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Phytochemical Constituents and Physicochemical Properties of Medicinal Plant (*Moringa Oleifera*) Around Bule Hora

Kassa Belay * and Mesay Sisay
(Department of chemistry, College natural and computational sciences/ Adigrat University, Ethiopia)

ABSTRACT
The investigation was carried out a qualitative test for the possible phytochemical components (Alkaloids, Phenolic compound, Quinone, Protein, Anthraquinones, Saponins, Coumarin, Flavonoids, Tannin Fixed oil and fats and Steroid-glycosides) and quantitative analysis for some selected physicochemical properties after extracting the sample using soxhlet extraction by using ethanol and methanol as extractants. And Phenolic compound, Tannins, flavonoid and Steroid-glycosides are intensively found in the plant but Anthraquinones, protein and fixed oil and fat were not found even in a minimum amount. The medicinal use of Moring is results from the presence of some active phytochemical constituents.
Lastly the physic-chemical properties value is investigated as follow: Moisture content 0.032% Total ash value 96 % Saponification value 37.4, Refractive index for Ethanol and methanol extract are 17,7 ,Acid value 3.94 and the extract is Insoluble in chloroform but highly soluble in Ethanol, Diethyl ether and Water.

Key Words: Moringa oleifera, physicochemical properties, phytochemical sceerining and soxhlet extraction

1. INTRODUCTION

In India and other countries of the world, phytomedicines have been used since time immemorial to treat various ailments long before the introduction of modern medicine. Herbal medicines are still widely used in many parts of the world especially in areas where people do not have access to modern medicines [1, 2]. Moreover in most Asian countries where herbal medicines are still heavily relied upon because of high cost of chemotherapeutic drugs, there is a need for scientific research to determine the biological activities of medicinal plants. The findings obtained from such research may lead to the validation of traditionally used medicinally important plants and enable full usage of the properties of these plants [3].

Moringa oleifera is one of the best known, widely distributed and grown species of a monogeneric family Moringaceae [4]. It is a drought-tolerant plant that thrives best under the tropical climate and tolerates different soil types [5]. The plant is highly valued since almost every part of the plant (leaves, roots, barks, fruits, flowers etc.) is used as food with high nutritional value [4, 6]. In addition the plant has been reported to possess antibacterial properties and this explains the reasons for its wide use in the treatment of human diseases [4, 7]. *Moringa oleifera* is used as drug by many ayurvedic practitioners for the treatment of asthma and the antihelminthic activity of the methanol extract of *Moringa oleifera* was also noted [8]. Various parts of the plants such as leaves , roots, seeds, barks, fruits, flowers and immature pods act as cardiac and circulatory stimulants, possess antipyretic, antiepileptic, anti-inflammatory and antiulcer [9]. Other important properties of the plant include antispasmodic [10], diuretic [11], antihypertensive[12], cholesterol lowering[13], antioxidant, ant-diabetic, hepatoprotective [14], antibacterial and antifungal activities[15].

Moringa oleifera are contains more than 92 nutrients & 46 types of antioxidants. Moringa is said to cure about three hundred diseases and almost have all the vitamins found in fruits & vegetable even in larger proportions. [16]. Moringa has vitamin A (Beta carotene), vitamin B_1 (Thiamine), vitamin B_2 (Riboflavin), vitamin B_3 (Niacin), Vitamin B_6 (Phyrodixine), vitamin B_7 (Biotin), vitamin C (Ascrobic ucids), vitamin D (Cholecalciferol), vitamin E (Tocopherol) and vitamin K [16].
Phytochemicals are chemical compounds that are naturally found in plant. They are responsible for the color and organoleptic properties of the plant [17]. It is also referred to as those chemicals that may have biological significance but are not established as essential nutrients in plant. Phytochemicals could be available as a dietary supplement, but the potential health benefits of phytochemicals are derived from consumption of the whole plant [18].
Although many works are done by different scholars on metal analysis in Moringa no research has done on phytochemical constituents and physicochemical properties of Moringa oleifera in Ethiopia.

The objectives of this study were

- ✓ To investigate chemical composition and physicochemical properties of the crude extract of Moringa Oleifera.
- ✓ To conduct preliminary phytochemical screening on Moringa crude extract
- ✓ To extract the leaf by soxhlet extraction
- ✓ To study physicochemical properties of crude extract. .

