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ISSN 2039-0394 (Print Edition)
ISSN 2039-0408 (Online Edition)

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Biodiversity Journal

JUNE 2015, 6 (2): 495-670

FOR NATURALISTIC RESEARCH AND ENVIRONMENTAL STUDIES

Cytisus aeolicus Guss. - Vulcano, Eolie Islands, Italy

BIODIVERSITY JOURNAL
2015, 6 (2): 495-670

Quaternly scientific journal
edited by Edizioni Danaus,
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Official authorization no. 40 (28.12.2010)

ISSN 2039-0394 (Print Edition)
ISSN 2039-0408 (Online Edition)

Soil microbial diversity has an impact on plant diversity and safeguard. Bacterial and Archaeal communities play a key role in biogeochemical cycles of C, N, S and P and are main players in ecosystem functioning. Nevertheless, only generic information is available on diversity of prokaryotes in water and soil ecosystems and microbial diversity is not on the biodiversity conservation agenda. One reason for this oversight is due to the opinion that microbes are generally resistant to physico-chemical fluctuations and resilient to perturbations, moreover their functions are considered redundant and not menaced by loss of biodiversity. Assessing microbial diversity, however, is a challenge due to microscopic size and to the fact that only 1% of the actual microbial diversity is represented as cultured organisms while the characteristics and functions of the remaining 99% are largely unknown. Recently, molecular techniques have contributed to open the black box of microbial diversity in natural ecosystems and helped linking taxonomic and functional diversity. Among the ecosystem services provided by prokaryotes nitrogen fixation is the most exclusive and crucial for life on earth. Symbiotic nitrogen fixing bacteria fix atmospheric nitrogen in the plant root nodules thus providing nitrogen nutrition to cultivated and spontaneous legumes. Spontaneous legume shrubs such as *Anagyris foetida*, *Genista* spp., *Calicotome* spp., *Spartium junceum*, *Astragalus* spp., play an important role for the conservation of soils, especially during the primary and secondary succession. Soil is a key natural resource that is threatened by desertification and pollution and its protection is essential to human health, to return land to agriculture and to increase the pool of soil carbon in order to mitigate climate change. In semi-arid Mediterranean ecosystems shrubby legumes have great potential for rehabilitation of degraded/anthropogenic soils as they establish mutualistic symbiosis not only with N-fixing rhizobia but also with mycorrhizal fungi that contribute to P uptake and plant fitness. Both symbiosis are highly specific and soil disturbance can prevent the formation of beneficial plant-microbes symbiosis. Most of the rhizobia isolated from Sicilian native and endemic shrub legumes, Genisteae in particular, are slow-growing rhizobia phylogenetically affiliated to the genus *Bradyrhizobium*. A strict specificity was evidenced between *Cytisus aeolicus* and its root symbionts that differ by effectiveness and competition ability for nodule occupancy. *C. aeolycus* is an endangered plant species strictly endemic of Aeolian Archipelago (South Tyrrhenian Sea, Italy). Due to differences from other species and sharp taxonomic isolation it is considered a relic species. The reintroduction of selected specific microbial symbionts may thus improve plant survival and help spreading rare legumes. Once identified, these beneficial symbiosis can be exploited for rehabilitation of arid, low productive and human-impacted soils of the Mediterranean area. To preserve and exploit the diversity of rhizobia a collection from wild Mediterranean legumes is maintained at the laboratory of Microbial Ecology & Environmental Microbiology of the Dept. STEBICEF at the University of Palermo: a little effort to preserve, understand and protect the huge diversity of the unseen majority.

Cover photo by A. Troia. Up: Root nodules of *Anagyris foetida* (photo T. La Mantia)

Colonization Etna lavas by endemic species *Astragalus siculus* and *Genista aetnensis* (photo T. La Mantia)

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