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Nutritional status of *Moringa oleifera* (Lam) with reference of Phytochemical, Biochemical, Antioxidant activity their Application -A Review

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Abstract :
Moringa oleifera (L.) is one most nutritious plant . that use in different types of drugs preparation. In this investigation we have view the different author reported the different property of this plant such as Phytochemical content , biochemistry, hypersterolemia, hypolipidemic ,amino acid, protein, lipid, carbohydrate vitamins , separation of biochemical by chromatography HPLC and TLC. We have to also see that the different types element are present essential for human growth and development such Nitrogen, Calcium, Phosphorous, Magnesium, Iron, Copper, iron etc. the number of uses so this plant called golden tree and number of report available Antimicrobial, Antifungal, Antibacterial, anti-inflammatory, anthelminthic ,anticancer activity, Free scavenging activity. Its used as food source , and number industry raw material food industry .There number have reported that application of moringa plants in human life such as used to food, used cure disease, food product preparation, medicine preparation . It is popularly called, has been found useful both medicinally and economically. In a plants different chemical component contained in different plants root, stem ,leaf ,fruits and seeds. The Moringa plant is one important nutritious plant in sense of biochemicals , growth nutrients ,vitamins enzyme and their different biological property. Its intensive importance so it's a part of food in some Asian country its pods eating as vegetable due to its nutritive value

Keywords : Moringa plant, nutritious, Biochemicals, antimicrobial, antifungal, antioxidant and application

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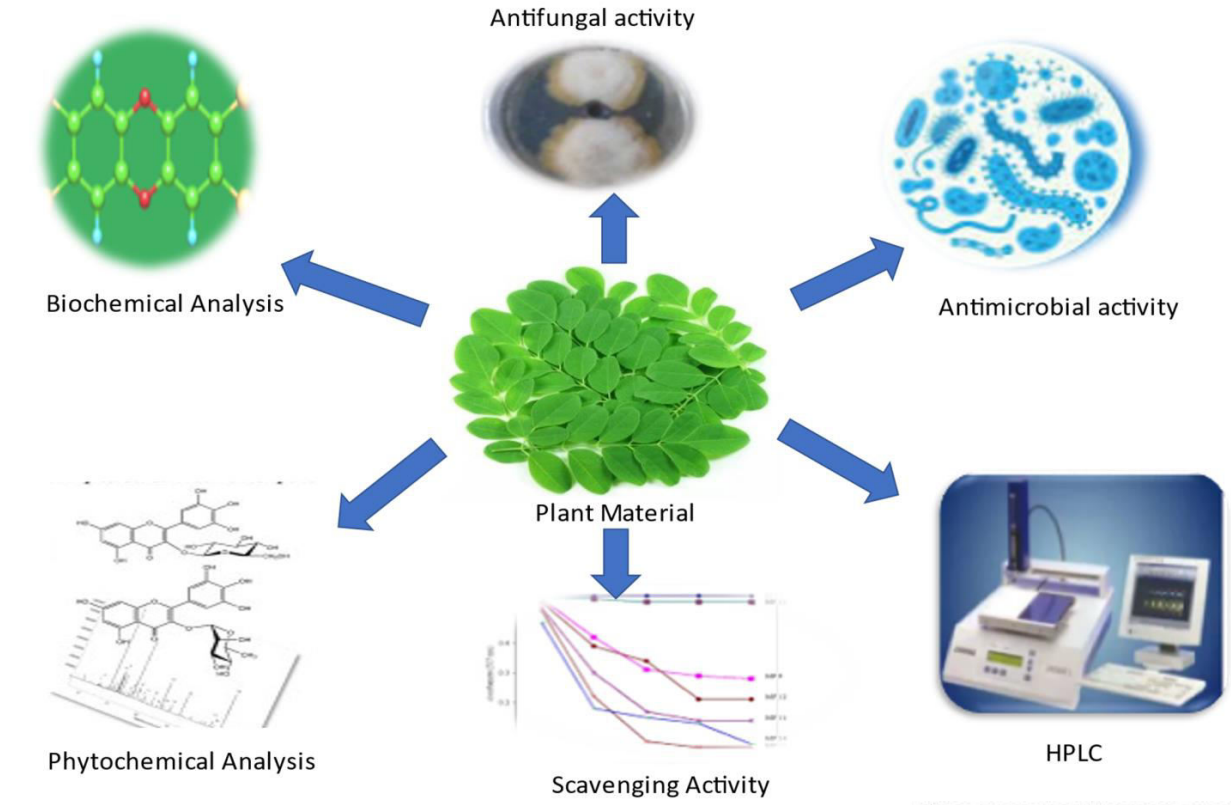
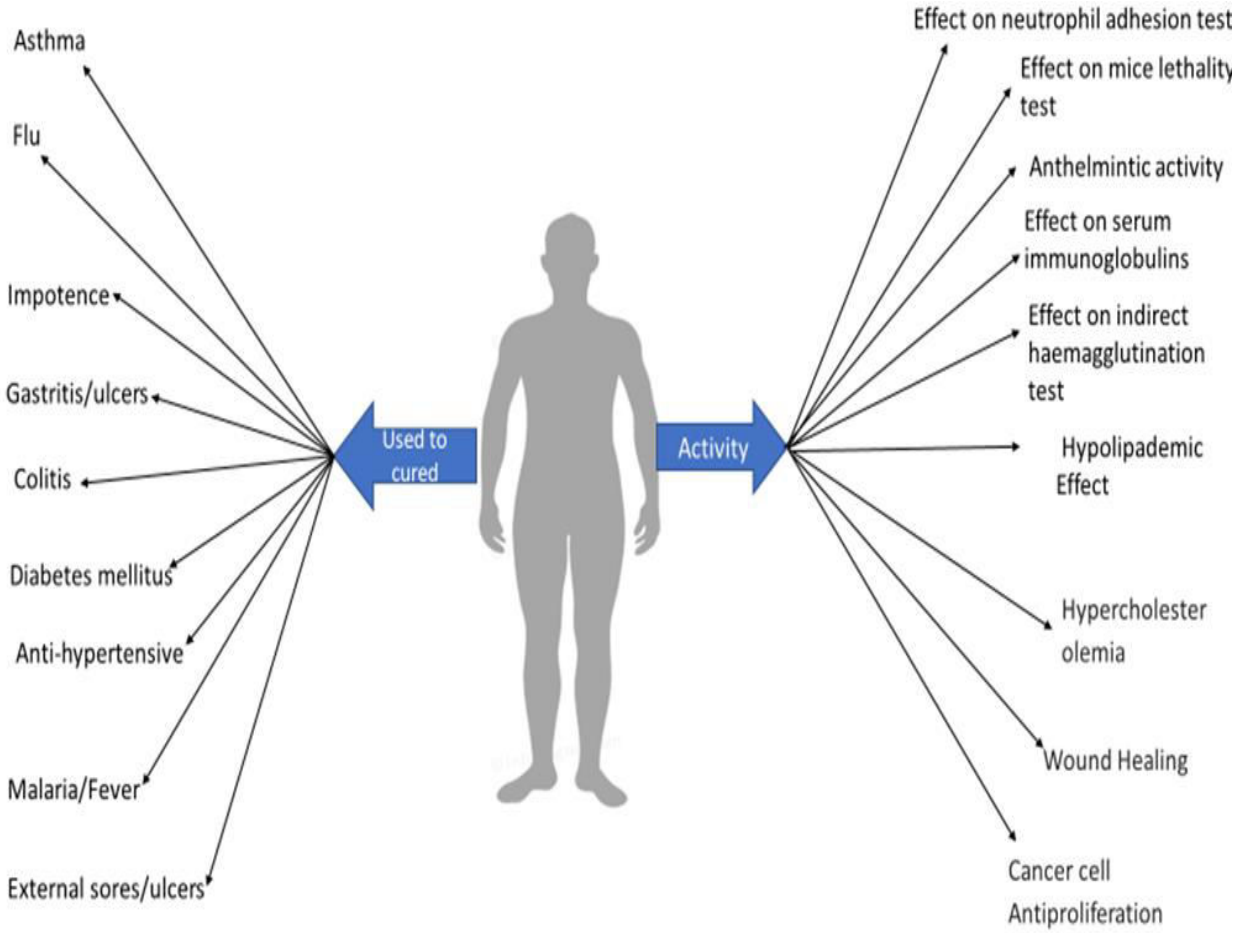
Graphical Abstract :