2. Medicinal plants

Medical plants are of great importance to the health of individuals and communities. The medicinal value of these plants lies in some chemical substances that produce a definite physiological action on the human body. The most important of these bioactive constituents of plants are alkaloids, tannins, flavondoids, and phenolic compounds [19]. Many of these indigenous medicinal plants are used as spices and food plants. They are also sometimes added to foods meant for pregnant and nursing mothers for medicinal purposes [20,21]. Traditional knowledge of medicinal plants has always guided the search for new-cures. In spite of the advent of modern high through out drug discovery and screening techniques. Traditional knowledge systems have given clues to the discovery of valuable drugs [22].
Traditional medicinal plants are often cheaper, locally available and easily consumable, raw or as simple medicinal practices form an integral part of complementary or alternative medicines. Although their efficacy and mechanism of action have not been tested scientifically in most cases, these simple medicinal preparations often mediate beneficial responses due to their active chemical constituents [23].

Traditional medicines are used by about 60 per cent of the world population. The nursery for the introduction of food, crop and medicinal plants was created in 1823. And before the introduction of chemical medicines, man relied the healing properties of medicinal plants. Medicinal plants have been indentified and used through out human history in this case medicinal plants are of great importance to the health of individuals and communities [24].
The importance of medicinal plants, are extremely useful for us on the one hand they provide us with the oxygen we need to be able to breathe for edible landscaping, a moringa tree is hard to beat. Moringa plants produce special substances in their roots, leaves, flowers or seeds that help them to survive and healing with medicinal plants old as mankind itself.
Moringa oleifera is considered to be effective in the treatment of many diseases [25]. It is an exceptionally nutritious vegetable tree with a variety of potential uses. The tree itself is rather slender, with dropping branches. It is often cut back annually to one meter or less and allowed to re-grow so that its pods and leaves remain within arm's reach.

Moringa tree is mainly grown in the semi-arid tropical and sub-tropical areas. It grows best in dry sandy soil and can tolerate any other type of soil. It is a fast growing drought resistant tree that is native to the Southern foothills of Himalayans in Northern India. It is considered as one of the world's most useful tree, as almost every part of the plant could be used for food or has some other beneficial properties [26]. In the tropics, it is used as forage for livestock and in many countries as vegetables that has the potential to improve nutrition, boost food security, foster rural development and support sustainable land care.

2.1. Moringa and it's medicinal usage

Moringa medicinal plants are used in the treatment of AIDS, high blood pressure, anemia and etc. The history of medicinal plants can trace it self back 4,000 years ago and an attempt to review the prevalence of medicinal herb use in different societies and the various line. The Global and national markets for medicinal herbs have been growing rapidly and significant economic gains. Medical plants have been used from ancient times to attempt cures for diseases and to relive physical suffering and healing with medicinal plants old as man kind it self.
Amorphophallus paeoniifolius is used long period in various chronic diseases therapeutically and these practices also play an important role in protection natural resources of medicinal plants for systainable use. Moringa is a genus of the tropical flowering plant family moringaceae containing 13 diverses species [24]. Crushed seeds of the moringa oleifera tree have been used traditionally as natural flocculant to clarify [28].

Free radicals, produced as a result of normal biochemical reactions in the body, are implicated in contributing to cancer, atherosclerosis, aging, immunosuppression, inflammation, ischemic heart diseases, diabetes, hair loss and neurodegenerative disorders such as Alzheimer's disease and parkinson's disease ([28,29,30].
The human body possesses innate defence mechanisms to counter free radicals in the form of enzymes such as superoxides dismutate, catalose, and glutathione peroxidase. Vitamin C, vitamin E, selenium, B – carotene, lycopene, lutein and other carotenoids have been used as supplementary antioxidants. A part from these, plant secondary metabolites such as flavonoids and terpeniods play important role in the defence against free radical [23,31,32]. Medicinal plants parts are commonly rich in phenolic compounds such as flavonoids, stillbenes, tannis, coumarins, lignans and lignins [33,34]. There have been several studies on the antioxidant activities of various herbs/ plants with medicinal values.
Phytochemicals in fruits, vegetable, spices and traditional gerbul medicinal plants have been found to play protective role against many human chronic diseases including cancer and cardio vascular disease (CVD). Phytocomponents including phenolics, flavonoids, tannis proanthocyanidins and various plants or herbal extracts have been reported to be radical scavengers and inhibitors of lipid peroxidation [35].
When Phytochemicals compounds react with a free radical, it is the delocalization of the guined electron over the phenolic antioxidant and the aromatic nucleus that prevents the continuation of the free radical chain reaction. This is often called "Radical scavenging". But polyphenolic compounds inhibit oxidation through a variety of mechanisms [36].
The plant possesses valuable medicinal properties but most of the advantages are still confined to tribal areas because of raw knowledge and absence of proper scientific standardization. For the useful application of the plant parts in modern medicine, Physico-chemical and phytochemical standardization is very important [37]. So that the medical benefits of the plant may be used properly and scientifically and reach to the larger populations to the world. Therefore, in the present research work was to evaluate the physicochemical parameters and phytochemical constituents of the whole plant of moringa oleifera.

