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Aman Chaudhary
 College of Pharmacy, Shivalik
 Campus, Dehradun,
 Uttarakhand, India

Anshu Tiwari
 College of Pharmacy, Shivalik
 Campus, Dehradun,
 Uttarakhand, India

Kiran Dobhal
 College of Pharmacy, Shivalik
 Campus, Dehradun,
 Uttarakhand, India

Vineet Joshi
 College of Pharmacy, Shivalik
 Campus, Dehradun,
 Uttarakhand, India

Corresponding Author:
Kiran Dobhal
 College of Pharmacy, Shivalik
 Campus, Dehradun,
 Uttarakhand, India

In vitro comparative analysis of hydrogen peroxide scavenging activity in *Murraya koenigii* and *Moringa oleifera*

Aman Chaudhary, Anshu Tiwari, Kiran Dobhal and Vineet Joshi

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Abstract

Murraya koenigii and *Moringa oleifera* are well known for their therapeutic and nutritious role from the ancient time. Both plants are treasure of secondary metabolites including alkaloids, flavonoids, phenolic acids, and essential oils, offer the antioxidant potential. Present study investigates and compares the hydrogen peroxide (H₂O₂) scavenging capacity of methanolic extracts of *Murraya koenigii* leave (MKME) and *Moringa oleifera* leave (MOME). Extracts were prepared using Soxhlet extraction and confirmed via H₂O₂ scavenging assay using ascorbic acid as a reference. Both MKME and MOME displayed concentration-dependent antioxidant potential, while MKME exhibiting slightly higher antioxidant potential (55.76%) at 400 µg/mL compared to MOME (53.66%). These outcomes of the plant extract reveal the strong free radical scavenging properties to support their continual utilization as natural antioxidants in functional foods and therapeutic formulations.

Keywords: *Murraya koenigii*, *Moringa oleifera*, therapeutic formulations, hydrogen peroxide

Introduction

Chalcones are organic compounds belonging to the flavonoid family and are commonly recognized by their structure, characterized by two aromatic rings joined by a three-carbon α,β -unsaturated carbonyl system ^[1-3]. They have attracted significant attention due to their diverse biological and pharmacological activities. These molecules are well known to found naturally in several plants and exhibited various beneficial properties, such as antioxidant, anti-inflammatory, antimicrobial, anticancer, and antiviral effects ^[4-9]. Because of their widespread presence in nature and multiple biological activities, chalcones have become important compounds for chemical synthesis and biological evaluations ^[10].

Plants are rich source of natural antioxidants which offer a vital role in improving health indicator. The antioxidant potential of different plant parts including leaves, stems, roots, seeds differ depending on their phytochemical conformation and extraction procedure ^[1, 2].

Murraya koenigii or curry leaf and *Moringa oleifera* or drum stick are extensively exploited medicinal flora in traditional medicine systems, predominantly Ayurveda and Unani due to their culinary implication, rich phytochemical content, and widespread variety of pharmacological actions. Numerous studies have highlighted the antioxidant potential of both plants ^[3, 4]. Curry leaf are recognized to contain a diverse array of secondary metabolite, including alkaloids (mahanimbine, girinimbine), flavonoids (quercetin, kaempferol), phenolic acids (caffeic acid, chlorogenic acid), and essential oils such as caryophyllene and β -phellandrene. Correspondingly, drum stick is also rich in phenolic compounds, flavonoids, vitamins A, C, and E, and unique glucosinolate and isothiocyanates, which imparts in free radical scavenging activity.

Plant extracts of curry leaf and drumstick leave in methanol, have been revealed to display strong hydrogen peroxide antioxidant potential, demonstrating their capacity to counteract reactive oxygen species (ROS) and prevent oxidative cellular damage. Methanolic extracts of drum stick leaves have proved significant antioxidant activity in DPPH method (2, 2-diphenyl-1-picrylhydrazyl), ABTS methods (2, 2'-azinobis (3-ethylbenzothiazoline-6-sulfonic acid)), and FRAP assays.

(Fluorescence recovery after Photobleaching), though curry leave has likewise been stated to reduce oxidative stress markers *in vitro* and *in vivo*. Furthermore, both plants display anti-inflammatory, hypoglycaemic, hepato-protective, and antimicrobial potential [7, 8]. Drumstick has been widely investigated as hypoglycaemic agents and protecting liver tissues against toxin-induced damage. Both plants employed as nutraceuticals and functional foods due to their high nutrient content, particularly in leaves [9, 10]. The amalgamation of traditional knowledge with contemporary pharmacological research reinforces the potential of these plants as promising candidates for the development of natural antioxidant therapies. Leave of both plants, contributing the presence of essential minerals *viz.* calcium, iron, and magnesium. Functionally, both plants display strong free radical scavenging activity established through assays such as DPPH, ABTS, and FRAP, due to presence of *in situ* antioxidants including flavonoids and phenolic acids. Overall, they possess anti-inflammatory potential through inhibition of inhibiting mediators including COX and TNF- α , hypoglycaemic action by regulating blood glucose and insulin levels, hepatoprotective potential via defence against toxin-induced liver damage, and antimicrobial activities against bacteria and fungi. ¹¹

Materials and Methods

Apparatus

All glassware was suitably cleaned and calibrated under controlled room conditions. The experiment was conducted using a Lab India (UV3200) single-beam UV-VIS spectrophotometer in the Central Instrumentation Laboratory (CIL) of the College of Pharmacy, Shivalik Campus, Dehradun and Uttarakhand.

