Original Article

Evaluate the Effectiveness of Phytochemical, Physicochemical and Mineral Analysis of Moringa oleifera (Drum Stick Leaves)

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ABSTRACT

Moringa oleifera Lam (Moringaceae) is one of the most adaptable plants in the world. *M. Oleifera* is used in nature to treat a variety of diseases and is now available without a prescription in the form of an herbal infusion. They are thought to cure a variety of ailments in the native medicine system. The presence or absence of such plant synthesized primary and secondary metabolites determines the values of food and medicine. The aim of this analysis was to assess the phytochemical elements, physicochemical properties, and nutritional values of dried *M. Oleifera* leaf powder using a qualitative test. *M. Oleifera*is used medicinally due to the presence of active phytochemical constituents such as alkaloids, flavonoids, hormones, phenols, and carbohydrates. Ash (6.18%) , Moisture (70.27%), Fiber (20.26%), Carbohydrates (40.40%), Protein (27.73%), Fat (2.24%), Tannin (22.16%) , Phytates (0.37g/100g), Vitamin C (0.86 mg/g), Beta-carotene (18.21 mg/100g), and Folic Acid (0.95 mg/100g) are among the physicochemical properties studied.Mineral research that may be involved has been examined, and its wide-ranging activities have been held responsible. Moringa leaves have been shown to be a good source of dietary nutraceuticals as well as essential characteristics for potential nutritional and technological applications

Key words: Moringa oleifera Lam, Phyochemical, Physiochemical, Mineral, Dietary nutaceutical

Herbal and organic drugs have a wide variety of chemical compositions. This can be so extreme that it can result in therapy failure or poisoning, so it's understandable that different samples of the same natural substance will have drastically different reactions. *M. Oleifera*is a type of vegetable shrub that grows to a height of 5–15 metres and has a 30 cm diameter soft and brittle stem [1]. Moringa leaves are round, pinnately tripled, and small round or oval in shape. The fruit is long and angular, with triangle-shaped sides; the drumsticks are 15–45 cm long and contain about 20 seeds [1]. Moringa thrives in moist tropics or hot, dry climates, and can thrive in less fertile soils. It is also droughtresistant [2]. Moringa is a tropical and subtropical plant that originated on the Indian subcontinent and has since spread throughout the world.

Plant sections that function as cardiac and circulatory stimulants include leaves, roots, seeds, barks, fruits, flowers, and immature pods. They also have antipyretic, antiepileptic, anti-inflammatory, and anti-ulcerative properties [3]. Other important plant properties include antispasmodic [4], diuretic [5], antihypertensive [6], cholesterol reduction [7], antioxidant, anti-diabetic, hepato-protective [8], antibacterial and antifungal [9]. Phytochemicals are chemical compounds found naturally in plants. They are caused by the plant's colour and organoleptic properties [10]. Chemicals that may have biological significance but are not known as important plant nutrients are often referred to as it. While phytochemicals are available as a dietary supplement, the potential health benefits of phytochemicals are derived from the ingestion of the entire plant [11]. Natural ingredients, either as pure compounds or as standardized plant extracts, have limitless possibilities for new medicines [12].

Some are responsible for colour and other organoleptic effects, such as the deep purple of blueberries and the odour of garlic [13]. Chemicals that may have biological significance (e.g., antioxidants) but are not defined as essential nutrients are commonly referred to as "essential nutrients" [14]. Appropriate methodologies for accurate diagnosis, standardization, and quality assurance of herbal drugs are critical for the future development of herbal drug pharmacognosis [15]. Verifying the origin of a drug, evaluating its worth and purity, and determining the nature of adulteration are all part of the drug evaluation process. Phytonutrients found in naturally grown herbs and plants are extremely beneficial to our bodies and overall health. The most common and useful phytonutrients are natural minerals (such as zinc, iron, calcium, copper, and other elements) and vitamins (such as vitamins A, B, C, D, E, PP, and others) [16]. The aim of this study was to see the effectiveness of the phytochemical, physicochemical, and mineral analysis of *M. oleifera*.

MATERIALS AND METHODS

Sample Collection and Processing: The plant came from the Erode District. Indoors, the plant was air-dried and powdered with a mortar and pestle. For further research, the powdered sample was placed in an airtight jar.

Phytochemical Screening: Normal techniques were used to conduct preliminary phytochemical investigations for secondary metabolites on a powdered sample of *M. Oleifera* leaves [17] [18]. Alkaloids, flavonoids, hormones, terpenoids, anthroquinones, phenols, saponins, tannins, carbohydrates, oils, and resins were among the metabolites examined. Analysis includes complete Ash value [19], Moisture content [20], Fiber [18], Total Carbohydrate [21], Proteins [22] [23], Fat [24], Tannin [25], Phytates [26], Vitamin C [27]. The normal method was used to evaluate Iron Forms (II) and (III) (Vogel, 1961).