Medicinal plants have been a major source of treatment for human diseases since time immemorial. One fourth of the world population i.e. 1.42 billion people are dependent on traditional medicines, particularly plant drug for curing aliments [38]. Herbal medicines are promising choice over modern synthetic drugs. They show minimum/ no side effects and are considered to be safe. Generally herbal formulations involve the use of fresh or dried plant parts. Correct knowledge of such crude drugs is very important aspect in preparation, safety and efficacy of the herbal product. The process of standardization can be achieved by stepwise pharamacognostic studies [39].

2.2. Vitamin component of moringa oleifera

Moringa aleifera: contains more than 92 nutrients and 46 types of antioxidants. moringa is said cure about three hundred diseases and almost have all the vitamins found in fruits and vegetables. Vitamins that are found in moringa are, vitamin A (Beta carotene), vitamin B_1 (thiamine), vitamin B_2 (Riboflavin), vitamin B_3 (Naiacin), Vitamin B_6 (pyrodixine), vitamin B_7 (Biotin), vitamin C (ascorbic acids), vitamin D (cholecalciferol), vitamin E (tocopherol) and vitamin K [16] **.** With all the health benefits of this miracle herb, it can easily be termed as the most nutritious herb on earth. There are no side effects which also has tried, tested documented and proved evidence to support the same. It can be consumed by small children and adults. Today, millions world over have started using Moringa based products in porridge, pastas, bread and to reap the everlasting health benefits of the extraordinary "Moringa" herb [15]. Moringa leaves contain all the essential amino acids to build strong healthy bodies. Example of some few nutritional value of Moringa: 2 times – the protein of yogurt ,3 times – the potassium of Bananas ,4 times – the calcium of milk ,4 times – the vitamin A of carrots and 7 times of – the vitamin C of oranges.

2.3. Phytochemical constituents and their specific advantage

Tannins are a group of polymeric phenolic compounds and cause local tumours [40]. They are able to inactivate and kill microorganisms. They used in the treatment of varicose ulcers, hemorrhoids, minor burns, frostbite as well as influmantation of gums, in recent years, these compounds have demonstrated their antiviral diseases including AIDS [41].

Flavonoids are strong antioxidants and are effective antibacterial substances *in vitro* against a large number of microorganisms by inhibition of the membrane-bound enzymes [41]. They also showed substantial anticarcinogenic and antimutagenic activities due to their antioxidant and anti-inflammatory properties [42,43]

and also they are an important class of natural products, are the main bioactive constituents of a lot of medicinal or dietary plants, they have been reported to show extensive benefits to human health, including antioxidant, anti-inflammatory, and anti-cancer activities in most cases, Flavonoids are present in plants as a series of analogues with similar structures and physicochemical properties.

