Exploring ATCC's fungal collection for opportunities in biofuel advancement

Credible leads to Incredible®

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Background

As a leading provider of authenticated biological materials, ATCC® supports research and development through our vast collection of authenticated microbial organisms. Our mycology collection, which comprises over thirty thousand fungal strains spanning 1850 genera, holds immense potential for diverse industrial applications. Currently, we are undertaking a comprehensive project to characterize the utility of our fungal collection and are providing reference-quality whole-genome sequencing data through the ATCC® Genome Portal. Within our extensive collection, nearly 600 ATCC® strains spanning 74 species across 45 genera have the potential for biofuel production, addressing the crucial need for sustainable energy sources. Microbial-produced biofuels offer a sustainable solution by harnessing natural metabolic pathways. Among the strains with biofuel potential, 57% are linked to lignocellulosic ethanol, 34% contain hydrocarbons usable in biodiesel production, and 9% are involved in bioethanol production. This poster highlights the symbiotic relationship between ATCC®'s collection and the evolving landscape of biofuel research, emphasizing the pivotal role our diverse strains can play in addressing both the global demand for sustainable energy solutions and the critical need for biofuel advancements amid depleting fossil fuel resources.

ATCC strain capabilities:

- Providing reliable authenticated materials for biofuel development.
- Providing high-quality genomes and metadata for strain source.
- Safeguarding public health and the environment by ensuring the integrity of biofuel products and identity of contaminants through type strains and fungal standards.

Results

Diversity of the ATCC® mycology collection

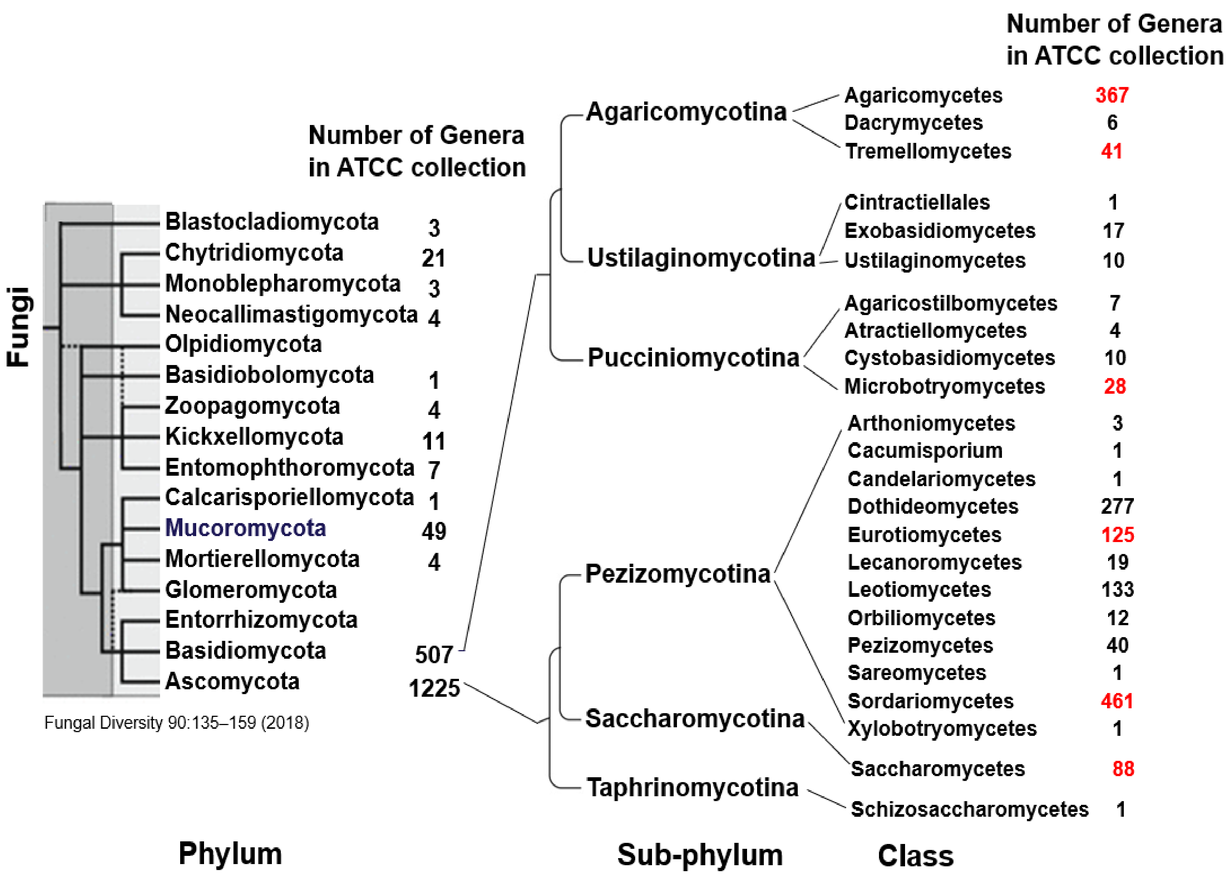

Figure 1: Diversity of the ATCC® mycology collection. Taxonomic classifications of every isolate were obtained from MycoBank (https://www.mycobank.org/) and the number of genera was counted using Excel. The red numbers indicate which Class contains strains with potential for biofuel production.

ATCC® fungi with potential applications in biofuel production

- Nearly 600 strains from 74 species encompassing 45 genera.