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Introduction :

Moringa oleifera Lam is a medicinally essential tree that containing the number of benefits chemical composition indicates that it is more nutritious than other plants due too their nutritive profile such as the mineral, vitamin, protein, and carbohydrate rich, It is indigenous to the sub-Himalayan region of India, Pakistan, and Afghanistan, as well as Africa, Arabia, South Asia, South America, it also found in himalayan region, pacific region , and the caribbeanislands.*Moringa oleifera* on the basis of their used and its structure is different names such as the as horseradish tree, drumstick tree, ben oil tree, miracle tree, and Mother's greatest friend, has become a naturalised species in many tropical and subtropical places across the world [28] . *Moringa oleifera* is often known as the "miracle tree" or "wonder tree"[5]. From ancient time plants are the useful of human life since the beginning of time, plants have always been significant to mankind, regardless of age or place[61].The moringa tree, also known as the elephant leg tree, is a type of tropical deciduous tree that belongs to a new generation of high-nutritional high-value crops. Moringa trees grow faster, taking about a year and a half to complete the nursery, planting, forest, flowering, and fruiting process[8] *Moringa oleifera* (Moringaceae) is a plant native to the Indian subcontinent. It has become diffused and spread throughout the world's tropical and temperate areas, where it is known by a number of vernacular names; in Tamil, it is known as Murungai[43]. *Moringa oleifera* Lam., also known as “Zogale” and “Gergedi” in Hausa and Igala languages of Nigeria, and drumstick in English, is a plant used as a food and in folkloric medicine in Nigeria and elsewhere[11].Plants have been used as dietary supplements and traditional remedies for a range of ailments for millennia all throughout the world. Herbal medicine is one of the oldest forms of treatment for a wide range of disorders, and it has a sizable following for obvious reasons such as cost effectiveness, accessibility, and compatibility with people's sociocultural lives [62].Different chemical components are found in the roots, stems, leaves, fruits, and seeds of different plants. So there is a growing interest in chemical composition in plant-based therapy now days. Plants featured a variety of bioactive chemicals as well as pharmacological activities. Plants have ability to produced different types of

chemicals is consider as phytochemicals it may be primary metabolites , may be secondary metabolites , *Moringa oleifera* is an angiosperm plant native to the Indian subcontinent, where its various parts have been used as food and medicine throughout history, Now a days moringa can be cultivated all tropical and sub-tropical regions of the planet. The nutritional, preventive, and medicinal properties of this plant are being praised on the Internet. Dietary consumption is encouraged as a strategy for maintaining personal health and self-medication in a variety of disorders [3].*Moringa oleifera* is a high-nutritional plant that has been utilised in folkloric medicine to treat a variety of ailments and provide socio-economic benefits[44].De-hulled seed (kernel) has a 42 percent oil content. The oil is a bright yellow colour. Because it has a low tendency to decay and become rancid and sticky, it is used as a lubricant for fine machinery such as watches. It can also be used as a vegetable cooking oil.Because of its ability to absorb and hold volatile chemicals, the oil is useful in the perfume business for smell stabilisation. The quantity of free fatty acids ranges from 0.5 to 3% [51].Nutritional status particularly for moringa leaf powder is maintained according to the standard code and the well inspect off the product good quality and sanitary and healthy practices are done for that more clinical study to gain more values and importance at international level of moringa can gain done by different community in the world [6] .We are familiar to Ayurveda number of plants are used as medicinally and clinical purpose , moringa is one of the plant that having many of the uses for the mankind inn india, Different study has been reported the *Moringa oleifera* has been used in number of disorder and diseases like a Chronic stress that can be reduced by giving the treatment of *Moringa oleifera*by inducing lipid peroxidation has been measured by the levels of malondialdehyde (MDA) in brain [34]. Moringa is one of the tree which growing faster and nutritious for the food purpose and its also cultivated as the source of economy ,This plant can be cultivated in any season like as the it can cultivated in rainy season, winter season or may be summer season also can do cultivation .In most of the part of world it can cultivated for the commercial purpose for their leaf due to their nutritional value has been reported in Nigeria .Due to all this nutritive character and clinical studies of moringa has been accepted as the food

supplement source by the some international scientific community, Moringa is a evergreen tree that grow up to height 10-12 meter and trunk have diameter 45 cm. Moringa oleifera is shown in scientific division to become from Kingdom: Plantae, Division: Magnoliophyta, Class: Magnoliopsida, Order: Brassicales, Family: Moringaceae, Genus: Moringa, Species: *Moringa oleifera*[77].Moringa is one the angiospermic plant which are being native to there origin is Indian subcontinent there are number of report are available that revealed that all parts of plant that being utilized that may be root , stem, leaf as purpose of the medicine Now days its cultivated in tropic and subtropics of the different parts of the country It very useful to curing disease due to its useful property like therapeutic, nutritional has been dominated in the most of plants Moringa composed of the different dietary fibres that are important in the health benefits improving immunity that can be preserved for long time there are number of evidence of there clinical evidence [3].Moringa is classified morphologically into root, stem, and leaf. The plant has a tap root system and grows best in black soil. The leaves are reticulate venation with compound leaf with alternate phyllotaxy, each leaf having a length of 7-60 cm and a green colour. The flowers are bisexual pentamerous white colour zygomorphic, and the fruits are capsule type with a size of 10-60 cm. that is known as pod type of fruit that pod is look like drumstick hence it is also known as drumstick plant .Its generally grown in month of April and June [9].*Moringa oleifera*has a wide range of characteristics and morphological variability, which could be used to improve the plant. Natural and cultivated accessions have a lot of genetic diversity, but there is currently no collection of cultivated and wild accessions[14].*Moringa oleifera* is a plant In various regions of the world, it is utilised as a folk medicine. [2]. Moringa helps in increasing breast in milk in breast feeding months .one tea spoon of moringa powder provide 14 % protein ,40 % calcium 23% iron and most of vitamin .The moringa seeds yield 38-40 % edible oil [15] *Moringa oleifera* has been reported as the it can be beneficial for the have the property like a chemo preventive and therapeutic effect on cancer and other oxidative damage-related diseases. Alkaloids, which are nitrogen-containing naturally occurring compounds that have antibacterial capabilities due to their capacity to intercalate with microbe DNA,