Mineral Analysis: The mineral analysis was carried out, according to [23]. To avoid detergent absorption, the glassware and polyethylene containers used for examination were washed with tap water, then soaked in 6N HNO3 solution overnight and rinsed with ultrapure water several times. Precisely weighted (2.0 g) crop specimens were moved to a silica crucible and ashed for 3 hours at 45^0 C in a muffle furnace, followed by the application of 5 mL of 6 M HCl to the crucible. The acid solution containing the crucible was then digested on a hot plate to obtain a clean solution. In 0.1 M HNO3 solution, the final residue was dissolved and made up to 50 mL. Flame and graphite furnace atomic absorption spectrophotometers are used to examine the plant specimens (AA 6300, Shimadzo, Japan). Metal content has been determined using an airacetylene burn. In flame mode, the instrument was operated under the following conditions: acetylene 1.8 L/min, air 15 L/min, inert argon gas flow and temperature parameters, as defined by the manufacturer. The absorption wavelength is given for determining the material, along with its linear working range and correlation coefficient of calibration graphs. The standard deviation value from triplicate measurements is used to round off the results.

RESULT AND DISCUSSION

The sample yielded significant diagnostic characters that could be useful in assessing the validity and detecting crude drug adulteration. Herbal medicine is thought to have been used to cure many illnesses in the history of human medicine. Herbal drugs have the advantage of having fewer side effects over time and being safe to use. They are also less expensive and more readily available than formulated medications [28]. The dried flower of *M. Oleifera L* was analyzed for phytochemicals, physicochemicals, and minerals.

Phytochemical Analysis: The qualitative phytochemical study of *M. Oleifera* leaves was carried out. Active phytochemicals such as alkaloids, flavonoids, steroids, phenols and carbohydrates. These active phytoconstituents are present in aqueous extract of *M. Oleifera*. The presence of alkaloid shows cream color precipitate, flavonoids show reddish-brown colour precipitate, steroids show green colour formation, phenols show deep blue to black colour formation and carbohydrates show blue colour precipitate.

Preliminary qualitative screening is helpful in detecting bioactive concepts and could lead to drug development and manufacturing [29]. Alkaloids are plant compounds that act as repellents for predators and insects. Alkaloids have been shown to have microbiocidal properties, and their key anti-diarrheal activity is likely due to their effects on the small intestine, as well as anti-hypertensive properties [30]. Several alkaloids are effective in the treatment of HIV infection and AIDS-related intestinal infections [12] (**Table 1**)

Table 1 - Phytochemical Analysis of *M. Oleifera* leave

Phytochemicals	Observations	Extracts Distilled Water
Alkaloids Mayer's test Wagner's test	Cream colour Reddish brown solution/ precipitate	Present
Flavonoids Lead acetate test H_2SO_4 test	Yellow orange Reddish brown / Orange colour precipitate	Present
Steroids LiebermannBurchard test	Violet to blue or Green colour formation	Present
Terpenoids Salkowski test	Reddish brown precipitate	Absent
Arthroquinone Borntrager's test	Pink colour	Absent
Phenols Ferric chloride test Lead acetate test	Deep blue to Black colour formation White precipitate	Present
Saponin	Stable persistent	Absent
Tannin	Brownish green / Blue black	Absent
Carbohydrates	Yellow/brownish /blue /green color	Present
Oils & Resins	Filter paper method	Absent

Flavonoids are powerful water-soluble antioxidants and free radical scavengers that protect cells from oxidative damage and have anti-cancer properties [31]. Flavonoids, which contain hydroxyl groups, are thought to be responsible for the radical scavenging effects of most plants. Phytochemicals such as tannins, saponins, and steroid-glycosides were found to be in relatively low concentrations. Tannins may be a good way to help your kidneys [19]. Tannins have also been shown to have antiviral, antibacterial, and anti-parasitic properties [10]. As an adjuvant, saponins are used in the production of vaccines.

Physicochemical Analysis: The importance of physicochemical research is that it aids in the identification of different constituents or groups of constituents that often lead to the

discovery of a connection between structure-activity and the drug's probable mechanism of action. The physicochemical analysis revealed that M. oleifera leaf powder was manufactured to a high purity level and of good quality, as determined by the WHO [32].

