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Chemical crosstalk between plants and microorganisms: Camptothecin and maytansine as an example

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Abstract

Backgroud: Studies on microbe-host interactions in plant aimed at understanding the role of these associations and their utility in pharmaceutical and agricultural sectors are gaining impetus. Several recent studies have lent evidence to the fact that certain so-called “plant metabolites” are actually biosynthesized by associated endophytic microorganisms.

Aims: We wanted to elucidate the biosynthesis of the important anticancer drug maytansine in Celastraceae plants in order to elucidate its actual producer(s), which has been an open question since its discovery in the 1970s.

Results: We showed that maytansine is actually a biosynthetic product of root-associated endophytic bacterial community in Putterlickia verrucosa and Putterlickia retrospinosa plants. This interesting outcome provided the scientific basis to investigate the actual producer(s) responsible for maytansine biosynthesis in Maytenus plants. Endophytic communities harboring different tissues of Maytenus serrata originating from Cameroon were investigated using a combination of bioanalytical tools such as HPLC-HRMSn and MALDI-MSI, and targeted genome mining techniques to elucidate the source and sites of maytansine biosynthesis. We proved that the biosynthesis of maytansine in M. serrata is shared between the endophytic bacterial community colonizing the stem and the host plant containing non-culturable cryptic endophytes.

Conclusion: Our work demonstrates that maytansine is biosynthesized in M. serrata only when the host plant joins forces with its selected and very eco-specific endophytic bacterial community.

Biography

Michael Spiteller studied chemistry at the Georg-August University in Göttingen from 1972 to 1976 . In 1979 he received his doctorate there . From 1979 to 1982 he worked as a research assistant at the Chair of Soil Science at the University of Bayreuth . On November 1, 1999, he went to the Technical University of Dortmund , where he has since headed the Institute for Environmental Research (INFU) of the Faculty of Chemistry.

Publications

1. Isoflavones from the seedpods of Tephrosia vogelii and pyrazoisopongaflavone with anti-inflammatory effects
2. Cytotoxic bufadienolides from the leaves of a medicinal plant Melianthus comosus collected in South Africa
3. Anti-inflammatory norhopanes from the root bark of Fagaropsis angolensis (Engl.) H.M.Gardner.
4. Corrigendum to “Ozonation of rivaroxaban production waste water and comparison of generated transformation products with known in vivo and in vitro metabolites” [Sci. Total Environ. 714 (2020), 136825]
5. Cytotoxic Bufadienolides from the Leaves of
6. Synergistic anti-inflammatory activities of a new flavone and other flavonoids from vatke
7. Ozonation of rivaroxaban production waste water and comparison of generated transformation products with known in vivo and in vitro metabolites
8. MALDI-HRMS imaging and HPLC-HRESI-MS characterisation of kaurane diterpenes in the fruits of Xylopia aethiopica (Dunal) A. Rich (Annonaceae)

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