# Influence of Solvents on the Biochemical Profiling of *Moringa oleifera* Extracts for Investigating an Effective Bioactive Compounds

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## ABSTRACT

**Background:** From centuries plants and their ingredients used to treat various diseases such as diabetes, blindness, anemia, hypertension, stress, depression, epilepsy, HIV/AIDs infections skin infections, joints, arthritis, and kidney-related disorders. In recent years these plants are being explored scientifically and engineered to produce highly nutritious genetically modified foods, recombinant pharmaceutical products, industrial or therapeutic proteins, and other secondary metabolites. Plant secondary metabolites include polyphenols, flavonoids, tannins, saponins, and alkaloids that are responsible for various biological activities. Among the medicinal plants, *Moringa oleifera* is encountered as traditional medicine, also known as a miracle tree, and belongs to the Moringaceae family. It is widely cultivated in subtropical regions of the world and characterized as a multipurpose tree because of its nutritional, industrial, and pharmaceutical properties. Every part of the Moringa tree use for different purposes like leaves are famous as a dietary supplement because it is a rich source of proteins, carbohydrate, vitamin, and minerals while seeds are mostly utilized for effluent water treatment, etc. Besides this, *Moringa oleifera* is also reported to have various biological activities including anti-cancer and anti-microbial activities. Researchers are more focused to optimize, source of the pant, extraction methods, and its extracting solvents to maximize the extraction yield and its bioactive compounds for pharmacological activities. Production of secondary metabolites in the plants is dependent on its surrounding atmosphere and its exposure to plant pathogens. So due to the climate diversity, origin, and storage of compounds, it is difficult to extract and isolate the desired compounds. Therefore, is it being important to study the extraction methods and their respective solvents for a particular part of the plant to obtain maximum active secondary metabolites for particular biological activities. It is reported earlier the concentration of phytochemicals and efficacy of extracts is solely dependent on the solvent system it follows the principle 'like dissolves like' Subsequently polar solvents extract polar compounds and vice versa.

**Keywords:** Biological activities, Extraction, Medicinal plants, *Moringa oleifera*, *Staphylococcus aureus*.

## AIM OF THE STUDY

On the basis of all this information, this study was aimed to extract highly potential and strongly effective phenolic compounds from parts of *Moringa oleifera* and evaluate the best extracting solvent for polar compounds from the effective part of *Moringa oleifera*.

## METHODOLOGY

For this plant samples of *Moringa oleifera* were collected from botanical garden of University of Karachi, Pakistan. Different solvents such as methanol, ethanol, acetone, and warm or hot distilled water were used to extract the secondary metabolites. Initially, extracts were prepared and the dry weight of all extracts was determined to find the extraction yield. After that, all dried extracts were re-dissolved in respective solvents

and subjected to phytochemical screening and evaluation of total phenol and flavonoid contents. The total polyphenol content was assessed by the Folin-Ciocalteu assay while total flavonoid content was measured by the Aluminium chloride method. To further authentic our results antimicrobial activity against multi-drug resistant *Staphylococcus aureus* (KIBGE-23) was performed and correlation of total phenolic content and flavonoid content with Anti-MRSA potential was calculated by agar well diffusion assay. Furthermore, the quercetin content and HPLC screening of effective stem bark methanolic extract was evaluated to identify quercetin concentration and an overall number of compounds involved in biological activity.

## RESULTS

Qualitative phytochemical screening of all extracts showed the presence of various classes of secondary metabolites. The highest concentrations of phenolics and flavonoids were observed in stem bark followed by leaves, while the lowest concentrations were detected in flowers. The highest antimicrobial activity was assessed by stem bark organic extracts, and results showed a strong positive correlation with phytochemical contents with the $R^2$ value (0.830 to 0.869) at the *P-value<0.05*. The biochemical profiling of plant part results along with anti-MDR activity confirmed that among all tested solvents, methanol was the most potent solvent for extracting significant compounds. HPLC screening also confirmed the presence of various glycosylated non-glycosidic bioactive compounds. Among these quercetins is the most important flavonoid for biological activities and its quantity was 0.517 ug/g.

## CONCLUSION

We can conclude that stem bark is the most effective part of *Moringa oleifera* as compared to others and organic solvents are more potential in the extraction process as compared to water. Among the most common polar solvents, methanol may be the best solvent for the extraction process and it also showed high efficacy as an anti-MDR agent so it can be used as an antimicrobial adjuvant in pharmaceutical products. Further studies are needed to isolate and purify these compounds in the future.

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