Characterization of the Fusarium circinatum biofilm environmental response role

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Abstract

The capacity to form biofilms is a common trait among many microorganisms present on Earth. In this study, we demonstrate for the first time that the fatal pine pitch canker agent, Fusarium circinatum, can lead a biofilm-like lifestyle with aggregated hyphal bundles wrapped in extracellular matrix (ECM). Our study suggests that F. circinatum biofilms respond to a changing environment, demonstrated by poor and optimal biofilm development under particular abiotic conditions, including temperature and pH. Further analysis revealed that while planktonic cells produced small amounts of ECM per unit of the biomass, heat- and azole-exposed biofilms produced significantly more ECM than non-exposed biofilms. The increased synthesis of ECM in biofilms due to these abiotic factors underscores biofilm importance in response to various stress conditions, demonstrating the adaptability of F. circinatum to changing environments. Interestingly, azole exposure also led to biofilms that were resistant to DNase, which typically uncouples biofilms by penetrating the biofilm and degrading its extracellular DNA; we propose that DNases were likely hindered from reaching target cells by the ECM barricade. The interplay between antifungal treatment and DNase enzyme suggests a complex relationship between eDNA, ECM, and antifungal agents in F. circinatum biofilms. Therefore, our results show how a phytopathogen's sessile (biofilm) lifestyle could influence its response to the surrounding environment.

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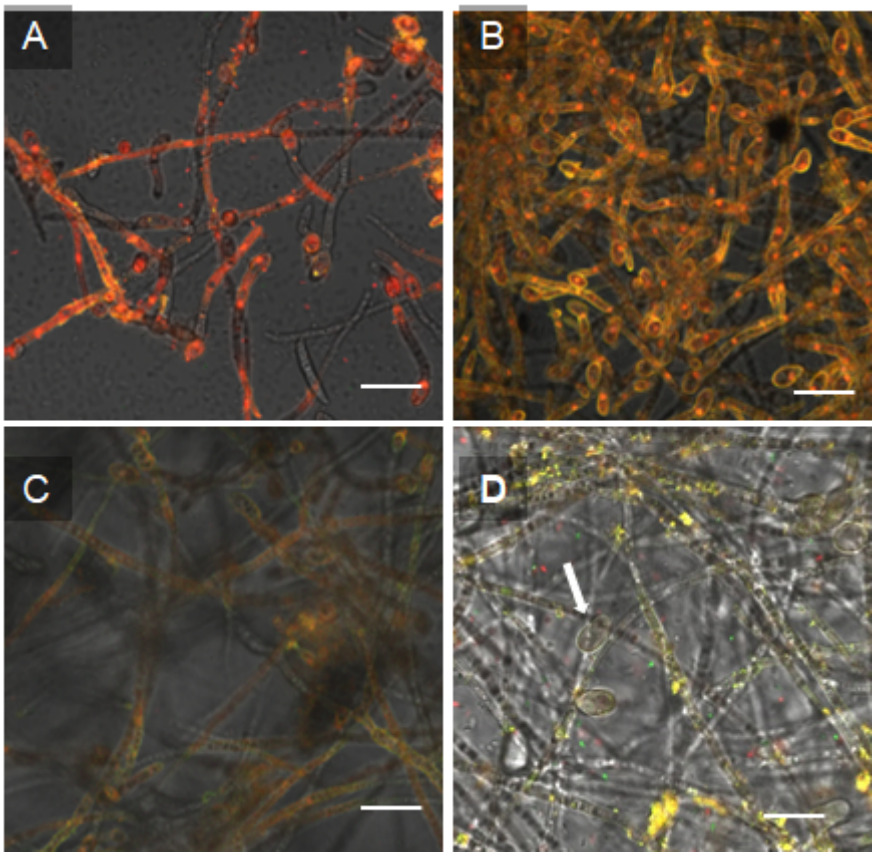