Coumarins: is a fragrant organic chemical compound in the benzopyrone chemical class, which is a colorless crystalline substance in its standard state. It is a natural substance found in many plants. These derivatives are found in antibiotic, anti-mitotic, immunomodulating, antiviral, anticancer, anti-inflammatory, anti-coagulant, anti-fungulant, antifungal, antioxidant and cytotoxic agents, as well as some biological assays.
Alkaloids are group of naturally occurring chemical compounds that contain mostly basic nitrogen atoms. This group also includes some related compounds with neutral and even weakly acidic properties. Some synthetic compounds of similar structure are also attributed to alkaloids. In addition to carbon, hydrogen and nitrogen, alkaloids may also contain oxygen, sulfur and more rarely other elements such as chlorine, bromine, and phosphorus. The boundary between alkaloids and other nitrogen-containing natural compounds is not clear-cut. Compounds like amino acid peptides, proteins, nucleotides, nucleic acid, amines, and antibiotics are usually not called alkaloids. Natural compounds containing nitrogen in the exocyclic position (mescaline,serotonin, dopamine, etc.) are usually attributed to amines rather than alkaloids. Some authors, however, consider alkaloids a special case of amines. [44].
The leaves of *M. oleifera* contain alkaloids, which showed potential antimicrobial properties by intercalating with bacterial DNA such as nicotine, are used in pesticides and others are used as chemicals reagents. The primary use of alkaloids, however, is in medicine, because they can act quickly on specific are as of the nervous system, strychnine, used in small does as a stimulant and a tonic, is highly poisonous. Alkaloids have also pharmacological effects and are used as local anesthetic and stimulants. Cocaine, caffeine, nicotine, the analgesic morphine , the anti-bacterial berberine and antimalarial drug quinine are all Alkaloids [44].
Quinine, is a natural white crystalline alkaloid having antipyretic (fever reducing), analgesic (painkilling), and anti-inflammatory properties and a bitter taste used in treating malaria, can cause dizziness if taken in large doses. Morphine and cocaine are among the most effective drugs known for temporarily relieving pain with out causing is their use is continued. And advantage over previous reaction detection methods for quinines is the simplicity of this system. No pot column reagent addition pumps are required. Additionally, the reaction is accomplished in a very short reactor which minimizes band broadening and analysis time.
Steroids are drugs that are structurally related to the cyclic steroid ring system and have similar effects to testosterone in the body. They increase protein within cells, especially in skeletal muscles. Anabolic steroids also have androgenic and virilizing properties, including the development and maintenance of masculine characteristics such as the growth of the vocal cords, testicles (primary sexual characteristics) and body hair (secondary sexual characteristics) [46].
Phenolic unit can be found dimerized or further polymerized, creating a new class of polyphenol, for example, ellagic acid is a dimer of gallic acid and forms the class of ellagitannins, or a catechin and a gallocatechin can combine to form the red compound the a flavin, a process that also results in the large class of brown thearubigins in tea.
Saponins : Any of a class of glycosides, found widely in plants, that have detergent properties and form a lather when shaken with water. which are stable both in alkaline and acidic media. Color reaction can be used to characterize saponins (and sapogenins) in order to verify the identity of drugs. Possess antioxidant, anti-inflammatory, antiapoptosis and immunostimulant properties which were found in *M. oleifera* [47].

Anthraquinones are a group of naturally occurring phenolic compounds and are present in *M. oleifera* leaves which showed laxative properties.
Terpenoids and steroids were detected in *M. oleifera* which were reported tom be active against *Staphylococcus aureus* [41]. These compounds also have anticarcinogenic properties [45].

3. MATERIALS AND METHODS

This chapter starts by presenting and discussing about the study area, experimental site and sampling procedure. It also goes through the detailed methodology followed in the experiment such as experimental procedure, materials and reagents used and method of data analysis. Finally, it winds up by specifying the analytical method, and software used.

3.1. Chemicals and reagents

Analytical grade reagents; Acetic acid, ethanol, ammonium hydroxide, $FeCl_3$, HCl, potassium ferrocyanide, aqueous ethanol, diethyl ether, aqueous sodium chloride, aqueous methanol, acetic anhydride, ethanolic acid, H_2SO_4, chloroform, concentrated H_2SO_4, glacial acetic acid, ferric chloride, and aqueous hydrochloric acid, potassium hydroxide, HNO_3, Phenophthalein, mayer's reagent (potassium mercuric Iodide), and sodum hydroxide.

3.1. Experimental site

Moringa oleifera sample was collected from Bule Hora which is located in Oromia National Regional state 467 km far from Addis Ababa to the south. And also 100 km far from north of yabello, the Administrative city of Borana zone with latitudes 5^0 $26^{'}$ and 5^0 $50^{'}$ North and longitudes $37^0 56^{'}$ and $38^0 31^{'}$.

3.2. Equipments and apparatus

The following apparatus were used in the study: Beaker, plastic bottle, volumetric flask, test tube, conical flask, separatory funnel, oven, whatman filter paper No 42 (125mm), soxhlet extractor, electronic balance, P^H meter, burette, metal stand, pipette, measuring cylinder, condenser, magnetic stirrer, hot plate, moisture disc, crucible, muffle furnace (Nabertherm), mortar and pestle.

3.3. Sample collection and preparation

Plant was collected, washed and dried. Then it was grounded using mortar and pestle to fine powder and passed through a 24-mesh sieve and the extract is weighted and stored at room temperature.

3.4. Preparation of extracts

Dried powder of different plant parts was continuously refluxed with methanol and ethanol separately at 40-80^0C for 3 h using soxhlet apparatus. The solvent extract was then stored in air-tight containers at 4^0C for further use.

