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Research Article

Antioxidant Capacity and Radical Scavenging Activities of *Moringa oleifera*

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Abstract

Due to its numerous health benefits and potent antioxidant properties *Moringa oleifera* has attracted a lot of interest. This study assesses the antioxidant and radical scavenging properties of leaf extracts from *Moringa oleifera*, with a particular emphasis on the plant's bioactive components and their potential to mitigate oxidative stress. Its strong antioxidant activity may be attributed to the presence of phytochemicals such as flavonoids, phenolic acids, alkaloids, and vitamins (especially C and E). *In vitro* methods including the DPPH 2,2-diphenyl-1-picrylhydrazyl) radical scavenging assay, the ABTS (2,2′-azinobis-3-ethylbenzothiazoline-6-sulfonic acid) assay, and the FRAP (Ferric Reducing Antioxidant Power) assay were employed to assess were employed to assess antioxidant activity. The findings showed that Moringa oleifera exhibited remarkable effects on free radical scavenging, with IC50 values antioxidants like tocopherol and ascorbic acid. At greater extract concentrations, the DPPH scavenging activity showed 70% inhibition rate moringa's ability to neutralize free radicals. Furthermore, there was a positive correlation observed between the antioxidant potency the extracts and their total phenolic content (TPC) and total flavonoid content (TFC), indicating that these chemicals are important contributors to the plant's overall antioxidant activity. These results demonstrate the potential of *Moringa oleifera* as a natural antioxidant source, positioning it as promising option for functional food products and nutraceuticals designed to reduce oxidative damage. The plant's capacity to counteract oxidative stress raises the possibility of its use in the prevention of chronic ailments like cancer, diabetes, and cardiovascular disease, all of which are known to be exacerbated by oxidative stress. Further research is imperative to elucidate its mechanism of action and potential therapeutic applications.

Keywords: *Moringa oleifera*; Oxidative Stress; Phytochemicals; Flavonoids; Phenolic Acids

Introduction

Moringa oleifera, commonly known as the drumstick tree or horseradish tree, is a plant native to India but cultivated worldwide in tropical and subtropical regions. The leaves, seeds, pods, and flowers of *Moringa oleifera* are rich in bioactive compounds, including flavonoids, phenolic acids, and vitamins, which contribute to its potent antioxidant properties [1].

Antioxidants play a crucial role in protecting the body against oxidative stress, which is linked to various chronic diseases such as cancer, diabetes, and cardiovascular diseases. The antioxidant capacity of *Moringa oleifera* is attributed to its ability to scavenge free radicals, inhibit lipid peroxidation, and enhance the activity of antioxidant enzymes [2].

Phytochemical constituents of *Moringa oleifera* related to antioxidant activity

Moringa oleifera is rich in several bioactive compounds that contribute to its antioxidant properties. These include:

- **Flavonoids:** Such as quercetin, kaempferol, and rutin, known for their free radical scavenging activity.
- **Phenolic Acids:** Including gallic acid and chlorogenic acid, which contribute to the plant's overall antioxidant potential.
- **Vitamins:** Particularly vitamin C, E, and A, which are well-known antioxidants.
- **Alkaloids and Saponins:** Other phytochemicals that exhibit antioxidant activities.

The aim of the study on the Antioxidant Capacity and Radical Scavenging Activities of Moringa oleifera is to evaluate and quantify the plant's antioxidant potential by analyzing its ability to neutralize free radicals through various assays. The study focuses on identifying the bioactive compounds responsible for these activities, such as flavonoids and phenolic acids, and determining their contribution to the overall antioxidant capacity of the plant.

Methods of assessing antioxidant capacity

Various assays are used to evaluate the antioxidant capacity of *Moringa oleifera*. Some of the most commonly used methods include.

Figure 1: Benefits of Moringa.

DPPH radical scavenging assay

Measures the ability of *Moringa oleifera* extracts to reduce the stable radical DPPH (2,2-diphenyl-1-picrylhydrazyl) to a yellow-colored diphenyl-picrylhydrazine.

ABTS radical cation decolorization assay

Assesses the scavenging ability of *Moringa oleifera* extracts against the ABTS•+ (2,2'-azino-bis(3-ethylbenzothiazoline-6-sulfonic acid)) radical cation.

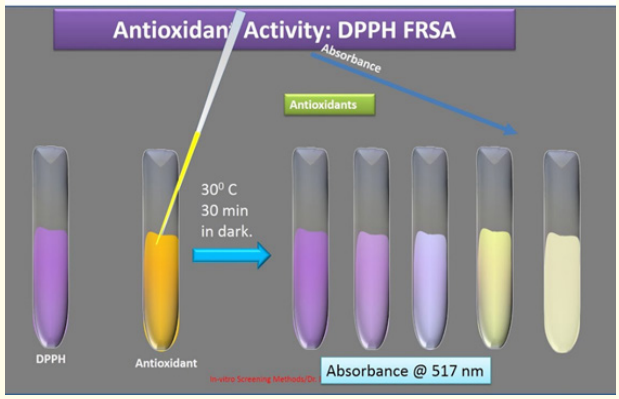

Figure 2: DPPH Radical Scavenging Assay.

