
Fusarium awaxy

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Fusarium awaxy Petters-Vandresen, Galli-Terasawa, Terasawa & Glienke, *sp. nov.*

Etymology. Named after the Tupi-Guarani word for maize, '*awaxy*', referring to the substrate (maize ears and stalks) and geographical location (Arapoti and Guarapuava cities in Paraná, as these names come from the Tupi-Guarani language).

Classification — *Nectriaceae*, *Hypocreales*, *Hypocreomycetidae*, *Sordariomycetes*.

On synthetic nutrient agar (SNA) with carnation leaves: *Microconidia* forming abundantly in false heads in aerial mycelium, arising in monophialides and polyphialides, oval, 7.8–16 µm ($\bar{x}$ = 11.7 µm) long, 2.1–5.7 µm ($\bar{x}$ = 4.4 µm) wide, aseptate. *Chlamydospores* absent. *Sporodochia* tan to cream coloured, formed on the surface of carnation leaves and seldom covered with aerial mycelium, occasionally formed on the surface of carnation leaf agar (CLA) or potato dextrose agar (PDA). *Macroconidia* 3-septate, 24.1–43.5 µm ($\bar{x}$ = 30.4 µm) long, 3.2–5.1 µm ($\bar{x}$ = 4.2 µm) wide, less abundant than microconidia, and observed only in sporodochia.

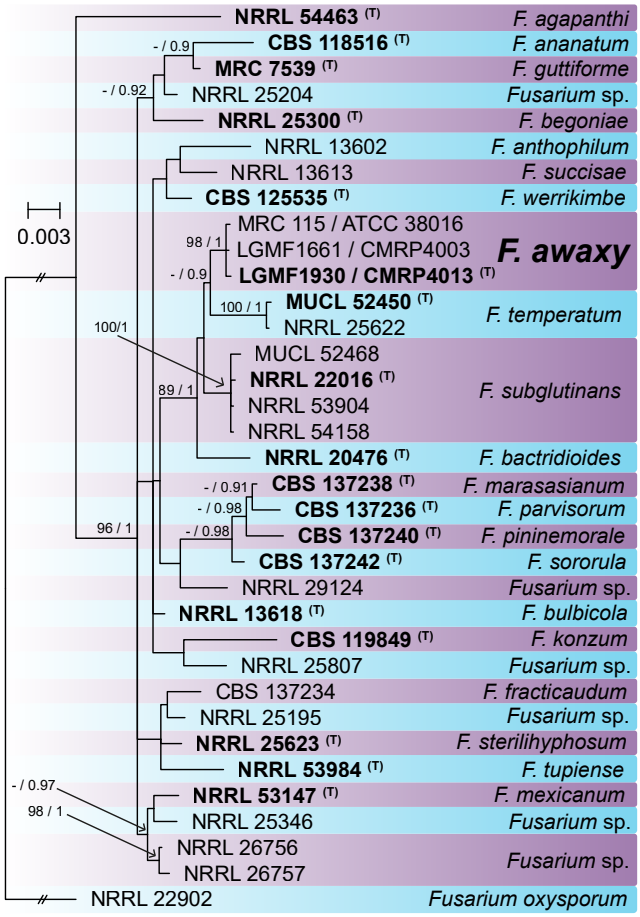
Culture characteristics — Colonies on PDA growing in the dark with average radial growth rate of 5.9 mm/d at 24 °C (reaching 74–80 mm diam in 7 d at 24 °C), with abundant aerial mycelium. Colony white, pale pink, pale violet or peach, occasionally becoming dark pink, vinaceous or violet in older cultures. Odour absent. Minimum observed temperature for growth at 16 °C, maximum at 32 °C, and optimal at 23–28 °C on potato dextrose agar, oatmeal agar and SNA.