3.5. Physicochemical properties investigations

Whole plant powder of moringa oleifera were subjected for determination of physicochemical parameters such as loss an drying, ash values, P^H value in 1% and 10 % solution, ethanol and methanol extractive values were carried out according to the methods recommended by the world health organization [48].

3.5.1. Determination of PH range

The P^H of different formulations in 1% w/v (1g; 100 ml) and 10 % w/v (10 g; 100ml) of water soluble portions of whole plant powder of Moringa oleifera were determined using standard simple glass electrode PH meter [49].

3.5.2. Determination of moisture content

This step was done by placing about 1.0 g of whole plant powder of the moringa oleifera, in an accurately weighed moisture disc (Electranic measurement scale- mettler Toledo). For estimation of loss on drying, it was dried at 105 ^{0}C for 3 hour in an oven, cooled in a desicator for 30 minutes and weighed with out delay. The loss of weight was calculated as the content of in percent of air-dried material.

3.5.3. Solubility

Solubility of the extract was checked by simply by dissolving the sample in water, chloroform, ethanol & Diethyl ethyl ether.

3.5.4. Determination of refractive index

Refractive index was measured by using Refractometer.

3.5.5. Determination of total ash

2 grams of the whole plant powder of the moringa oleifera, was placed in a previously ignited (350 ^{0}C for 1 hour) and tarred crucible accurately weighed. Dried material was spread in an even layer in the crucible and the material ignited by gradually increasing the heat to 550 ^{0}C for 5 hours in a maffle furnace (Naber them) until it is white, indicating the absence of carbon. Cooled in a desiccator and weighed. Total ash content was calculated in mg per g of air-dried material.

3.5.6. Determination of saponifivation value

Saponification value was determined by mixing 1.5 g sample with 25 ml of 0.1 N ethanoic acid and KOH by gently stiring and then 3 drop of phenolphthalein indicator was added. And Titration 0.5M HCl was continued until pink color is disapperared.

Saponification value = 56.1 x N (V_b-V_a) /M

Where, N= normality of HCl soln., vb = volume of HCl soln. used in blank, va = volume of HCl used in sample, M= mass of the oil used.

3.5.7. Determination of acid value

Take 25 ml of diethyl ether or 25 ml of ethanol and add 3 drop of phenolphthalein then Titrated with 0.1 N KOH (end point dark pink color) volume of 0.1 N KOH will be noted

Acid value = 56.1xNxV/M

Where N= normality of KOH, M = mass of the oil used v= volume of 0.1 N KOH used for titration.

3.6. Preliminary phytochemical screening

The analysis of phytochemicals from the solvent free extract of *Moringa oleifera* was individually performed using different qualitative tests for alkaloids, flavonoids, saponins, tannins, sterodglycosides, phenolic compound, coumarins, protein, anthraquinones, quinines, fixed oil & fats.

3.6.1. Determination of phenolic compounds

Three drops of 1% ferric chloride ($FeCl_3$) solution were added in to 2 ml portions of each extract. The appearance of deep violet color with ferric ions indicates the presence of Phenolic compounds.

3.6.2. Determination coumarins

Coumarins form a yellow color with 1 % KOH in absolute ethanol. 1 ml of portions of 1% solutions of each in test tubes was treated with 3-4 drops of 1% KOH in absolute ethanol.

3.6.3. Determination of Alkaloids

Mayer's test: 1 ml portions of each extracts was acidified with 3 drops of 1M Hydrochloric acid and treated with 5 drops of Mayer's regent (potassium mercuric Iodide) formation of a yellow or white colored precipitate or turbidity indicated the presence of Alkaloids.

3.6.4. Detection of Quinines

To the test sample, sodium hydroxide is added. Formation of blue, green or red color indicates the presence of quinines.

3.6.5. Detection of protein

Xanthoproteic Test-the extracts were treated with few drops of conc. Nitric acid. Formation of yellow color indicates the presence of proteins.

3.6.6. Detection of Anthraquinone

For examining the Anthraquinone derivatives prepare a specimen in potassium hydroxide solution, Anthraquinone give blood red color.

3.6.7. Detection saponins

Foam Test: 0.5g of extract was shaken with 2 ml of water. If foam produced persists for ten minutes it indicates the presence of saponins.

3.6.8. Detection of Fixed oils and Fats

Spot Test: A drop of concentrated extract was pressed in between two filter papers and kept undisturbed. Oil stain on the paper indicates the presence of oils and fats.

