Data Article

Fungal metabolic profile dataset was not influenced by long-term in vitro preservation of strains

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ABSTRACT

Comparative ecophysiology is highly valuable approach to reveal adaptive traits linked with specific ecological niches. Although long-term in vitro preserved fungal isolates are often used for analyses, only sparse data is available about the effect of such handling on fungal physiology. The purpose of our data is to show the effect of long-term in vitro preservation of fungal strains on their metabolic profiles. This data is related to research paper “Adaptive traits of bark and ambrosia beetle-associated fungi” (Veselská et al., 2019). Biolog MicroPlates™ for Filamentous fungi were used to compare metabolic profiles between freshly isolated and long-term in vitro preserved strains of two Geosmithia species. Additionally, carbon utilization profiles of 35 Geosmithia species were assessed, including plant pathogen G. morbida and three ambrosia species. Data also shows differences in carbon utilization profiles among diverse ecology types presented in the genus Geosmithia.

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1. Data

Biolog MicroPlate™ for Filamentous fungi was used to assess carbon sources utilization profiles of Geosmithia fungi living in symbiosis with bark beetles [1]. Their ecology spans from facultative to obligatory ambrosia symbiosis and from saprotrophic to pathogenic nourishment of severe phytopathogen G. morbida (Table 1). The aims were to test whether metabolic profiles of Geosmithia species are modified by their ecology and whether long-term preservation of strains has effect on their metabolic profiles. The distinct metabolic profiles belonging to particular ecology types are pictured in Fig. 1 and Table S1. The similarity in metabolic profiles of freshly isolated and long-term preserved strains of Geosmithia sp. 5 and G. langdonii is shown in Fig. 1 and Table S1. Raw data containing growth value of individual strains on each carbon source is presented in Table S1. Raw data is helpful for further identification of adaptive traits of these important species.