Typus. Brazil, Paraná, Guarapuava, on rotten stalks of *Zea mays* (*Poaceae*), 2016, *F. Terasawa* (holotype UPCB93138-H, cultures ex-type LGMF1930 = CMRP 4013, ITS, LSU, *tef1*, *tub*, *cal* and *rpb2* sequences GenBank MH252922, MN566091, MG839004, MG839013, MK766940 and MK766941, MycoBank MB824048).

Notes — *Fusarium awaxy* was identified as a new member from the American clade of the *Fusarium fujikuroi* species complex in a phylogenetic analysis using *tef1, tub, ITS*, *cal* and *rpb2* sequences. *Fusarium temperatum* and *F. subglutinans*, both species already described causing maize stalk rot (Leslie & Summerell 2006, Scauflaire et al. 2011) are the closest phylogenetic relatives. *Fusarium temperatum* and *F. subglutinans* show some morphological similarities, both producing microconidia on mono- and polyphialides arranged in false heads in the aerial mycelium, only differing in the degree of septation of the macroconidia, as *F. temperatum* macroconidia are usually 4-septate and *F. subglutinans* are 3-septate (Scauflaire et al. 2011). Besides the difference in sporodochia colour, there is not a clear morphological delimitation between *F. awaxy* and *F. subglutinans*. Nevertheless, many other species morphologically similar to *F. subglutinans* have been described (e.g., *F. bulbicola*, *F. guttiforme*, *F. sacchari*) and can be properly differentiated only with the use of molecular information (Leslie & Summerell 2006). *Fusarium subglutinans* and *F. temperatum* have already been described causing human infections (Al-Hatmi et al. 2014), but *F. awaxy* did not grow above 32 °C, suggesting inability to cause infection in humans.

Colour illustrations. *Zea mays* growing in a field trial near Curitiba. *Fusarium awaxy* colony on potato dextrose agar plate; sporodochia on carnation leaves; aerial conidiophores: polyphialide, false head and monophialide; aerial oval conidia (microconidia); sporodochial conidia (macroconidia). Photos: D.A.L. Petters-Vandresen. Scale bars = 10 µm.

Additionally, based on a BLAST search and a phylogenetic analysis using *tef1* sequences, other strains, which were misidentified as *F. subglutinans*, are now identified as *F. awaxy*. Such strains include isolates from *Zea mays* from China (GenBank KT716223; Identities = 630/630 (100 %)) (Zhang et al. 2016), South Korea (GenBank JX867945; Identities = 641/641 (100 %)) (Kim et al. 2012), Argentina (GenBank MG857113; Identities = 641/641 (100 %)) (Martinez et al. unpubl. data) and Brazil (GenBank KP336408; Identities = 545/545 (100 %)) (Faria et al. 2012), as well as one strain isolated from *Sorghum bicolor* in the USA (GenBank KX681493; Identities = 634/634 (100 %)) (Funnell-Harris et al. 2017). Furthermore, another isolate from *Zea mays* from South Africa (MRC 115, GenBank MH582309; Identities = 649/649 (100 %)), which was previously identified both as *F. subglutinans* and also as a putatively novel species ('*Fusarium* sp. 8') (O'Donnell et al. 2018), can now be referred as *F. awaxy*.



Bayesian Inference tree produced with MrBayes v. 3.2.6 (Ronquist et al. 2012) at CIPRES Science Gateway (Miller et al. 2012) based on *tef1*, *tub2*, ITS, *cal* and *rpb2* sequences of *Fusarium awaxy* and other reference strains belonging to the American clade of *Fusarium fujikuroi* species complex. ML bootstrap values above 70 % (obtained using GARLI 2.01 (Zwickl 2006) at CIPRES Science Gateway) and Bayesian posterior probability values (PP) values above 0.9 indicated to the left of the nodes. Ex-type strains included in analysis are indicated in **bold** and with (T). The tree was rooted to *Fusarium oxysporum* NRRL 22902. Scale bar indicates the number of substitutions per nucleotide. TreeBASE: http://purl.org/phylo/treebase/phylows/study/TB2:S24292.

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