Ash (6.18 percent), moisture (70.27%), fiber (20.26%), carbohydrates (40.40 %), protein (27.73%), fat (2.24%), tannin (22.16%), phytates (0.37g/100g), vitamin C (0.86 mg/g), betacarotene (18.21 mg/100g), and folic acid (0.95 mg/100g) are all examined as a consequence of the physicochemical evaluation is investigated. In order to detect adulterants and improper drug handling, it is important to decide the physicochemical parameter. Since mineral matter can cause a pharmacological effect [33], ash values are important quantitative standards [34]. They are also a criterion for evaluating the identity and purity of crude drugs, particularly in the form of powder [35]. In addition to lowering cholesterol and triglycerides, dietary fibres protect against cancer and digestive disorders. More information regarding a crude drug's total ash also represents the care taken in preserving products, as well as the purity of both crude and prepared drugs [35].

Determination of iron forms: Iron is needed for the development of hemoglobin, the normal functioning of the central nervous system, and the oxidation of starch, protein, and fat. The amount of iron in both dried and fresh leaves is determined. Fresh leaves have a ferrous content of 2.57 0.02 and a ferric content of 1.23 ± 0.03. In dry leaves, ferrous is 2.09 ± 0.04 and ferric is 0.96 ± 0.02. In comparison to both, the test iron form for fresh leaves is higher. Iron is essential for haemo-poiesis, infection control, and cell-mediated immunity [36].

Mineral Analysis: Mineral elements are essential for the proper functioning of all cells because they serve as structural tissue components, as well as components of body fluid and vital enzymes in major metabolic pathways. Heavy metal contamination of medicinal plant materials can cause chronic or acute poisoning. As a result, it has become important to ensure the heavy metal content of all starting materials, as well as other inorganic elements that are needed. The presence of heavy metals was determined using elemental analysis, and the results for *M. Oleifera* leaf powder in ppm are Iron (Fe) - 0.548, Copper (Cu) - 0.075, Manganese (Mn) - 0.038, Zinc (Zn) - 0.138, Nickel (Ni) - 0.133, Cobalt (Co) - 0.547, Lead (Pb) - 0.486, Aluminum (Al) - 1.984, Vanadium (V) - 1.096, Chromium (Cr) - 0.048, Molybdenum (Mo) - 0.137, Mercury (Hg) - 0.145, Arsenic (As) - 0.052, Cadmium (Cd) - 0.098.The most common nutritional deficiency has been described as iron deficiency anemia, which is estimated to affect more than one billion people worldwide [37]. Reduced work capacity, behavioural and cognitive function impairments, and decreased infection tolerance are all consequences of iron deficiency [27]. It's also essential for cell growth and repair, bone development, and kidney function (**Table 2**).

Table 2 - Mineral Analysis for *M. Oleifera* leaves

Elements analyzed	Quantity (in ppm)
Iron (Fe)	0.548
Copper (Cu)	0.075
Manganese (Mn)	0.038
Zinc (Zn)	0.138
Nickel (Ni)	0.133
Cobalt (Co)	0.547
Lead (Pb)	0.486
Aluminum (Al)	1.984
Vanadium (V)	1.096
Chromium (Cr)	0.048
Molybdenum (Mo)	0.137
Mercury (Hg)	0.145
Arsenic (As)	0.052
Cadmium (Cd)	0.098

This is essential for maintaining the body's acidalkaline balance [38]. Minerals such as cadmium, nickel, and lead are thought to be found in trace quantities. Cadmium and lead in high concentrations are unsuitable for bodywork and unappealing. The study lays the groundwork for further isolation and characterization of the bioactive constituents present in the leaves of this plant, thanks to its therapeutic properties. Magnesium is a part of chlorophyll and is an important mineral element in the treatment of ischemic heart disease and bone calcium metabolism [39]. Zinc is a part of more than 50 enzymes in the body that play a role in immune system function [40]. An estimated 20% of the world's population is at risk of insufficient zinc intake [41].

CONCLUSION

The presence of phytochemicals, physico-chemicals, minerals and iron forms in leaves has been demonstrated in this research, which supports both their nutritional and ethno-medicinal benefits for human health. Alkaloids, flavonoids, phenols, steroids and carbohydrates were present in high concentrations in *M. Oleifera* leaves. The leaves still had a good amount of Ash, Moisture, Fiber, Carbohydrates, Protein, Fat, Tannin, Phytates, Vitamin C, Betacarotene and Folic Acid. In Moringa oleifera leaves have a high nutritional value and are high in the mineral portion needed for good health. The sample's physicochemical characters were analyzed for standardization so that future research could be conducted on samples that were found to be equivalent based on these characters, ensuring the sample's scientific analysis.

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