

Using divergence times in fungal classification

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Purpose: The current classification system for the recognition of taxonomic ranks among fungi, especially at high ranking level, is subjective. With the development of molecular approaches and the availability of fossil calibration data, the use of divergence times as a universally standardized criterion for ranking taxa has now become possible. We can therefore date the origin of Ascomycota lineages by using molecular clock methods and establish the divergence times for the orders and families of Dothideomycetes.

Methods: We chose Dothideomycetes, the largest class of the phylum Ascomycota, which contains 32 orders, to establish ages at which points orders have split; and Pleosporales, the largest order of Dothideomycetes contains 55 families, to establish family divergence times. We have assembled a multi-gene data set (LSU, SSU, TEF1 and RPB2) from 391 taxa representing most family groups of Dothideomycetes and utilized fossil calibration points solely from within the ascomycetes and a Bayesian approach to establish divergence times of Dothideomycetes lineages.

Results and Conclusions: Our results indicate that divergence times (crown age) for most orders (20 out of 32, or 63%) are between 100 and 220 Mya, while divergence times for most families (39 out of 55, or 71%) are between 20 and 100 Mya. We believe that divergence times can provide additional evidence to support establishment of higher level taxa, such as families, orders and classes. Taking advantage of this added approach, we can strive towards establishing a standardized taxonomic system both within and outside Fungi. To get more reliable calibrations, we also carry out a modern review of estimations regarding ancient lineages of Ascomycota, and we summarize a historical fossil outline with a reliable minimum age for 16 calibrating points. A scheme of Ascomycota ancient lineages is also provided in order to improve divergence time estimations.