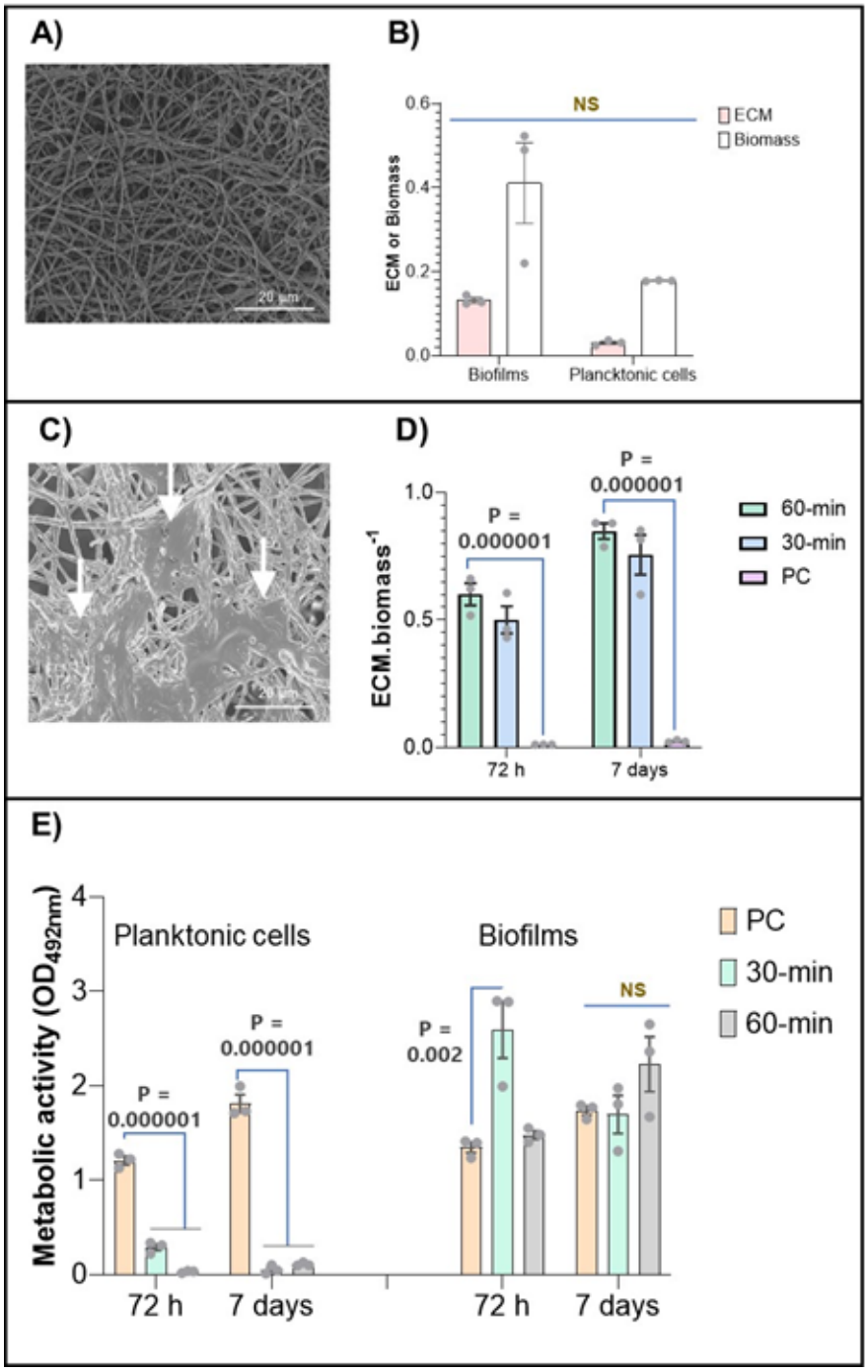

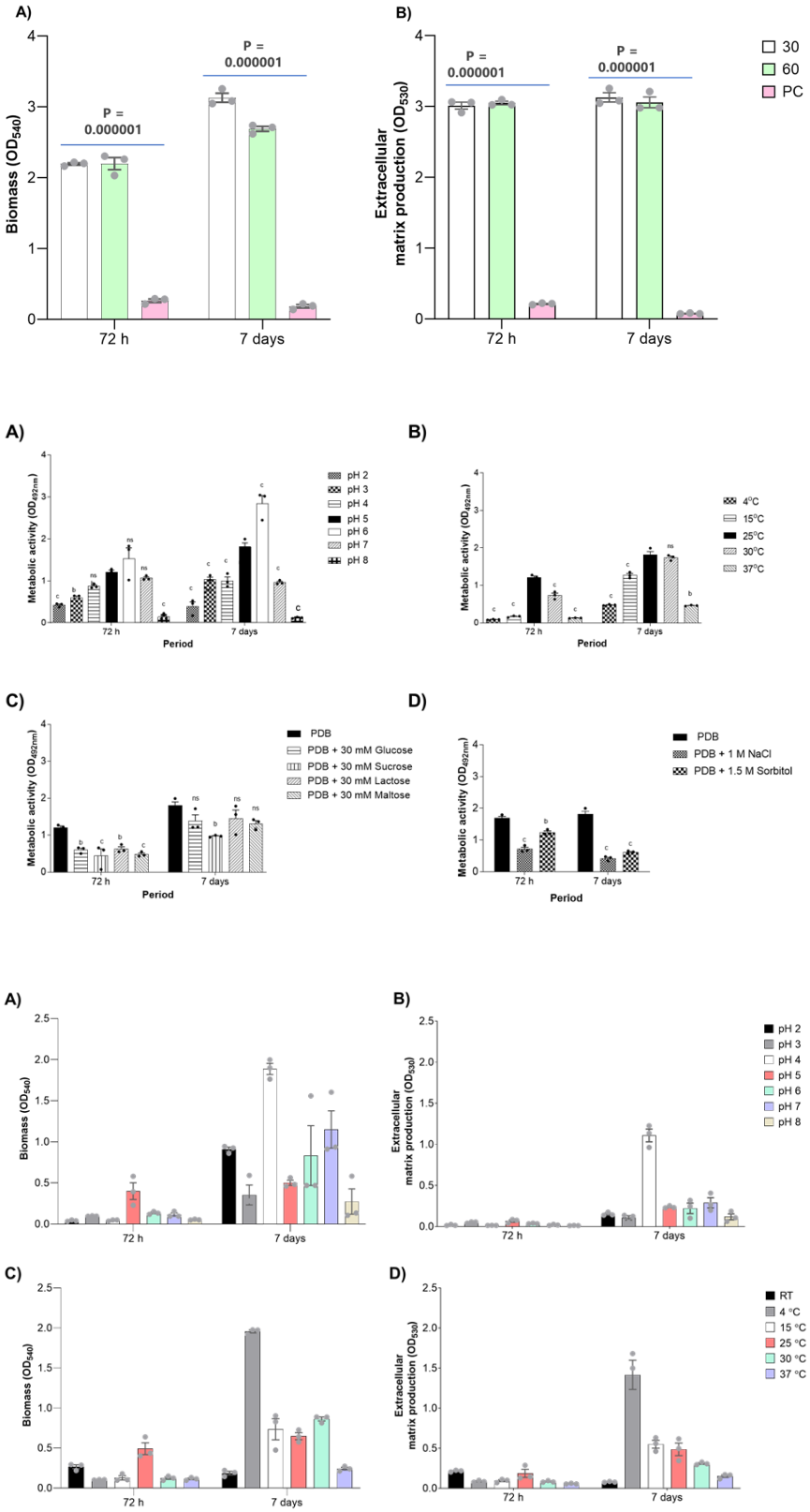

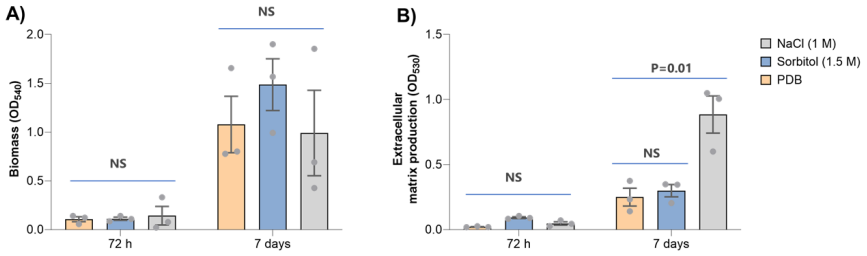