Reagents and solutions

AR-grade chemicals were used in the study procure from the Pharmacy store of department. Hydrogen peroxide (30%v/v) from Avirise, Ascorbic acid from CDH, and distilled water were used during the study.

Preparation of plant extract

Leaves of *Murraya koenigii* and *Moringa oleifera*, were locally collected from Dehradun, Uttarakhand subjected to shade dry and converted into coarse powder. Furthermore, methanolic extraction was performed through a Soxhlet apparatus over consecutive three successive cycles. The subsequent extracts were concentrated until a dense oleoresin which is comprised by both volatile essential oils and non-volatile resinous bioactive compounds. A stock solution with a concentration of 10 mg/mL was prepared for each extract by dissolving the oleoresin in methanol. MKME and MOME was indicated furthermore for the methanolic extract of leave of *Murraya koenigii* and *Moringa oleifera* respectively [12].

Antioxidant activity of hydrogen peroxide

To evaluate antioxidant potential of MKME and MOME, a hydrogen peroxide (H₂O₂) scavenging assay was carried out by the previous literature. A 0.04 M H₂O₂ solution was prepared in 0.05M phosphate buffer (pH 7.4). Different concentration of MKME and MOME was prepared and incubated with the H₂O₂-buffer solution for 10 minutes separately. Absorbance was measured at 230 nm wavelength using a single-beam UV-Visible spectrophotometer.

Ascorbic acid (AA) was employed as a reference to compare antioxidant potential of MKME and MOME [13].

Results and Discussion

The MKME and MOME exhibited concentration-dependent *in vitro* hydrogen peroxide scavenging activity. Each concentration of MKME and MOME exhibits in the 0.05 M phosphate buffer with 0.04 M H₂O₂ solution. For MKME, the scavenging percentages were 41.13, 46.93, 49.11 and 55.76 at 100, 200, 300, and 400 μ g/mL respectively. The corresponding outcomes of scavenging percentages for MOME were observed less than for MKME i.e., 40.95, 44.76, 47.16, and 53.66 respectively. Antioxidant activity of AA demonstrated considerably remarkable reduction with scavenging values of 64.79, 69.54, 76.34, and 81.35 at the same concentrations.

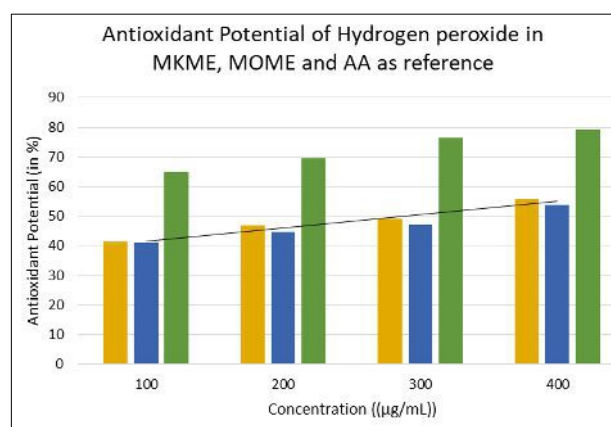


Fig 1: *In vitro* comparative analysis of hydrogen peroxide scavenging activity in MKME, MOME, and AA as reference

Study suggests that MKME and MOME both display the good level of antioxidant potential at 200, 300, and 400 μ g/mL concentrations, however but the maximum scavenging activities was observed at 400 μ g/mL for the MKME and MOME. Results was also revealed that MKME (55.76%) exposed improved percentage antioxidant potential than MOME (53.66%). Figure 1 illustrations the hydrogen peroxide antioxidant potential of MKME, MOME, and AA. The stem and seed of curry plants also revealed the presence of *in situ* antioxidant components including phenolic compounds, flavonoids, tannins, and terpenoids. In comparison of leave, methanolic extracts of seed and stem displayed moderate to significant H₂O₂ scavenging activity. The hydrogen peroxide scavenging potential of the stem and seed of drum stick has been investigated limited, however both parts possessing antioxidant potential due to the presence of various bioactive compounds [14, 16].

Conclusion

The comparative analysis of methanolic extracts of Curry leave and Drum stick leave addresses their substantial hydrogen peroxide scavenging action, supporting their role as potent natural antioxidants. MKME and MOME displayed a dose-dependent increase in antioxidant potential, MKME showed slightly superior activity compared to MOME. The presence of bioactive compounds such as flavonoids and phenolic acids contributes to their free radical neutralization capabilities. These results not only reinforce traditional knowledge but also support the ongoing exploration of these plants for development into

natural antioxidant therapies. Future studies employing diverse antioxidant assays and *in vivo* models could further elucidate their therapeutic potential and mechanisms of action.

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Conflict of interest

None

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