3.6.9. Test for steroids

Two ml of acetic anhydride was added to 0.5 g ethanolic extract of each sample with 2 ml H_2SO_4. The colour changed from violet to blue or green in some samples indicating the presence of steroids.

3.6.10. Test for flavonoids

To 1 ml of the extract, a few drops of dilute sodium hydroxide were added. An intense yellow colour was produced in the plant extract, which become colourless on addition of a few drops of dilute acid indicates the presence of flavonoids.

3.6.11. Determination of Tannins

Ferric chloride Test-A small quantity of the extract was boiled with water and filtered. Two drops of ferric chloride was added to the filtrate, formation of a blue- black, or green blackish color in the presence of ferric chloride precipitate was taken as evidence for the presence of tannins.

4. RESULT AND DISCUSION

The average physicochemical parameters of the whole plant of moringa oleifera course powder are tabulated as table No.1 and the preliminary phytochemical screening for various functions group is tabulated as table No.2

Table 1: physico-chemical parameters of moringa oleifera

Parameters	Whole plant of Moringa oleifera	
Moisture content	0.032%	
Total ash value	96 %	
PH of 1% w/v formulation solution	6.5	
Saponification value	37.4	
Refractive index		
Ethanol extract refractive index	17	
Methanol extract refractive index	7	
Acid value	3.94	
solubility		
	Insoluble	chloroform
	Soluble	Water
		Ethanol
		Diethyl Ether

Table 2: phytochemical screening for ethanol and methanol extracts of Moringa oleifera

Components	Ethanol extracts	Methanol extracts
Phenolic compound	+++	+++
Quinine	++	++
Protein	-	-
Anthraquinone	-	-
Saponins	++	+
Flavonoids	+++	+++
Coumarins	++	++
Tannin	+++	+++
Fixed oil and fats	+	+
Steroid-glycosides	+++	+++
Alkaloids	++	++

+++= appreciable amount, ++ = average amount, + = trace amount, - = absent

Plant products including phelolic, quinines, saponins, Flavonoids, coumarins, tannin, steroids and Alkaloids are found in the sample. Fats and oil was found in a small amount but anthraquinones and protein were detected. So the presences of these phytochemical constituents promote rapid healing and the formation of new tissues as discussed below.

The results of the phytochemical analyses showed that Flavonoids were more in quantity than the other phytochemicals tested. Flavonoids, according to the research by may modify allergens, viruses and carcinogens thereby acting like a biological response modifier and acting on bacteria by inhibiting its protein synthesis. Also, *in vitro* studies showed that flavonoids could also posses anti-microbial [47], anti-allergic and anti-inflammatory properties [50].

Phytochemicals such as Coumarins, Saponins, Quinine and alkaloids were found to be moderate in concentration. Steroids are used in the stimulation of bone marrow and growth. It stimulates lean body mass and also play vital roles in the prevention of bone loss in elderly men [51].
Phytochemicals such as tannins, saponins, and Steroid-glycosides were found to be relatively low in concentration. Tannins could be an effective ameliorative agent of the kidney [52]. Tannins have also shown to be potential anti-viral, anti-bacterial and anti-parasitic agents [17]. Saponins are used as an adjuvant in the production of vaccines.

5. CONCLUSION AND RECOMMENDATIONS

5.1. Conclusion

As there is not enough evidence for detailed physicochemical and phytochemical evaluation on whole plant of Moringa oleifera is reported. Therefore present work is taken up in the view to completely standardize the herb in accordance to parameters of world health organization (WHO) Guidelines and standard laboratory procedures. In the present study whole plant of Moringa oleifera was thoroughly investigated for their physicochemical characters and major active constituents to analyze their quality, safety and standardization for their safe use. The generated information of the present study will provide data which is helpful in the correct identification and authentication of this medicinal plant.
The leaf of *Moringa oleifera* has been known to be used in the treatment of dental caries, common cold, Fever, Diarrhea, flatulence and Edema. There is an increasing awareness that many components of traditional medicine are beneficial while others are harmful, hence WHO encourages and supports countries to identify and provide safe and effective remedies for use in the public and private health services [53]. The present study showed that the leaf of *Moringa oleifera* have pharmacologically important chemical compounds such as Carbohydrates, Saponins, Tannins, Steroids, Flavonoids, Coumarins ,Quinine, phenolic compound and Alkaloids.

5.1. Recommendations

The following recommendations are made in order to benefit those who need to intervene with the result of the study under consideration.

Further study should be conducted in

- ✓ anti-oxidant activities of Moringa oleifera
- ✓ anti-helm antic activities

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