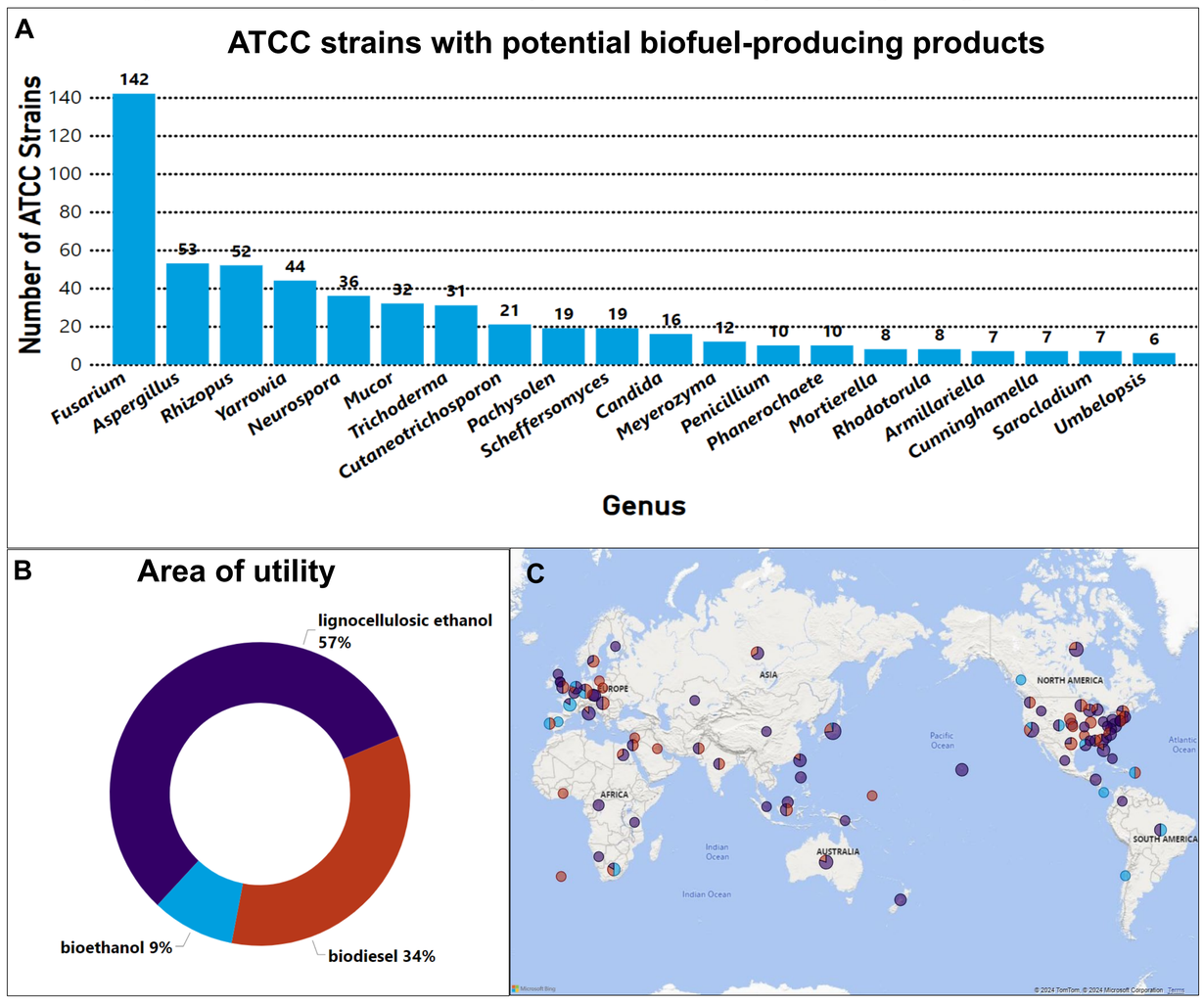

Figure 2: Using a comprehensive (automated and manual) literature search and metadata analysis, 595 fungal strains from the ATCC® collection were selected as potential biofuel-producing products. (A) Distribution of the 595 fungal strains among the top 20 genera with the most strains. (B) Percent of ATCC® strains organized by area of utility. (C) Geographical isolation of ATCC® fungal strains; circles indicate isolation site and colors indicate area of utility as describe in Figure 2B. Figures were generated using Power BI Desktop.

Notable examples

- *Cutaneotrichosporon oleaginosus* (ATCC® 20509™) – Can convert crude glycerol to lipids as a potential biodiesel source.[1]
- *Saccharomyces cerevisiae* (ATCC® 26602™) – Can perform simultaneous saccharification and fermentation of pulp and paper mill sludge to bioethanol.[2]
- *Spathaspora passalidarum* (ATCC® MYA-4345™) – Can produce ethanol from lignocellulosic biomass.[3]

Additional collections

- ATCC® also contains 89 algae and 13 bacteria stains that were reported as potential biofuel producers.

Conclusions

- Nearly 600 ATCC® fungal strains have the potential for biofuel production.
- ATCC® acknowledges the critical role of biofuel-related strains and remains dedicated to expanding its collection to meet industry demands.
- Collaboration with other entities and researchers is welcomed to further develop and distribute these vital biofuel resources.

References

1. Pham *et al.* Biotechnology for Biofuels 14(2): 1-17, 2021.
2. Mendes *et al.* Bioresource Technology 220: 161-167, 2016.
3. Du *et al*. Applied Microbiology and Biotechnology 103: 2845-2855, 2019.

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