2. Experimental design, materials and methods

2.1. Fungal strains

The metabolic profiles of 60 strains belonging to 35 Geosmithia species (Table 1) were analyzed. These strains are deposited in the Culture Collection of Fungi (CCF) or at Institute of Microbiology of the Czech Academy of Sciences for several years. Then, two species, G. sp. 5 and G. langdonii, were chosen and the effect of long-term in vitro preservation (0–10 years) on fungal carbon assimilation profiles was observed. Fresh strains of these species were isolated from active beetle galleries in 2009 and identified as it is described in Pepori et al. [2]. These strains were analyzed within a 2 months on Biolog MicroPlates™ for Filamentous fungi. Altogether, three “old” and six “new” strains of G. sp. 5 and four “old” and four “new” strains of G. langdonii were compared. The species classification follows Kolarík et al. [3].
| Species       | Ecology type | Strain code | Culture collection | Strain code in Fig. 1 | Substrate (mostly as insect vector/plant hosts)                                      | Locality                     | Year of isolation | Reference |
|---------------|--------------|-------------|--------------------|------------------------|--------------------------------------------------------------------------------------|------------------------------|------------------|-----------|
| G. sp. 1      | PF, G        | 1, 1790     | CCF4529            | 1                      | *Hypoborus ficus/Ficus carica*                                                       | Azerbaijan, Shaki Rayonu      | 2006             | [6]       |
| G. sp. 2      | PF, G        | 2, 1510     | CCF4270            | 2                      | *Scolytus kirschii/Ulmus minor*                                                      | Italy, Termoli                | 2004             | [6]       |
| G. sp. 4      | PF, G        | 4, 1722     | CCF4278            | 4                      | *Pteleobius vitattus F./Ulmus laevis*                                                 | Czech R., Breclav             | 2004             | [7]       |
| G. purretillii | PF, G        | 6, 103      | CCF3342            | 6                      | *Scolytus rugulosus/Prunus sp.*                                                       | Czech R., Velemín             | 2000             | [8]       |
| G. flava      | PF, G        | 7, 264      | CCF3534            | 7                      | *Hylesinus fraxini/Fraxinus excelsior*                                                | Slovakia, Murán castle        | 2002             | [8]       |
| G. sp. 8      | PF, HWS      | 8, 124      | CCF3530            | 8a                     | *Scolytus intricatus/Quercus sp.*                                                    | Czech R., Prague              | 2001             | [7]       |
|               |              | 8, 1712a    | CCF4277            | 8b                     | *Scolytus intricatus/Quercus ceras*                                                  | Bulgaria, Kardzalý            | 2005             | [7]       |
|               |              | 37, 1806    | CCF4207            | 8c                     | *Scolytus beetle/Acacia smithii*                                                      | Australia, Eugella, Credition Hall | 2006             | [6]       |
| G. ulmacea    | PF, HWS      | 13, 924     | CCF4601            | 13                     | *Scolytus multistriatus/Ulmus minor*                                                  | Belgium, Brussels, Antwerp    | 2002             | [7]       |
| G. obscura    | PF, G        | 17, 391     | CCF3424            | 12a                    | *Taphrychus bicolor/Fagus sylvatica*                                                  | Czech R., Louny, Hřivice       | 2003             | [7]       |
| G. lavendula  | PF, G        | 18, 1219    | CCF4268            | 18a                    | *Hypoborus ficus/Ficus carica*                                                       | Croatia, Dalmatia, Sibenik    | 2005             | [6]       |
|               |              | 18, 1781    | CCF4285            | 18b                    | *Hypoborus ficus/Ficus carica*                                                       | Azerbaijan, Baki Sahara, Baku | 2006             | [6]       |
| G. sp. 19     | PF, G        | 19, 1085a   | CCF3658            | 19                     | *Hypoborus ficus/Ficus carica*                                                       | Italy, Molise, Termoli        | 2004             | [6]       |
| G. sp. 20     | PF, G        | 20, 764     | CCF4527            | 20                     | *Phloeotribus scarabeoides/Olea europea*                                              | Syria, Krak des Chevaliers    | 2004             | [6]       |
| G. sp. 21     | PF, G        | 21, 1665    | CCF4520            | 21                     | *Hypoborus ficus/Ficus carica*                                                       | Spain, Rosal de la Frontera   | 2005             | [6]       |
| G. sp. 22     | PF, G        | 22, 739     | CCF3645            | 22                     | *Phloeotribus scarabeoides/Olea europea*                                              | Jordan, Wadi al Mujib         | 2004             | [6]       |
| G. morbida    | HWS, P       | 41, 1218    | CCF3879            | 41a                    | *Pityophthorus juglandis/J. nigra*                                                    | USA, Colorado, Boulder        | 2007             | [9]       |
|               |              | (CBS 124664) |                    |                        |                                                                                        |                              |                  |           |
|               |              | 41, U173    | CCF4576            | 41b                    | *Pityophthorus juglandis/J. nigra*                                                    | USA, California, Rio Oso      | 2009             | [9]       |
|               |              | 41, U1259.55 | CCF4576            | 41c                    | *Pityophthorus juglandis/Juglandis sp.*                                               | USA, Oregon                   | 2008             | [9]       |
|               |              | 41, U1259.59 | CCF4576            | 41d                    | *Pityophthorus juglandis/Juglandis sp.*                                               | USA, Oregon                   | 2008             | [9]       |
| G. sp. 9      | PF, SP       | 9, 1210     | CCF3703            | 9                      | *Cryphalus piceae/Abies alba*                                                        | Poland, Myślenice             | 2005             | [10]      |
| G. sp. 16     | PF, SP       | 16, 08 m    | CCF4201            | 16                     | *Pityophthorus pityographus/Picea abies*                                              | Poland, Czajowice             | 2007             | [11]      |
| G. sp. 24     | PF, SP       | 24, R06ka   | CCF4525            | 24                     | *Pityogenes bidentatus/Pinus sylvestris*                                               | Poland, Zaborze               | 2007             | [11]      |
| G. sp. 26     | PF, SP       | 26, 1796    | CCF4223            | 26                     | *Pityophthorus pityographus/Pinus silvestris*                                          | Czech R., Seník               | 2006             | [11]      |
| G. sp. 27     | PF, SP       | 27, 0919    | CCF4206            | 27                     | *Pityogenes bidentatus/Pinus silvestris*                                               | Poland, Záruša                | 2006             | [11]      |
| G. sp. 28     | PF, SP       | 28, 279     | CCF4210            | 28                     | *Polygraphus poligraphus/Picea abies*                                                 | Poland, Chyżówko              | 2007             | [11]      |
| G. sp. 30     | PF, SP       | 30, 09 m    | CCF4209            | 30                     | *Pityophthorus pityographus/Picea abies*                                               | Poland, Czajowice             | 2007             | [11]      |
| G. sp. 31     | PF, SP       | 31, 21k     | CCF4526            | 31                     | *Pityophthorus pityographus/Pinus sylvestris*                                          | Poland, Czajowice             | 2007             | [11]      |
| G. sp. 29     | PF, SP       | 33, 1827b   | CCF4221            | 33                     | *Pityophthorus pityographus + Cryphalus abietis/Abies alba*                           | Czech R., Boubín hill         | 2008             | [11]      |
| G. sp. 30     | PF, SP       | 34, 1833    | CCF4208            | 34                     | *C. piceae + P. pityographus/Abies alba*                                               | Czech R., Jilové u Prahy      | 2008             | [11]      |
| G. sp. 25     | PF, SP       | 35, 1835    | CCF4205            | 25                     | *C. piceae + P. pityographus/Abies alba*                                               | Czech R., Plešné jezero lake  | 2008             | [11]      |

