

Anti-oxidant, Anti-platelet and Anti-inflammatory Properties of Wines and Wine- α -Cyclodextrin Powders: A Comparative Study

Study Overview

This study evaluated the anti-platelet, anti-inflammatory, and anti-oxidant properties of six wine varieties and their corresponding α -cyclodextrin based powders. It aimed to identify if wine- α -cyclodextrin complexex will have the same biological activity as corresponding wines.

Date: July 29, 2025
Institution: Harokopio University
Samples: 6 wines + 6 powders

Key Objective:

- Compare total polyphenol concentration of wine and wine- α -cyclodextrin based powder
- Compare biological activities between wines and powders ove anti-platelet, anti-inflammatory, and antioxidant activity

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Total Polyphenol Concentrations

The tables below present the total polyphenol concentrations for all wine and wine-derived powder samples, measured in mg Gallic Acid Equivalents (GAE) per mg of extract.

Wine Samples

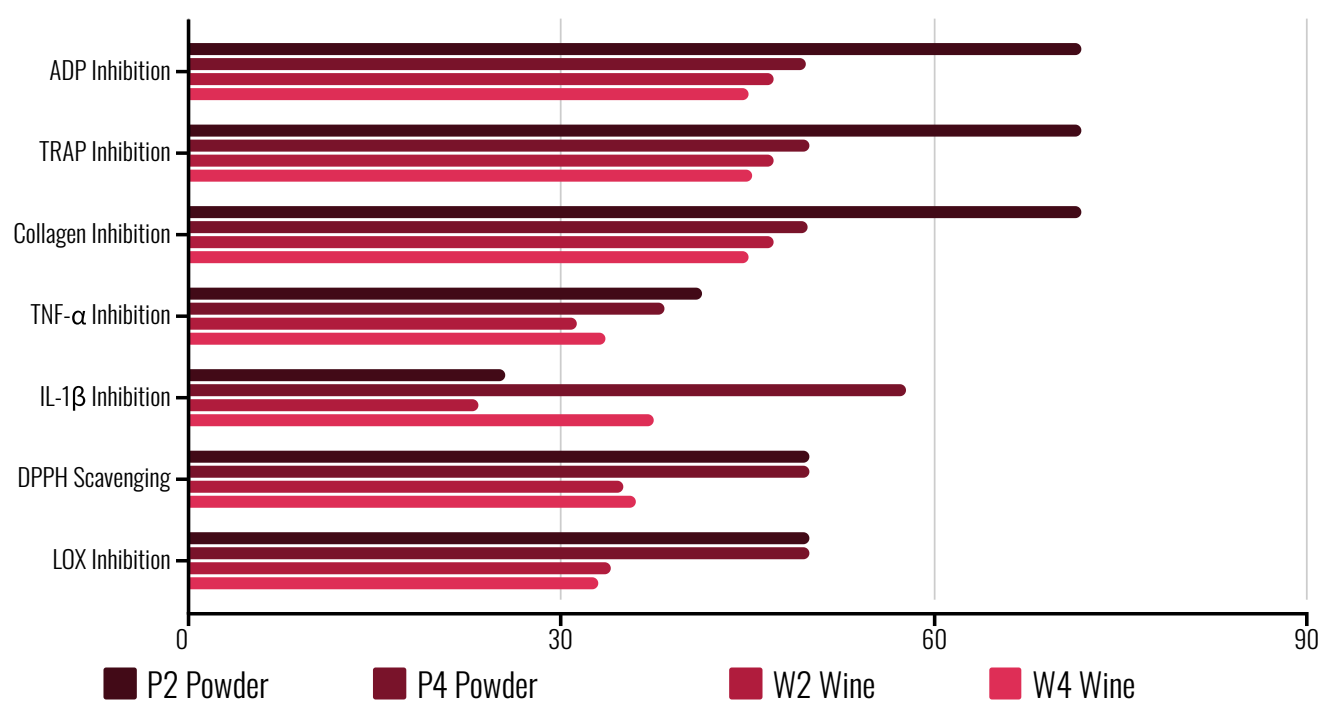
Sample	Polyphenol Concentration
W1 (Apullus Noora Frankinja)	0.078
W2 (Cabernet Sauvignon)	0.085
W3 (Cabernet Sauvignon)	0.082
W4 (Merlot)	0.090
W5 (Merlot)	0.056
W6 (Merlot)	0.065

Powder Samples

Sample	Polyphenol Concentration
P1 (Apullus Noora Frankinja)	0.075
P2 (Cabernet Sauvignon)	0.088
P3 (Cabernet Sauvignon)	0.077
P4 (Merlot Powder)	0.084
P5 (Merlot Powder)	0.060
P6 (Merlot Powder)	0.068

Detailed Biological Activity Profile: P2 and P4 Powders

This section delves into a comprehensive comparison of the biological activities of P2 (Cabernet Sauvignon powder) and P4 (Merlot powder) against their respective wine counterparts, W2 and W4. The data presented here highlights the specific strengths of these wine-derived powders in anti-platelet, anti-inflammatory, and antioxidant capabilities, underscoring their potential as potent bioactive agents (% inhibition).



Determinants of Efficacy Across Powders: Role of Total vs Individual Polyphenols

The biological activities observed in wine-derived powders are driven by different polyphenolic mechanisms. TPC-driven efficacy is primarily responsible for platelet aggregation inhibition, DPPH scavenging, and serum oxidation protection, where higher total polyphenol concentrations directly correlate with enhanced activity. This explains why P2 and P4, with their elevated TPC levels (0.088 and 0.084 mg GAE/mg respectively), demonstrate superior anti-platelet and general antioxidant performance.

Mixed influence activities, such as LOX inhibition, depend on both total polyphenol content and the presence of specific bioactive compounds. This dual mechanism accounts for the consistent 50% LOX inhibition observed across top-performing powders, regardless of minor TPC variations.

Individual phenol-driven efficacy is most evident in anti-inflammatory responses, where specific compounds like quercetin and gallic acid appear to be key determinants. This mechanism explains why P4 excels in IL-1β inhibition (57.8%) despite having lower TPC than P2, suggesting that its individual phenolic profile is particularly rich in anti-inflammatory compounds.