novel ideas for maximising dew collection to aid plant establishment to combat desertification and restore degraded dry and arid lands (solicited)
Benz Kotzen

11:00–11:15 EGU2014-269
A “win-win” scenario: the use of sustainable land management technologies to improve rural livelihoods and combat desertification in semi-arid lands in Kenya
Kevin Mganga, Nashon Musimba, Dickson Nyariki, Moses Nyangito, and Agnes Mwang'ombe

11:15–11:30 EGU2014-14744
Effective Ecological Restoration of Collapsed Ecosystems - Linking Soil, Water and Society
Thorunn Petursdottir and David Finger

11:30–11:45 EGU2014-15430
Integrated use of soil physical and water isotope methods for ecohydrological characterization of

desertified areas
Christoph Külls, Alice Nunes, Melanie Köbel-Batista, Cristina Branquinho, Nadja Bianconi, and Eduardo Costantini

11:45–12:00 EGU2014-7610 | presentation
Conservation and restoration of indigenous plants to improve community livelihoods: the Useful Plants Project
Tiziana Ulian, Moctar Sacandé, and *Efisio Mattana*

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Molecular and chemical features of the excreted extracellular polysaccharides in Induced Biological Soil Crusts of different ages

Federico Rossi (1), Chen Lanzhou (2), Yongding Liu (3), Alessandra Adessi (1), and Roberto De Philippis (1)

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Biological Soil Crusts (BSCs) are complex microbial associations widely distributed in arid and semiarid environments. These microbial associations have recently been acknowledged as important in restoration ecology (Bowker 2007). The primary colonization of cyanobacteria and other crust organisms after events such as fire or cessation of plowing is considered critical for later vascular plant establishment, due to the control of seed germination and due to the complex pathways that BSCs are capable to establish between plants and crust organisms and exudates (Rossi et al. 2013). In a ten year study carried out in the hyper-arid region of Inner Mongolia (China), introduction of man - made BSCs (induced BSCs, IBSCs) proved to be effective in producing a shift of the ecosystem state from high abiotic to low abiotic stress, evidenced by an increase in photothrophic abundance and subshrub cover.

The prerequisite for an efficient exploitation of crust organisms as soil colonizers is their capability to secrete large amount of exopolysaccharides (EPS) which are important, among the reasons, as they lead to soil and BSC stabilization and represent a noticeable source of C that can be respired by the crustal community. By these means, a deep chemical and physiological knowledge concerning these exudates is required. Notwithstanding the large amount of literature available, recently thoroughly reviewed by Mager and Thomas (2011), the chemical characteristics of EPS from BSCs, and in particular from IBSCs, have not been investigated yet.

We analyzed the monosaccharidic composition and the molecular weight distribution of two EPS fractions, the more soluble fraction and the fraction more tightly bound to cells, extracted from IBSCs collected in the Inner Mongolian desert, inoculated in different years (namely 4, 6 and 8 years before the sampling), thus characterized by different developmental stages. We thereafter investigated the degradation processes involving EPS, assessing the activity of two key enzymes for sugar degradation: dehydrogenase and sucrase.

The results obtained demonstrated a high complexity in terms of monosaccharidic composition and molecular weight, the latter resulting differently distributed between the two fractions. Enzymatic activity resulted mainly directed to the more soluble, low - molecular weight carbohydrates.

The data presented represent a first study of the biochemical processes involving carbon from EPS released by IBSCs on bare substrates after the colonization of soils by the inoculated cyanobacteria.

Bowker MA (2007) Biological soil crusts rehabilitation in theory and practice: an underexploited opportunity. Restoration Ecology 15(1): 13 – 23.

Mager DM, Thomas AD (2011) Extracellular polysaccharides from cyanobacterial soil crusts: A review of their role in dryland soil processes. Journal of Arid Environments 75: 91 – 97.

Rossi F, Diels L, Olguin E, De Philippis R (2013) Microbial fixation of CO_2 in water bodies and in drylands to combat climate change, soil loss and desertification. New Biotechnology. DOI: . http://dx.doi.org/10.1016/j.nbt.2013.12.002.