

Polyphenols from Onion Skin Waste: A Natural Antioxidant Source with Health Benefits Applications

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INTRODUCTION & AIM

Onion (*Allium cepa* L.) processing generates significant wastes which are often discarded causing environmental issues despite being rich in bioactive compounds.

Objective: Valorize onion skin (OS) waste from *Horcal* and *Red* cultivars by producing flavonoid-rich extracts, analyzing their phenolic content and their bioactive properties.

MATERIALS AND METHODS

Raw material: OS waste from *Horcal* and *Red* cultivars.

Extraction: Ethanol:water (70:30, v/v) mixture at 37 °C for 60 min.

Phenolics identification: HPLC-DAD equipped with a Kinetex® Biphenyl column (Phenomenex).

Biological activity determination: Antioxidant, antidiabetic, anti-inflammatory activities, cytotoxicity, and antimicrobial properties.

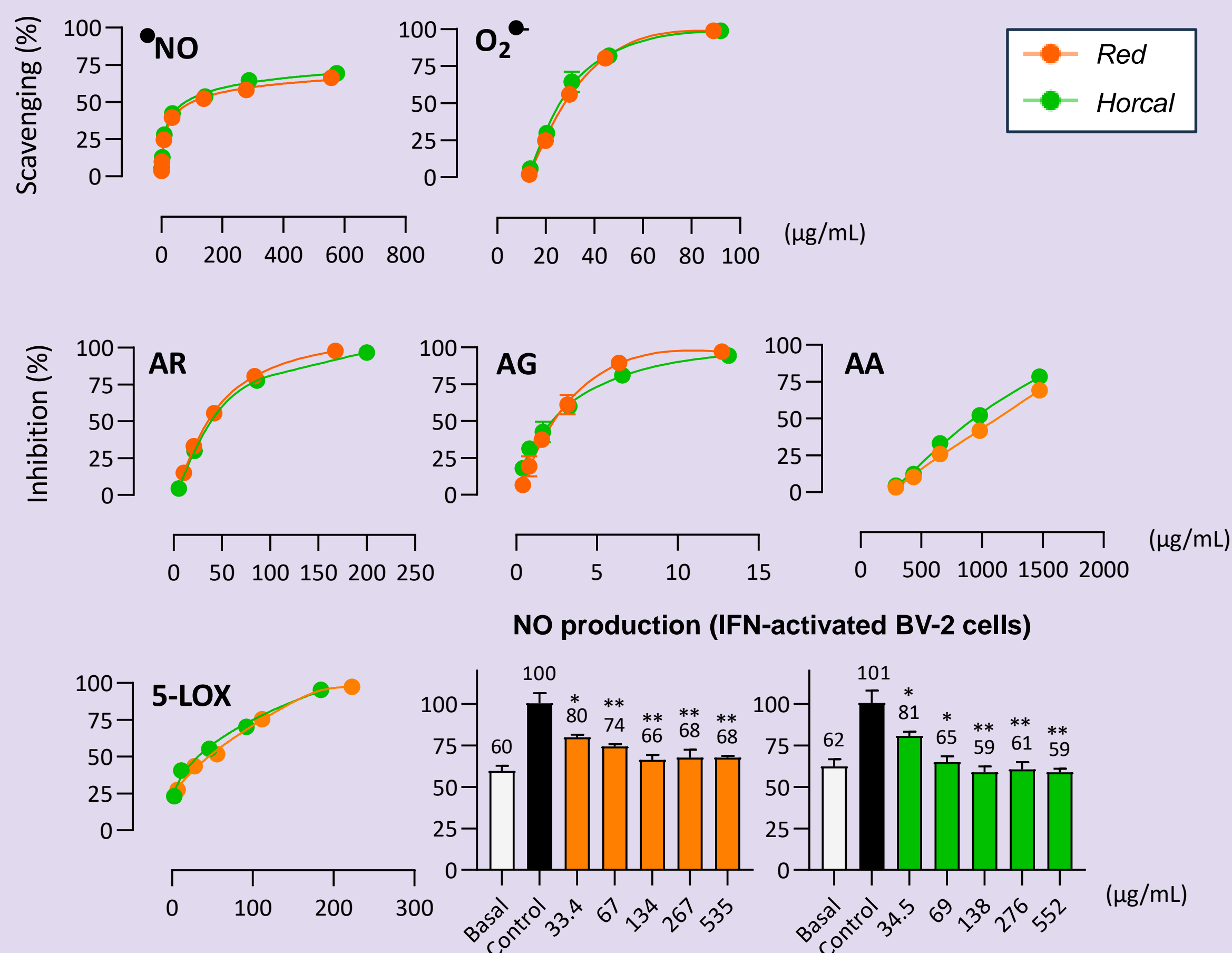
RESULTS & DISCUSSION

Chemical composition: Primary components in the OS waste extracts were **phenolics (103-155 mg/g)** and **flavonoids (81-115 mg/g)**, with quercetin and quercetin-4'-O-glucoside as major phenolics, while sugars and proteins constituted less than 11 %.

Antioxidant activity: The extracts exhibited strong •NO radical scavenging activity (IC₅₀ = 53-56 µg/mL) and even greater efficiency against O₂^{•-} anion radical (IC₅₀ = 26-28 µg/mL).

Antidiabetic properties: The extracts completely inhibited aldose-reductase (AR) (IC₅₀ = 37-44 µg/mL) and α-glucosidase (AG) (IC₅₀ = 2.2-2.3 µg/mL), while preserving α-amylase (AA) activity (IC₅₀ = 932-1126 µg/mL), thus avoiding side effects associated with its inhibition.

Anti-inflammatory effects: were demonstrated by inhibiting 5-lipoxygenase (5-LOX) (IC₅₀ = 30-47 µg/mL) and reducing NO production in IFN-activated BV-2 cells to basal levels, indicating anti-neuroinflammatory potential.



Cytotoxic effects: no cytotoxicity was exhibited on human cell lines (AGS, Caco-2, HepG2, SH-SY5Y, and BV-2) up to 535-552 µg/mL.

Antimicrobial properties: anti-dermatophytic effects against *T. rubrum* (MIC-MFC = 1 mg/mL) and *E. floccosum* (MIC – MFC = 1-2 mg/mL)

CONCLUSION

OS waste has been shown to be a natural source of flavonoids, mainly quercetin and its glucosides, exhibiting diverse biological activities and a favorable safety profile. These findings support their potential application in food supplements, functional foods, and nutraceuticals.

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