are also discovered in *M. oleifera* leaves. Glucosinolates are found in *Moringa stenopetala* [11].Due to tis nutritional property there are number of the people around the world have used this plant as a source of food, and some information has been reported that the leaves of *Moringa oleifera* have chemical and nutritional features that we have define in terms of chemical composition and protein [2].*Moringa oleifera* Lam (Moringaceae) is a valuable plant found in many tropical and subtropical areas. It's a popular nutritional herb with some interesting pharmacological properties. [89].It was reported that the medicinal plants have benefits in the local population in Uganda and Screening of the phytochemical present. Leaves are administered as powder at health benefits in different parts of the Senegal and Benin to treat malnutrition and another problem related to the health issue in children. [5].There are many benefits of *M. oleifera*but they may be leads to the problemslike overexploitation, posing a threat to natural variety in the near future. As a result, for ethnobotanical, medicinal, nutraceutical, and biodiversity considerations, the species must be protected[11].Moringa has a higher nutritional value. In some tribal areas, daily food sources have been utilised in food since ancient times, and in some parts of the world, they are employed in the treatment of certain disorders and diseases in humans, such as hypercholesterolemia and hyperglycemia. Active components can be found in any part of the plant, including the bark, leaves, flowers, roots, fruits, and seeds.The chemical makeup of plant-based medications is gaining popularity these days. Several bioactive components have been identified and pharmacological actions has been reported [10]

Biochemical Compound :

Moringa shows high nutrition in nature due its biochemical composition, There are one report available that's indicates that the leaf flour contained 28.7% crude protein, 7.1% fat, 10.9% ashes, 44.4% carbohydrate and 3.0mg calcium and 103.1mg iron per 100 g. The protein profile revealed levels of 3.1% albumin, 0.3% globulins, 2.2% prolamin, 3.5% glutelin and 70.1% insoluble proteins has been reported by various author .There are different agent are used to the to hydrolysed the sample Sodium dodecyl sulphate (SDS) and 2-mercaptoethanol (ME) which are used for the protein analysis the protein from leaf flour, yielding 39.5 percent and 29.5 percent, has

been reported . In vitro digestibility of the total protein was poor 31.8 percent . Tannins 20.7 mg , trypsin inhibitor 1.45TIU mg , nitrate 17 mg and oxalic acid 10.5 mg were the antinutritional compounds evaluated has been reported , in addition to the lack of cyanogenic chemicals With quantities of 161.0 and 47.0 g leaf, respectively, -carotene and lutein stood out as the primary carotenoids. Even following heat treatment and chemical attack, the crude protein in *M. oleifera* leaves is mainly insoluble and has limited in vitro digestibility. To better assess the utility of this product, in vivo studies are required[2] .Carotenoid major compound has been reported and the role in the secondary metabolism are observed in the most of plant parts of the moringa [31] [7].Phytochemicals are chemicals produced by plants in the purest sense of the term. However, the term is commonly used to refer to only those chemicals that may have an effect on human health or on plant flavour, texture, fragrance, or colour, but are not required by humans as necessary nutrients, It was the reported that the phytochemicals of *Moringa* species allows researchers to look at a variety of unusual compounds has been present has been observed by number documentation . This plant family is particularly rich in compounds containing the simple sugar rhamnose, as well as a group of chemicals known as glucosinolates and isothiocyanates [8].

Cholesterol, Brassica sterol, and methylene cholesterol are examples of chemical substances. Campesterol campestanol-campestanol-campestanol-campestanol-campestanol-campestanol-campStigmasterol Ergostadienol Cholesterol -sitosterol -avenasterol,-isoavenasterolStigmastanol -sitosterol -avenasterol,-isoavenasterolstigmastadienol. has been reported.*Moringa*dried leaves contained 30.3 percent crude protein and 19 amino acids has been reported . The amino acids with the highest content were alanine (3.033%), followed by cysteine (0.01%). Calcium had the greatest value of 3.65 percent followed by pottassium (1.5 percent) and phosphorus had the least value of 0.30 percent among the macro-elements has been documented . Fe(iron) had the highest value of 490 mg/kg among the micro-minerals, followed by Se(serine) with 3.63 mg/kg. Copper's value was the lowest, at 8.25 mg/kg. The dried Moringa leaves contained 17 fatty acids, with the highest value being -linolenic acid (44.57 percent), followed by heneicosanoic (14.41 percent), g-linolenic (0.20 percent), palmiteic (0.17 percent), and capric acid

(0.07 percent). With 77 mg/100, vitamin E had the highest concentration. while Beta-carotene had 18.5 mg/100 g. The fibre content been NDF, ADF, ADL and ADC of the leaves were 11.4, 8.49, 1.8 and 4.01 percent , respectively. Condensed tannins accounted for 3.2 percent of total polyphenols, while total polyphenols accounted for 2.02 percent. Moringa leaves were shown to possess nutritive chemicals, according to the study. As a result, Moringa leaves have the potential to be an effective source of supplemental protein in animal diets. This level of crude protein content is nutritionally significant because it may meet the protein and energy needs of animals while also boosting their immune systems has been documented [12].Except for steam blanching for 5 minutes, the protein content of the blanched *Moringa oleifera* leaves powder was in the range of 24.70 - 30.68 mg 100 g–1 dry mass in the 6 samples. The boil blanching sample had the highest protein content (30.68 mg 100 g–1 dry mass) [45].In the leaf methanolic extract, sixteen chemical components were reported is 9-octadecenoic acid (20.89%), L-(+)-ascorbic acid-2,6-dihexadecanoate (19.66%), 14–methyl-8-hexadecenal (8.11%), 4-hydroxyl-4-methyl-2-pentanone (7.01%), 3-ethyl-2, 4-dimethyl-pentane (6.14) N-(1-methylethyllidene)-benzene ethanamine (1.54%), 4, 8, 12, 16-tetramethylheptadecan-4-olide (2.77%), 3-5-bis(1-methylethyllidene)-benzene ethanamine (1, 1-dimethylethyl) -phenol (2.55%), 1-hexadecanol (1.23%), 3, 7, 11, 15-tetramethyl-2 hexadecene-1-ol (1.17%), hexadecanoic acid (2.03%), 1, 2, 3-propanetriyl ester-9 octadecenoic acid (2.03%) (1.23 percent). Oleic acid (84 percent), L-(+) - ascorbic acid- 2, 6-dihexadecanoate (9.80 percent), 9-octadecenoic acid (1.88 percent), methyl ester-hexadecanoic acid (1.31 percent), and 9-octadecenamide were found as chemical ingredients in methanolic seed extract (0.78 percent) has been documented various author [39].The young leaves are edible and can be cooked and eaten like spinach or added to soups and salads. Provitamin A, vitamins B and C, minerals (especially iron), and the sulphur-containing amino acids methionine and cystine are all abundant in them has been documented [51].Carotene content of *Moringa oleifera* leaf powder under the three blanching procedures. The -carotene concentration of unblanched *Moringa oleifera* leaf DM was 16.51 mg 100 g–1 dry mass, however it reduced significantly (p0.5) in dried samples regardless of blanching method. The

