



Comparative Evaluation of Phenolic Compound Profiles and Antioxidant Properties of Two Truffle Species (*Tuber uncinatum* and *Tuber brumale*)

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Abstract

Truffles are valuable macrofungi known for their distinctive aroma and potential bioactive properties. In recent years, attention has increasingly focused on the phenolic composition and antioxidant potential of truffle species for applications in functional foods and nutraceuticals. This study compared the phenolic profiles and antioxidant capacities of methanolic extracts from *Tuber uncinatum* and *Tuber brumale*. The total phenolic content (TPC), antioxidant activity (FRAP and DPPH assays), and individual phenolic compounds were assessed. Results showed substantial differences between the two species in phenolic composition and antioxidant characteristics. Among the identified phenolic compounds, tyrosol was the dominant component in both species. *T. brumale* had significantly higher tyrosol content (383.62 ± 6.41 mg/kg DW) than *T. uncinatum* (115.88 ± 3.48 mg/kg DW). In contrast, (+)-catechin and chlorogenic acid were detected only in *T. uncinatum*, at 18.55 ± 0.29 and 2.07 ± 0.05 mg/kg DW, respectively. Oleuropein and 3-hydroxytyrosol were markedly higher in *T. uncinatum*, whereas syringic acid was comparatively higher in *T. brumale*. *T. brumale* exhibited higher FRAP (30.31 ± 1.19 mg TE/g DW), DPPH (38.30 ± 0.74 mg TE/g DW), and TPC (27.89 ± 0.87 mg GAE/g DW) than *T. uncinatum* (FRAP: 24.70 ± 1.14 mg TE/g DW, DPPH: 32.16 ± 0.99 mg TE/g DW, and TPC: 16.71 ± 0.66 mg GAE/g DW). The elevated antioxidant capacity of *T. brumale* may be associated with its substantially higher tyrosol concentration and overall phenolic content. Overall, the findings demonstrate that both truffle species are important sources of phenolic compounds with notable antioxidant potential. In particular, *T. brumale* showed promising antioxidant characteristics, whereas *T. uncinatum* exhibited a more diverse phenolic profile.

Keywords: Truffle, *Tuber uncinatum*, *Tuber brumale*, Phenolic compounds, Antioxidant activity