Ferric reducing antioxidant power (FRAP) assay

Measures the reducing power of *Moringa oleifera* extracts, which reflects their antioxidant potential.

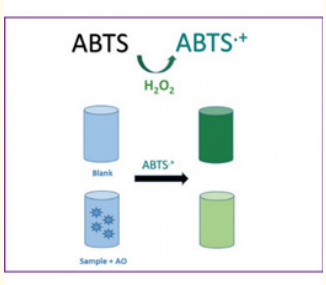

Figure 3: ABTS Assay.

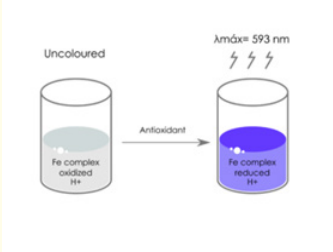

Figure 4: FRAP Assay.

Oxygen radical absorbance capacity (ORAC) assay

Evaluates the total antioxidant capacity by measuring the inhibition of peroxyl radical-induced oxidation.

Results and Discussion

Studies have shown that *Moringa oleifera* possesses significant antioxidant activity, which can be attributed to its high content of

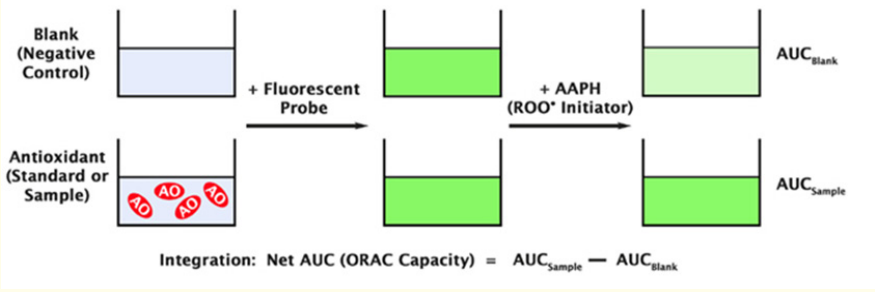

Figure 5: ORAC Assay.

flavonoids, phenolic acids, and other bioactive compounds [7].

- **DPPH Assay:** Several studies have reported that *Moringa oleifera* leaf extracts exhibit high DPPH radical scavenging activity, comparable to that of standard antioxidants like ascorbic acid. This indicates the plant's ability to neutralize free radicals effectively [2].
- **ABTS Assay:** *Moringa oleifera* extracts have demonstrated strong ABTS radical cation scavenging activity, indicating their potential as natural antioxidants [3].
- **FRAP Assay:** The reducing power of *Moringa oleifera* leaf extracts is significant, suggesting that they can act as electron donors and neutralize free radicals, thereby contributing to their antioxidant properties [6].
- **ORAC Assay:** The total antioxidant capacity of *Moringa oleifera* is high, which is consistent with the presence of various antioxidant compounds in the plant. This high total antioxidant capacity further underscores *Moringa oleifera's* efficacy as a potent antioxidant source [5].

Conclusion

Moringa oleifera is a potent source of natural antioxidants, with various parts of the plant exhibiting significant free radical scavenging activity. The robust antioxidant capacity of Moringa oleifera not only positions it as a valuable asset for dietary supplementation but also underscores its potential for therapeutic applications in combating oxidative stress-related ailments. Incorporating Moringa oleifera into functional foods and nutraceutical products may offer a sustainable and natural strategy to bolster antioxidant defenses and promote overall well-being".

Bibliography

1. Anwar F., *et al*. "Moringa oleifera: A food plant with multiple medicinal uses". *Phytotherapy Research* 21.1 (2007): 17-25.
2. Sreelatha S and Padma P R. "Antioxidant activity and total phenolic content of Moringa oleifera leaves in two stages of maturity". *Plant Foods for Human Nutrition* 64 (2009): 303-311.
3. Verma AR., *et al*. "In vitro and in vivo antioxidant properties of different fractions of Moringa oleifera leaves". *Food and Chemical Toxicology* 47.9 (2009): 2196-2201.
4. Dwivedi P., *et al*. "Phytochemical analysis and antioxidant activity of Moringa oleifera leaf extract". *Journal of Medicinal Plants Studies* 9.3 (2021): 121-128.
5. Fahey JW. "Moringa oleifera: A review of the medical evidence for its nutritional, therapeutic, and prophylactic properties. Part 1". *Trees for Life Journal* 1.5 (2005): 1-15.
6. Siddhuraju P and Becker K. "Antioxidant properties of various solvent extracts of total phenolic constituents from three different agroclimatic origins of drumstick tree (Moringa oleifera Lam.) leaves". *Journal of Agricultural and Food Chemistry* 51.8 (2003): 2144-2155.
7. Leone A., *et al*. "Moringa oleifera seeds and leaves: beneficial effects on obesity and its related complications". *Nutrients* 7.11 (2015): 8571-8589.