blanched *Moringa oleifera* leaf had a greater -carotene concentration (p0.05) than the unblanched samples [45] The Ministry of Agriculture's Food and Nutrition Unit recently identified Moringa (*Moringa oleifera*), a nutrient-rich local tree commonly known as drumstick and grown in several parts of Malawi, as a potential solution to vitamin A deficiency [50].When compared to the normal FAO protein, lysine, leucine, phenylalanine , tyrosine, and threonine were lacking in kernels, meal, and their water-extracted residues, although sulphur-containing amino acids were higher[51].The biochemical investigation revealed that *M. oleifera* leaves contain both -α and β -carotene, with β-carotene levels consistently greater. There was no direct correlation between the values obtained for α- and β -carotene. That is, samples with high β-carotene concentrations did not always have neither high nor low α--carotene concentrations. . The flavonoids quercetin and kaempferol were found in abundance in Moringa leaves, with quercetin being the most abundant of the two. Quercetin levels in the leaves varied from 1.62 to 0.066 percent, whereas kaemperol levels were lower, ranging from 0.673 to 0.054 percent has been reported [18]

Its leaves (weight per weight) contain four times the calcium of milk, seven times the vitamin C of oranges, three times the potassium of bananas, three times the iron of spinach, four times the vitamin A of carrots, and two times the protein of milk[46]. The number of report are available reveal that tannins, alkaloids, steroids, triterpenoids, flavonoids, hydroxy-anthraquinones, cardiac glycosides, saponins, and carbohydrates (glucose and fructose) have preferential solubility in a series of polarity-varying solvents. All of the extracts, however, tested negative for proteins, fixed oils, and fats. The active components of many medications are secondary metabolites present in plants, hence basic phytoinvestigations of the extracts for their primary phytocompounds are critical. The yield achieved from successive *M. sativa* leaf extracts. In this study employing petroleum ether, chloroform, ethanol, and water (aqueous), oleifera was found to be the most effective in the case of ethanol, followed by water, and In this case, petroleum ether and chloroform were used in that order has been reported [52]*Moringa* leaves contain 0.19 percent phenols, 0.42 percent alkaloids, and 8.22 percent tannins, according to a quantitative phytochemical examination. Saponins

have a content of 1.75 percent [19].The phytochemical examination of moringa reveals the presence of terpenoids and saponins in several extracts from diverse parts of the plant, including the root, stem, and leaf, as well as the absence of alkaloids [26].Sodium (Na), Potassium (K), Calcium (Ca), Magnesium (Mg), Zinc (Zn), Iron (Fe), Copper (Cu), Manganese (Mn), and Phosphorus (P) are all found in *Moringa oleifera*, with the exception of Lead (Pb). The largest amount of magnesium was found in *Moringa oleifera* sources during the study has been done on the Quantitative Analyses of Anti–nutrients found in *Moringa oleifera* were seen and assessed. During the investigation, the largest amount of magnesium was found in *Moringa oleifera* sources. Quantitative Analyses of Anti–nutrients found in *Moringa oleifera* were detected and measured in percentages (percent). M*oringa oleifera* was found to contain all of the anti-nutrients examined, with flavonoid accounting for the greatest percentage component, while saponin was not found. It depicts the approximate percentage (%) of nutritional composition. It depicts the nutrient content of Ash, Moisture Content, Crude Protein, Fat, Fibre, and Carbohydrate in Moringa oleifera with carbohydrate [20].The crude proximate composition of the various nutrients as a percentage. The leaf's carbohydrate content was 45.4 percent, 16.2 percent protein, and 9.68 percent fibre [30]. The proximate composition of M. oleifera seeds revealed high quantities of lipids and proteins, according to studies. Protein, Lipid, Carbohydrate, and Ash Components were 332.5 g/kg, 44.3 g/kg, and 1.1 g/kg, respectively [48].Proximate analysis of Moringa leaves have been done . Moringa leaves contained crude protein (17.01% ±0.1) and carbohydrate (63.11% ±0.09). The leaves also contained amounts of crude fibre (7.09% ±0.11), ash (7.93% ±0.12), crude fat (2.11% ±0.11) and fatty acid (1.69% ±0.09). Ca (1.91% ±0.08), K (0.97% ±0.01), Na (192.95±4.4), Fe (107.48±8.2), Mn (81.65±2.31), Zn (60.06±0.3) and P (30.15±0.5) parts per million (ppm). Magnesium (0.38% ±0.01) and copper (6.10±0.19) were the least has been reported [24] .The leaves was found to be rich in Vitamin- C, it contained 2.18 ± 0.89 mg.AAE/g. Phytochemical analysis revealed high concentrations of Phenol and Flavonoids, it contained 627 ± 12.26 mgGAE/100 g of phenolic compound and it contained 22.16 ± 1.54mgQE/g of Flavonoid respectively[44].*M. oleifera* leaves have essential amino acids, including the sulfur-containing amino

acids in higher levels . *Moringa oleifera* leaf contain 8.13g/kg of vitamin A[48]

Phytochemical Screening : .

Nutritive profile has been estimated by the different analysis techniques one of that is the phytochemical analysis ,The ethanol leaf extract of *M. oleifera* contains alkaloids, tannins, carbohydrates, and cardiac glycosides, according to preliminary phytochemical screeninghas been reported [1]. Gallic tannins, Catechol tannins, Coumarins, Steroids and triterpenoids, Flavonoids, and Saponins are some of the phytochemical and chemical elements found in *Moringa oleifera* has been reported ,some report are available that indicates that the sugars are reduced by anthraquinones, which are alkaloids. Coumarin and reducing sugar present in low concentrations in the ether extract moringa has been seen Catechol tennins, Coumarins, and Alkaloids with low content are found in the ethanol extractwhile in water extract Coumarin is absent and other phytochemical are present in the rich contents [4], Both 4-(-l-rhamnopyranosyloxy)-benzylglucosinolate and benzyl glucosinolatehas been reported in the roots of *M. oleifera and M. stenopetala*. 4-(-l-rhamnopyranosyloxy)-benzylglucosinolate and three monoacetyl isomers of this glucosinolate were found in the leaves of both species. In *M. oleifera* bark tissue, only 4-(-l-rhamnopyranosyloxy)-benzylglucosinolate was foundQuercetin-3-O-glucoside and quercetin-3-O-(6‘ ‘-malonyl-glucoside) were found in higher proportions in M. oleifera leaves, while kaempferol-3-O-glucoside and kaempferol-3-O-(6‘ ‘-malonyl-glucoside) were found in lower amounts[10] The active components of many therapeutic use of some secondary metabolites present in plants, hence basic phytoinvestigations of the extracts for their primary phytocompounds are critical consideration .Number of investigation report are available , the yield obtained from consecutive extracts of *M. oleifera* leaves using petroleum ether, chloroform, ethanol, and water (aqueous) was highest in the case of ethanol, followed by water, petroleum ether, and chloroform. The phytochemical studies revealed that hydrolysable tannins were present in ethanol and aqueous extracts but not in petroleum ether or chloroform extracts.TheDragendorff's alkaloids test are used to testing, that indicating presence of low amounts of alkaloids in both ethanol and aqueous extracts, also some test like Hager's, Mayer's, and Wagner tests indicates the presence of low amounts of alkaloids exclusively in the