(continued on next page)
| Species       | Strain code (collection) | Substrate (mostly as insect vector/plant hosts) | Locality           | Year of isolation | Reference |
|--------------|---------------------------|-----------------------------------------------|-------------------|------------------|-----------|
| **G. sp. 5** | 5_U1.2c.25 CNR28          | *Scolytus multistriatus/Ulmus minor*          | Czech R., Středokluky | 2009             | [2]       |
|              | 5_U6.3e.35 CNR48          | *Scolytus multistriatus/Ulmus minor*          | Czech R., Velký Osek | 2009             | [2]       |
|              | 5_U7.8b CNR30             | *Scolytus multistriatus/Ulmus laevis*         | Czech R., Velký Osek | 2009             | [2]       |
|              | 5_U8.1a CNR49             | *Scolytus multistriatus/Ulmus minor*          | Czech R., Maršovice  | 2009             | [2]       |
|              | 5_U8.1b –                 | *Scolytus multistriatus/Ulmus minor*          | Czech R., Maršovice  | 2009             | [2]       |
|              | 5_580 –                   | *Hypoborus ficus/Ficus carica*                | France, Biaritz, Ondres | 2003           | [6]       |
|              | 5_U7.9a CNR6              | *Scolytus multistriatus/Ulmus laevis*         | Czech R., Velký Osek | 2009             | [2]       |
|              | 5_1550 CCF4271            | *Scolytus intricatus/Quercus petraea*         | Poland, Szynowiec | 1997            | [7]       |
|              | 5_157 m CCF4215           | *Pityophthorus pityographus galleries/Picea abies* | Czech R., Mlynářův luh, 1997 | 1997         | [7]       |
| **G. omnicola** | 10_989 CCF3560          | *Scolytus pygmaeus/Ulmus minor*               | Czech R., Breclov | 2004             | [7]       |
|              | 10_1788 CCF4286           | *Hypoborus ficus/Ficus carica*                | Azerbaïdjan, Suvalan | 2006           | [6]       |
|              | 10_U2.6a CNR5             | *Scolytus multistriatus/Ulmus minor*          | Czech R., Středokluky | 2009           | [2]       |
|              | 10_U7.5a CNR8             | *Scolytus multistriatus/Ulmus laevis*         | Czech R., Velký Osek | 2009             | [2]       |
|              | 10_942 –                  | *Hypoborus ficus/Ficus carica*                | Croatia, Brač Island | 2004            | [6]       |
| **G. langdonii** | 15_U5.3a CNR11           | *Scolytus multistriatus/Ulmus minor*          | Czech R., Velký Osek | 2009             | [2]       |
|              | 15_U7.9a CNR6             | *Scolytus multistriatus/Ulmus laevis*         | Czech R., Velký Osek | 2009             | [2]       |
|              | 15_U8.6c CNR117           | *Scolytus multistriatus/Ulmus minor*          | Czech R., Maršovice  | 2009             | [2]       |
|              | 15_U8.12a –               | *Scolytus multistriatus/Ulmus minor*          | Czech R., Maršovice  | 2009             | [2]       |
|              | 15_1645 –                 | *Scolytus multistriatus/Ulmus laevis*         | Czech R., Neratovice | 2005             | [12]      |
|              | 15_1683 CCF4276           | *Ernoporus tiliae/Tilia sp.*                  | Czech R., Nové Hradky | 2005           | [7]       |
|              | 15_1603c CCF3562          | *Phloeosinus thujae/Thuja occidentalis*        | Czech R., Poříčí nad Sázavou | 2005 | [7]       |
|              | 15_1619 CCF4272           | *bostrichid beetle/Pistacia lentiscus*        | Portugal, Sesimbra | 2005             | [6]       |
| **G. cnesini** | 29_1820 CCF4292          | *Cnesinus lecontei/Creton draco*              | Costa Rica, Heredia | 2007            | [13]      |
| **G. microcorthyli** | 38_A2 CCF3861           | *Microcorthylus sp./Cassia grandis*           | Costa Rica, Heredia | 2006            | [14]      |
| **G. eupagioceri** | 39_A1 CCF3754           | *Eupagiocerus dentipes/Paulinia renesi*        | Costa Rica, Heredia | 2006            | [14]      |
| **G. rufescens** | 42_1821 CCF4524          | *Cnesinus lecontei/Creton draco*              | Costa Rica, Heredia | 2007            | [14]      |

Ecology: PF – association with phloem feeding beetles, G – generalist, SF – specialists to *Fagus*, SP – specialist to Pinaceae, HWS – hardwood specialists, P – pathogen, AF – ambrosia fungi, AAF – auxiliary ambrosia fungi.
2.2. Biolog MicroPlate™ for Filamentous fungi

Biolog MicroPlate™ for Filamentous fungi contains 95 different dried carbon sources and one negative control. Fungal conidia from grown cultures were transferred into the inoculating fluid (0.25% Phytagel, 0.03% Tween 40) by rolling a swab across sporulating areas to get the final transmittance of 75 ± 2%. The inoculated plates (200 µl per well) were then incubated in the dark at 25 °C and absorbance at 750 nm was used to measure mycelial growth at 24, 48, 72, 96 and 168 h. An absorbance reading taken 96 h after the inoculation was included in the analysis, because sporulation occurred in some strains after that time. Two technical replicates per strain were prepared.

2.3. Statistical analysis

The absorbance of the negative control was subtracted from all substrates within one plate and negative values were assigned a value of zero [4]. Biolog™ data were visualized on PCA (Principal Component Analysis) in PAST program [5]. The statistical significance of the type of ecology was evaluated by one-way NPMANOVA with Bonferroni-corrected p values using Bray-Curtis distance and 9999 permutations.

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Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.dib.2019.104568.

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