Devosia elaeis sp. nov., isolated from oil palm rhizospheric soil

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Abstract

A bacterial isolate, designated strain S37T, was isolated from the rhizosphere of oil palm (Elaeis guineensis). Strain S37T was found to be Gram-stain-negative, aerobic, motile and rod shaped. Based on 16S rRNA gene sequence analysis, strain S37T was most closely related to Devosia albogrisea IPL15T (97.3 %), Devosia chinhatensis IPL18T (96.8 %) and Devosia subaquaeoris HST3-14T (96.5 %). The G+C content of the genomic DNA was 63.0 mol%, and dominant cellular fatty acids were summed feature 8 (C18:1ω7c and/or C18:1ω6c11), 11-methyl C15:0 3-OH and C16:0 3-OH. The predominant isoprenolog quinone was ubiquinone-10 (Q-10), and the major polar lipids were phosphatidylglycerol, diphosphatidylglycerol, glycolipid and phospholipids. Based on the polyphasic taxonomic data, it is clear that strain S37T represents a novel species of the genus Devosia within the family Hyphomicrobiaceae, for which we propose the name Devosia elaeis sp. nov., with strain S37T (=TBRC 5145T=LMG 29420T) as the type strain.

The genus Devosia belongs to the class Alphaproteobacteria and family Hyphomicrobiaceae and was created by the reclassification of Pseudomonas riboflava [1] as Devosia riboflava [2]. The DNA G+C content of members of the genus Devosia ranges from 59.5 to 66.2 mol% [3]. At the time of writing, the genus Devosia comprises 17 species. Members of the genus Devosia can be found in soil [2–6], glacier [7], dump site [8, 9], nitrifying inoculum [10], marine sediment [11, 12] and even on the surface of a medical leech [13].

In an effort to isolate and characterize plant-growth-promoting bacteria, strain S37T was isolated from a rhizospheric soil sample collected from an oil palm plantation (03° 00’ 12.1” N 101° 39’ 33.1” E) in Temerloh, Pahang, Malaysia, in January 2015. In brief, 1 g of firm, root-adhering soil [14] was collected aseptically, added to 9 ml quarter-strength Ringer’s solution and shaken at 120 r.p.m. for 30 min at 28 ºC. Subsequently, the suspension was serially diluted (10-fold dilutions), inoculated (100 µl) on Luria-Bertani (LB) agar (Sigma) and incubated at 28 ºC for 5 days. Bacterial colonies with distinctive morphology were picked, purified and subcultured on LB agar. The colony of strain S37T was yellowish in colour and slightly convex on LB agar after 5 days of incubation. Strain S37T was preserved in glycerol (25 %, v/v) at −80 ºC and routinely subcultured on LB agar at 28 ºC. Devosia albogrisea CCM 7427T, Devosia chinhatensis CCM 7426T and Devosia subaquaeoris JCM 14206T were selected as reference type strains for the phenotypic analysis. All strains were cultivated under the same conditions except for strain D. subaquaeoris JCM 14206T, which was grown on LB agar supplemented with NaCl (1 %, w/v).

Crude DNA was extracted and purified using NucleoSpin Tissue kit (Macherey-Nagel) according to manufacturer’s protocol. The 16S rRNA gene was amplified by PCR with universal primers 27F and 1492R [15]. The 16S rRNA gene fragments were sequenced using ABI 3730XL (Applied Biosystems) automated sequencer at the First BASE Laboratories. The 16S rRNA gene sequences of related taxa were obtained from the GenBank database and the EzTaxon-e server (http://www.ezbiocloud.net/net/ [16]). CLUSTAL W software [17] was used to align the 16S rRNA gene sequence of the novel strain with those of closely related members of the genus Devosia. Genetic distances were calculated using Tamura 3-parameter model [18]. Phylogenetic trees were constructed using the neighbour-joining [19], maximum-likelihood and maximum-parsimony algorithms [20] available within the MEGA 6 software package [21]. The topological structure of each tree was evaluated by bootstrap analysis with 1000 replications [22]. The G+C content was determined using reverse-phase HPLC according to Mesbah et al. [23].

A nearly-complete 16S rRNA gene sequence with a length of 1383 bp was obtained for strain S37T. Comparison of 16S

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The GenBank/EMBL/DDBJ accession number for the 16S rRNA gene sequence of strain S37T is KT345712.

One supplementary table and four supplementary figures are available with the online Supplementary Material.