ethanol extract. In petroleum ether and chloroform extracts, the Libermann-test Burchard's for phytosterols was positive has been observed it was reported , while ethanol and aqueous extracts were negative. Only ethanol and water extracts passed the Salkowski test for triterpenoid reported in moringa .The Shinoda test used to indication amount of flavonoid It indicates the moringa plant extract a low amount of flavonoids in aqueous extracts, whereas the lead acetate and alkaline reagent tests revealed a large amount of flavonoids in ethanol and water extracts has been reported .The Saponin Foam test some time shows negative while the olive oil saponins test are positive in the aqueous extract. In petroleum ether, chloroform, and ethanol extracts, the kellarkillani test for cardiac glycoside was positive, whereas in aqueous extracts it was negative. Only chloroform, ethanol, and water extracts tested positive for hydroxyanthroquinone has been reported .The Molisch and Fehling's test revealed a high concentration of carbs in both the ethanol and aqueous extracts, whereas the Barfoed's test revealed a low concentration of carbohydrates in the ethanol extract and a negative result in the aqueous extract has been reported .The Seliwanoff test revealed the presence of keto sugars in all extracts, with the chloroform extract having the lowest level. In both ethanol and aqueous extracts, Millon's test for amino acid (hydroxyl phenol group of tyrosine) was positive. All of the subsequent extracts tested negative for protein (Biuret), lipids, and fixed oils has a reported [21].There are some study has been carried out on the phytochemistry and pharmacological effects of *Moringa oleifera* leaves because they are the most commonly used portion of the plant. *Moringa oleifera* leaves were found to have a number of bioactive chemicals. Vitamins, carotenoids, polyphenols, phenolic acids, flavonoids, alkaloids, glucosinolates, isothiocyanates, tannins, saponins, oxalates, and phytates are some of the categories has been reported [13]. In ethanolic extracts of plants, preliminary phytochemical screening revealed the presence of saponin, steroids, carbohydrates, alkaloids, tannins, proteins, and flavonoids. [54].The extract contained important types of phytochemicals such as tannins, alkaloids, flavonoids, and cardiac glycosides, according to preliminary phytochemical study has been reported [25]. Alkaloids, flavonoids, tannins, and saponins are detected qualitatively by phytochemical analysis has been reported by the several author [37]. Phytochemical

screening and antibacterial assays on *M. oleifera* leaves extract have been recorded in several papers [41].The extracts of *M. oleifera* can be produced by boiling the leaves with the respective solvents for 1 hour are screened for phytochemicals. There are some report are available that can indicates that extract shows Alkaloid Reducing sugar Flavonoid Saponin Tannin Volatile oil Glycoside Phenols are present [53].The phytochemical analysis of *Moringa oleifera* aqueous seed extract revealed that tannins and carbohydrates were present in low concentrations, saponins, alkaloids, cardiac glycosides, and anthraquinones were present in moderate concentrations, flavonoids were present in high concentrations, and phlobatannins and steroids were absent [29].Alkaloids, Phytosterols, Triterpenoids, Flavonoids, Tannins, Saponins, Glycosides, Carbohydrates, and Proteins are abundant in the Phytochemical are reported . There are no fats or fixed oils [44].Polyphenol, simple sugar, tannins, vitamins, rhamnose, carotenoids, phytates, phenolic acids, flavonoids, alkaloids, isothiocyanates, saponins, oxalates, and glucosinolates triterpenoid are all found in the leaves *of Moringa oleifera*has been observed [47].In several solvent extracts of *Moringa oleifera*, phytochemical components such as alkaloids, flavonoids, carbohydrates, glycosides, proteins, saponins, tannins, and terpenoids has been reported [17].*Moringa oleifera* contains phytochemicals such as Tannins, Alkaloids, Phlobatannins Saponins, and Phenol, which were extracted using different solvents such as ethanol, hexane, and ethyl acetate. Phlobatannins are absent in ethanol, Saponins are absent in hexane, and Phlobatannins are absent in hexane; yet, all phytochemicals show high contents such as Tannins, Alkaloids, and Phenol has been reported [19]. Tannin, saponins, flavonoids, alkaloids, anthraquinone, and reducing sugars are phytochemicals has been reported different parts of plants Only Moringa leaf and flower extracts were reported to contain terpenoids[40]. Alkaloids, tannin, flavonoids, and phenol were less than 1%, whereas saponin was 18.34%, according to phytochemical screening and quantitative estimation of percentage crude yields of chemical elements. Meanwhile, there were no steroid, terpenoids, or cardiac glycosides [30].

Chromatographic purification:

Chromatography with Thin Layers (TLC) All Successive extracts of *Moringa oleifera* pods prepared by Successive extraction

procedures were subjected to Thin Layer Chromatography (TLC) to confirm their nature biochemical composition by evaluating TLC chromatograms and to separate active saponin components from the extracts. TLC analysis of Moringa oleifera pod benzene extract revealed the presence of eight components (corresponding to 8 spots)When a solvent phase of chloroform: methanol: H2O (7:3:1) was utilised, TLC of benzene extract of *Moringa oleifera* pods revealed the presence of 8 compounds (corresponding to 8 spots) with Rf values of 0.30, 0.47, 0.62, 0.75, 0.87, 0.90, 0.95, and 0.98, respectively has been reported . The compounds with Rf values of 0.90 and 0.87 were the most visible and had definite spots (green spots). As can be observed from the preceding results, substances with similar RF values are of the same nature. These compounds have Rf values of 0.90 (IS1), 0.87 (IS2), 0.75 (IS3), 0.47 (IS4), and 0.30 (IS5) has been reported. Additionally, all of these saponins that have been separated (IS1-IS5). The most conspicuous spots in the benzene extract of Moringa oleifera pods have Rf of IS1 and IS2. As a result, this extract was chosen for further identification and purification, which included large-scale TLC collection of these two spots (IS1 and IS2). . To collect substantial amounts of IS1 and IS2, the spots were scratched from silica plates and placed in centrifuge tubes with the appropriate solvent (benzene). They are then centrifuged for 15 minutes at 4 degrees Celsius (15000 rpm). Because these chemicals were absorbed by silica, the supernatant was discarded. The sample was centrifuged with methanol as the solvent, After vacuum drying the supernatant, pure IS1 and IS2 were obtained. Percentage yield of chemicals recovered from Moringa oleifera pod benzene extract [14] The standard retention factor (Rf) values were used to identify flavonoids. Flavonols (myrcetin) (Rf-47), flavones (Rf-73), biflavonyl (kayaflavone) (Rf-98), kaempferol (Rf-84), delphinidin (Rf-45), triglycosides (Rf-27), and glycosylflavones (Rf-27) were among the flavonoid chemicals discovered in Moringa (Rf-32). [40] The phytoconstituents were separated by TLC using chloroform-methanol, The fractionated extract was separated by TLC using a chloroform-methanol solvent system, yielding substances with Rf values of 0.32, 0.53, 0.54, 0.55, 0.69, 0.89, 0.95, and 0.97 [41].