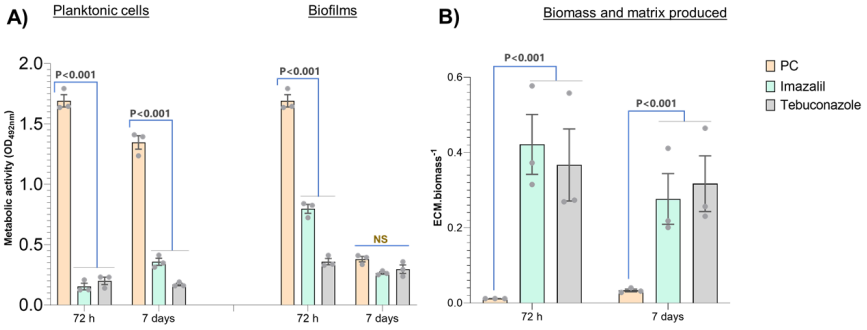

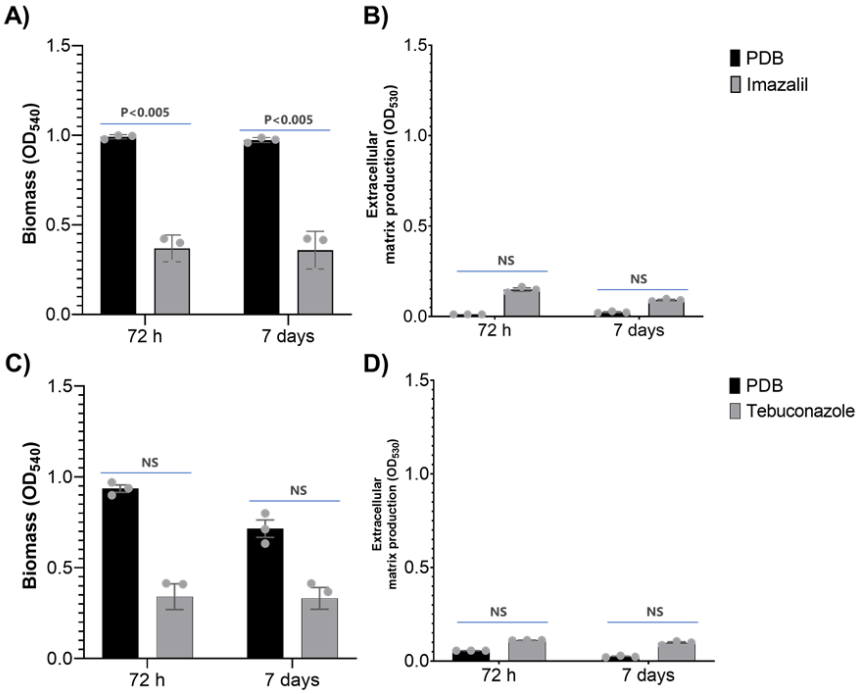

