

# A mapping of the distribution of the albanian wine quality based on their antioxidant capacity.

---

**Nensi Isak**<sup>1,2</sup>

Muhamed Farruku<sup>1,2</sup>, Xhensiana Ndreka<sup>1,2</sup>, Kledi Xhaxhiu<sup>1,2</sup>

<sup>1</sup>University of Tirana, Faculty of Natural Sciences, Department of Chemistry Blv. Zogu I, 25/1, 1001 Tirana, Albania

<sup>2</sup>Research Center of Nanotechnology, Academy of Sciences of Albania, Murat Toptani Avenue, 1000 Tirana, Albania

[nensi.isak@fshn.edu.al](mailto:nensi.isak@fshn.edu.al)

---

## Abstract

This study presents a comprehensive mapping of Albanian wine quality based on their antioxidant capacity, with a focus on catechin quantification using modified carbon paste electrodes (CPE). Because wine composition is so complicated, it is difficult to determine catechins directly, which is why an ex-situ voltametric approach was developed. Using this technique, the CPE is extracted or adsorbed upon, and then differential pulse voltammetry (DPV) measurements are made. The CPE was modified using a variety of nanomaterials, with multi-walled carbon nanotubes (MWCNTs) showing the highest sensitivity. Other nanomaterials that were employed included zeolite, Prrenjasi clay, and carbon nanotubes. Albanian wines have 665–2235 mg/L of catechins, with red wines having higher antioxidant contents than white wines. A comparative examination using UV-VIS spectrophotometry and the Prussian blue spectrophotometric approach, both of which showed consistent patterns, validated the results. Climate and soil composition have been discovered to have a major impact on antioxidant content; warmer climates are associated with higher antioxidant capacity in wines. This approach offers Albanian wine producers a useful tool for evaluating and accrediting wine quality according to antioxidant content.