High Performance Liquid Chromatography (HPLC):

HPLC chromatograms of the isolated chemical from benzene extract obtained by successive extraction procedures were

analysed to validate its composition. TLC analysis revealed that benzene extract had the highest saponin level, which was confirmed by spot analysis. As a result, we adopted the SM (saponin) nomenclature for spot number one, i.e. IS1 (Rf 0.90). Out of all the spots (8) extracted from benzene extract, (saponin from Moringa pods) has the highest saponin concentration, as determined by phytochemical screening, and the compound yield is more than IS2, At a wavelength range of 200-400nm, the HPLC profile of successive benzene extract of Moringa oleifera pods was observed, together with its separated saponin SM. Peak sharpness, retention time (Rt min), height, and percent area were all taken into account. A benzene extract HPLC chromatogram revealed 12 peaks. Only four peaks stood up, each with a notable height and percent area (> 10%). At the retention time 14.981 (Rt min), one of the most significant peaks with 17.07 percent area and 61995 height is observed, which is comparable to that reported in the case of isolated compound SM (15.201 Rt min). Retention times of 3.215, 10.020, and 12.780 (Rt min) were measured for the other notable peaks, respectively. However, just one conspicuous peak was detected in the HPLC chromatogram of SM, with a 70.11 percent area and a height of 30259, and a Rt of 15.201. (min). Apart from this peak, a few inconspicuous peaks with percent area >10 percent were also found in the chromatogram of SM, which could be due to the presence of some contaminants in extremely low concentrations alongside isolated has been reported [14]. *M. oleifera* has a higher protein content than *M. peregrina.* MOLE had a crude protein of 13.69 while MOFE had a protein of 16.88. When compared to MPFE and MPLE, MPLE has a better nutritional value due to the inclusion of macro elements (Ca, K, Mg, Na, P) and micro elements (Cu, Co, Fe, Mn, Zn) in MPFE. Ca, Co, and K, Cu levels are higher in leaves of *M. oleifera* than in other species. Copper is a potent pro-oxidant that catalyses the oxidation of unsaturated fats, oils, and ascorbic acidha been reported [22]Crypto-chlorogenic acid, isoquercetin, and astragalin, the main active antioxidant components in M. oleifera leaves, were extracted and identified using chromatographic and spectroscopic techniques, giving 0.0027, 0.0080, and 0.0067 percent (w/w) dry powder has been reported [71].

Polyphenol and flavonoid contents :

Extracts of *M. oleifera*Folin-Ciocalteau assay was used to assess the polyphenol content of ME and DE. Has been seen, both extracts contained significant

quantities of polyphenol. ME contained more GAE per gramme of extract (216.45 ±4.64 mg GAE/g extract) than DE (100.12±3.7 mg GAE/g extract), The flavonoid concentration of *M. oleifera* extracts was measured using an aluminium chloride colorimetric technique in this work. ME had 65.382.37 mg QE/g extract of flavonoid, while DE had 40.143.31 mg QE/g extract[9]. The polyphenol extract of *Moringa oleifera* reduced cholesterol levels in rats with high serum cholesterol levels through influencing lipid metabolism, as evidenced by blocking a key enzyme and faecal excretion of cholesterol compounds[72].

Total phenolic content :

Moringa oleifera leaf extract powder's total phenolic content was has been reported number of author . The extract has been reported that have to be comparable to 205.8 0.22g/ml gallic acid at 10 mg/ml[16]. The total phenolic content of a leaf of *M. oleifera* Lam. was 2.28 mg/mL, while the total phenolic content of a floral extract of the same plants was 1.08 mg/mL has been reported [41] It has been documented that the total phenolic contents (TPC) of various plant materials utilising four solvent systems such as the absolute and aqueous methanol and absolute and aqueous ethanol, as well as two extraction procedures (shaking and reflux). The maximum TPC (16.5 g GAE/100g DW) was found in aqueous ethanolic extract of *Acacia nilotica* bark, followed by Aqueous ethanolic extract (aq. EE) of *Terminalia arjuna* bark (12.8 percent), aqueous ethanolic extract (aq. ME) of *Moringa oleifera* leaves (12.2%), aqueous ethanolic extract (aq. EE) of Azadirachta indica bark (12.0%), aqueous ethanolic extract (aq. ME) of Aloe barbadensis leaves (10.3 percent), a (0.31 percent) [48] The total phenolic content expressed in terms of GAE and yield (%) of *Moringa oleifrea* flower extract was determined to be (19.31±1.79) mg of GA/g and 8.69 percent (w/w), respectively has been reported [79].

Free radical scavenging activity :

Extracts of *Moringa oleifera* extracts' radical scavenging ability was assessed using two methods: DPPH and ABTS tests. The antioxidant activity of the extracts is has been reported has the ability of antioxidant activity . ME was found to have stronger scavenging activity than DE, with an IC50 of 1.60 ±0.03 mg/ml versus 2.31 ±0.02 mg/ml. In addition to the DPPH assay, ABTS radical cation decolorization was performed, To confirm the antioxidant activity of the extracts, ABTS radical cation

decolorization was performed. Both extracts demonstrated ABTS free radical scavenging activity, which was similar to the DPPH assay result. ME showed a higher radical scavenging capacity (1.02±0.06 mg/ml) than DE has been documented [9] The consecutive aqueous extracts of *Moringa oleifera* shown a substantial scavenging action on the free radicals 2, 2-diphenyl-2-picryl hydrazyl (DPPH), superoxide, and nitric oxide radical, as well as prevention of lipid per oxidation. *Moringa oleifera* leaf extract's free radical scavenging activity was comparable to that of the reference antioxidants[33]

Scavenging effects on DPPH radicals :

The effect of *Moringa oleifera* leaf extract on DPPH radical scavenging to see if it possessed radical scavenging properties. The IC50 for the leaf extract was 78.15± 0.92g/ml. In comparison, Trolox, the positive control, has an IC50 of 2.14 ±0.12g/ml has been reported [16]