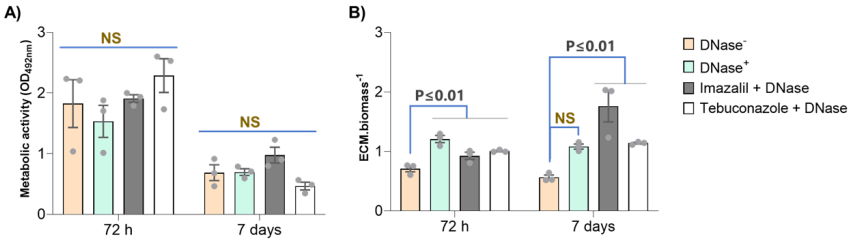

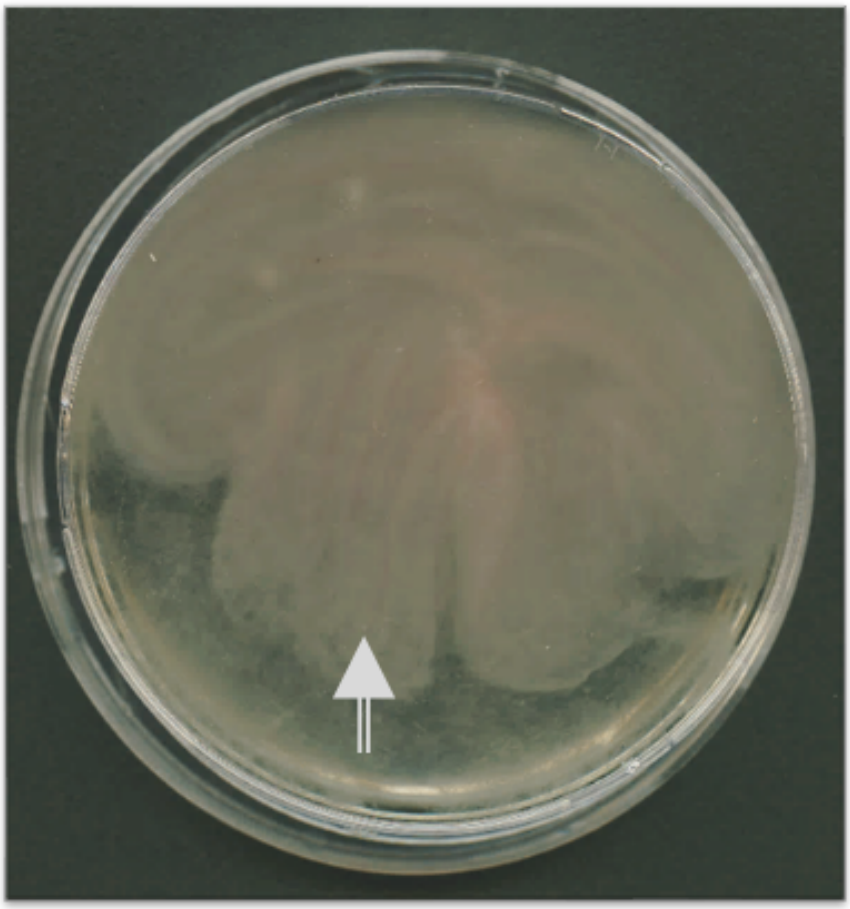

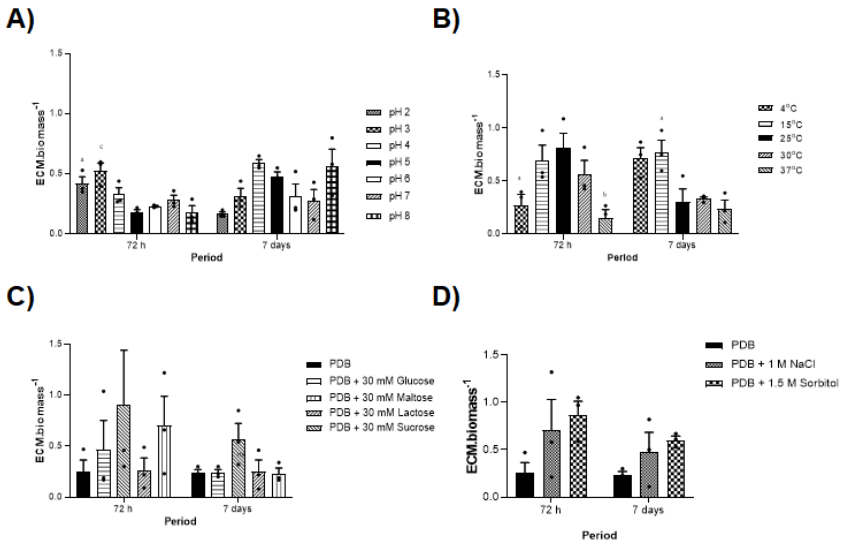

Azole	I_{50} mg/L	
	Mycelia	Biofilms
Tebuconazole	0.04±0.01 b	0.46±0.07 b
Imazalil	0.26±0.13 b	0.74±0.05 b