The DPPH free radical scavenging effect of varied concentrations of *M. oleifera* flower extract was compared to that of the standard anti-oxidant, ascorbic acid. The results were expressed as a percentage of inhibition (%) seen in Flower extract, which demonstrated dose-dependent scavenging action. However, when compared to ascorbic acid, their scavenging ability was determined to be non-significant (P>0.05) [25]. Various proven in vitro systems, such as -carotene bleaching, reducing power, DPPH/superoxide/hydroxyl radical scavenging, ferrous ion chelation, and lipid peroxidation, were used to study the antioxidant effectiveness of different fractions of Moringa oleifera leaves[27]

Antibacterial Activity :

It has been reported the diameter of zones of inhibition of bacterial growth at varying concentrations of *Moringa oleifera* Lam fresh leaf juice, powder from fresh leaf juice, cold and hot water extracts of fresh leaves, cold and hot water extracts of dried leaves, ethanol extract , Fresh leaf juice had better antibacterial activity against Gram-negative and Gram-positive bacteria, with inhibition zones measuring 20.2±0.04, 17.00±0.66, 25.1±0.12, and 25.20.04, respectively, and 15.230.05, 22.40.28, 18.00.04, 21.60.04, 18.10.04, 19.00.04 mm. Again, powdered fresh leaf juice (dissolved in DMSO) revealed a strong inhibitory effect , Powder from fresh leaf juice (dissolved in DMSO) inhibited all Gram-negative and Gram-positive bacteria tested, with respective diameter zones of inhibition of

36.20±0.08, 39.60±0.49, 33.5±0.12, 42.3±0.16 and 36.4±0.08, 29.25±0.2, 35.15±0.12, 33.75±0.2, 34.4±0.44, 39.25±0.2 mm, respectively has been reported [35]

Antimicrobial Activity :

The moringa leaf exhibits antimicrobial effects against a variety of microorganisms, including *Staphylococcus aureus, E. coli, Salmonella typhi, Candida albicans*, and others. The extract is prepared using three solvents: ethanol, hexane, and ethyl acetate. *Staphylococcus* aureus 9mm NA 10mm *Escherichia coli* 4mm NA 8mm *Staphylococcus aureus* 9mm NA 10mm *Staphylococcus aureus* 9mm NA 10mm *Staphylococcus aureus* 9mm NA 10mm *Staphylococcus aureus 9mm* NA 10mm The inhibition zone in culture media is visible because to antimicrobial activity. *Staphylococcus aureus* is a type of bacteria that causes infections in humans. 4mm NA 8mm Escherichia coli 9mm NA 10mm NA 9mm NA 10mm NA 9mm NA 10mm NA 9mm NA 10mm NA 9mm NA 10mm *Mucor* 3mm 2mm 4mm *Candida albican* 3mm 2mm 4mm *Salmonella tiphy* 6mm 4mm 10mm Mucor 3mm 2mm 4mm [19]The petroleum ether extracts of *Moringa oleifera* were found to be very active against the growth of *Staphylococcus aureus*, with the 0.2g/ml concentration resulting in the highest zone of inhibition measurement (12.0 mm). *Moringa oleifera* ethanolic extract demonstrated an antibacterial impact on *Staphylococcus aureus*, but not as much as the petroleum ether extract.The aqueous extract of *Moringa oleifera* had the least antimicrobial effect on *Staphylococcus aureus*..It was discovered that the *Moringa oleifera* petroleum ether extract was significantly active against the growth of Streptococcus species, with the 0.6g/ml concentration giving the highest measurement of zone of inhibition (12.0mm*).Moringa oleifera* ethanolic extract demonstrated an antibacterial impact on Streptococcus species, but not as much as the petroleum ether extract. On Streptococcus species, the aqueous extract of Moringa oleifera demonstrated the least antibacterial activity [20].The ethanolic extract of the leaf had antibacterial action against all of the microorganisms that were tested. *Salmonella typhi, Pseudomonas aeruginosa, Escherichia coli, and Vibrio cholerae* have all been documented to be resistant to chloroform extract[32].On the test organisms, *M. oleifera* extracts had antibacterial action. Chloroform and aqueous crude extracts of M. oleifera leaf

leaves were found to be efficacious against the test organisms. On *E. coli and S. typhi,* the control (ampiclox) exhibited the largest zone of inhibition (23mm), followed by aqueous leaf extract (20mm) and chloroform extract (20mm) on *Pseudomonas aeruginosa* with An 18mm inhibition zone *P. aeruginosa* was resistant to the aqueous extract's action. [37].The antibacterial analysis revealed a broad activity spectrum against the test microorganisms, with inhibitory zones comparable to those seen with conventional antibiotics. For all species, the MIC was between 10mg/ml to 9Omg/ml [41].Antifungal and antibacterial activities of Moringa oleifera seed extracts: The results of antifungal activity of *Moringa oleifera* extracts showed inhibitory zones of different M. oleifera extracts against Bacillus subtilis and *Staphlococcus aureus,* respectively has been reported .Crude samples had high activity against *Fusariamsolani, Bacillus subtilis, and Staphlococcus aureus*, but almost no activity against *Rhizopus solani,* and less activity against *Pasturellamultocida, Aspergillus niger, Metarhisiumaniscoplae, and Escherichia coli*, whereas supernatant had low activity against *Rhizopus solani, Pasturellamultocida, Staphlococcus aureus*,Moderate activity against *Escherichia coli, Aspergillus niger, and Metarhisiumaniscoplae in Bacillus subtilis.*Dialyzed samples had modest activity against all four bacteria species and *Aspergillus niger* but no activity against *Rhizopus solani*. Only *Fusariamsolani and Metarhisiumaniscoplae* were found to be very sensitive to the dialyzed sample [36].Six bacterial species and two mould species have been discovered. *Staphylococcus aureus, Bacillus cereus, Escherichia coli, Streptococcus Spp, Pseudomonas aeruginosa, and Proteus vulgaris* were among the bacteria isolated, while *Rhizopus spp and Mucor spp* were among the moulds. The isolated microbes were found to contain Staphylococcus aureus and Bacillus cepacia.The major bacteria found in all of the beef offal samples were *Staphylococcus aureus and Bacillus cereus,* according to a microbial count of the isolated microorganisms. In addition to *Bacillus cereus and Staphylococcus aureus, Streptococcus faecalis, Escherichia coli, and Proteus vulgaris* were found in the intestine. [38]*Salmonella typhi and Klebsiella pneumoniae* were the most sensitive bacteria, while *Staphylococcus aureus and Escherichia coli* were the least sensitive

microorganisms, with *Proteus mirabilis and Enterobacter aeroginosa* proving resistant. The extract's minimum inhibitory concentration for all sensitive isolates was 100 mg/ml, but the minimum inhibitory value for all other isolates was 50 mg/ml.The extract's lowest inhibitory concentration for all sensitive isolates was 100 mg/ml, whereas the extract's minimum bactericidal concentration prevented the development of Staphylococcus aureus, Salmonella typhi, and Escherichia coli was 50 mg/ml has been reported [29].

The antibacterial efficacy of *M. oleifera* leaf extracts in aqueous, methanolic, and ethanolic forms is discussed. At 30 mg/ml, all of the leaf extracts had a zone of growth inhibition of less than 1.5 mm, indicating that they had limited inhibitory impact on enteropathogens. Except for *Streptococcus sp. and P. mirabilis,* all of the orthopaedic wound isolates were sensitive to the aqueous extract of the leaves, with inhibition zones ranging from 12 to 15 mm, whereas methanolic extract produced inhibition zones ranging from 12 to 19 mm with *Streptococcus sp, P. fluorescens, A. baumanii, B. cepacia, Y. enterocolitica, and P. mirabilis and S. pullorum inhibited K. pneumoniae, P. vulgaris, P. stuartii, E. coli , S. rubidae, and K. oxycota, but not K. pneumoniae, P. vulgaris, P. stuartii, E. coli), S. rubidae, or K. oxycota.* All of the orthopaedic wound microbes, on the other hand, exhibited resistance to the ethanolic extract of the leaves has been reported [30].

Anti-inflammatory::Using the rat paw edoema and rat 6-day air pouch inflammatory models, a crude methanol extract of the root of the plant Moringa oleifera Lam. was tested for anti-inflammatory activity. The extract reduced carrageenan-induced rat paw edoema in a dose-dependent manner following oral treatment, with a 50 percent inhibitory concentration (IC 50) of 660 mg/kg.The extract was substantially more potent in the 6-day air pouch acute inflammation caused with carrageenan, with IC 50 values of 302.0 mg/kg and 315.5 mg/kg for cellular accumulation and fluid exudation, respectively. With 600 mg/kg, the maximum inhibition was 83.8 percent and 80.0 percent, respectively [42].

Effect on neutrophil adhesion test – Incubation of neutrophils with nylon fibres (NF) produced a decrease in the neutrophil counts due to adhesion of neutrophils to the fibres. Both doses of MEMO and OSE showed significant increase in the neutrophil adhesion when compared to

control. The low dose of MEMO was found to be more effective than high dose of MEMO. There was also rise in neutrophil count in untreated blood of all treatment groups[28]

Effect on mice lethality test – When *Pasteurella multocida* was given to the control group, 100 percent of them died within 72 hours. Without any prior medication therapy, the vaccinated group had an 83.33 percent mortality rate. MEMO at low and high dosages reduced death to 66.66 and 83.33 percent, respectively, whereas OSE exhibited a 33.33 percent reduction in mortality, with four mice out of six surviving[28].

Effect on cyclophosphamide induced neutropenia –Cyclophosphamide treatment lowered TLC in control mice by 54.52 percent. With low and high dosages of cyclophosphamide, pretreatment with MEMO for 10 days before cyclophosphamide delivery resulted in TLC reductions of 48.91 percent and 52.81 percent, respectively. When animals were pretreated with OSE(Oscimum sanctum extract), TLC decreased by 45.93 percent compared to baseline levels. In the control and OSE groups, the percent reduction in neutrophil count was 57.01 and 38.53, respectively. When compared to initial values, the low and high doses of MEMO reduced neutrophil count by 40.00 and 48.23 percent, respectively[28]

Effect on serum immunoglobulins and haemagglutination:

When compared to control, the modest dose of MEMO (methanolic extract of *Moringa oleifera*) exhibited a substantial rise in serum immunoglobulin levels. When compared to control, the high dose of MEMO was unable to significantly enhance immunoglobulin levels. While in haemagglutination When animals were vaccinated with a low or high dose of MEMO their haemagglutinating antibody (HA) titre value was much higher than when they were vaccinated alone [28].

Hypolipademic Effect :

In experimentally generated hypercholesterolemia rats, the hypolipidaemic effect of ethanol leaf extract of Moringa oleifera was examined. The researchers employed 36 wistar rats, both sexes, weighing 130.53±4.86g . The animals were completely randomized into six groups (A-F) comprising 6 animals each. Groups A, B and C comprise female rats administered 1 ml of distilled water, high dose of 600 mg/kg and low dose of 300 mg/kg body weight of the extract respectively,Male rats in groups D, E, and F were given 1 ml of distilled water, a high dose of 600 mg/kg, and a low dose of 300 mg/kg body weight of the extract. Only the

high dose female group (600 mg/kg body weight) reduced or maintained body weight significantly (p 0.05) differently than the low dose and high dose male groups, indicating that the extract dose only had a little effect their body mass index In the case of blood lipids, both male and female serum total cholesterol concentrations decreased significantly (p 0.05) in comparison to the other groups. For those who received low dosages (300 mg/kg body weight) of the extract, serum low density lipoprotein cholesterol (LDLC) levels were also lowered significantly (p 0.05).concentration in both male and female reduced significantly (p 0.05) ,The LDLC of the male rats did not decrease significantly (p>0.05). In male and female rats given low and high doses of the extract, serum triacylglycerol (TAG) concentrations decreased significantly (p0.05). Overall, the results of this investigation reveal that *M. oleifera* ethanol leaf extract has a hypolipidaemic impact [1].*Moringa oleifera* has been shown to have potential anti-hyperglycaemic properties in animal models of diabetes by many scientific groups. We used various approaches to investigate the putative mechanisms of action of M. oleifera extract. In Type 2 diabetic rats, we first measured fasting blood glucose and then performed a glucose tolerance test[55].

Hypercholesterolemia:

If the animals were given a high-fat dietwhich caused hypercholesterolemia. Then after the 21-day feeding period, the extract was given for 14 days it become useful cured that abnormality [1] It was discovered by number of author that ingesting a *Moringa oleifera*-rich extract significantly lowered serum cholesterol, triglycerides, and low-density lipoprotein cholesterol levels. Feeding rats *Moringa oliefera* and a high fat-cholesterol diet had no effect on their apparent development. In the current study, *Moringa oliefera* treatment lowered total cholesterol levels[72].

Wound Healing :

Moringa oleifera reveals wound healing activity on albino rats utilising multiple wound healing models pharmacological investigation indicate the tensile strength drug treated we got model that explained the wound closure day and mean scar area as well as wound contraction and its impact on the granuloma tissue Zinc sulphate was abundant in Moringa oleifera, and zinc sulphate is used to treat wounds[56]

Anthelmintic activity:

Moringa oleifera has been reported that the it shows paralysis between 6-15 minutes, whereas death is comparable to piperazine citrate, with worms dying at 64 minutes. Vitex negundo was used for paralysis for 23-92 minutes and worm death after 4-8 hours.According to the findings, *Moringa oleifera* has significant anthelmintic activity, but *Vitex negundo* takes a long time to kill worms.The isolation of phytoconstituents responsible for activity will be required in the future[54].The anthelmintic activity of Moringa oleifera oil has been reported against the Indian earthworm *Pheritimaposthuma*. The oil of *Moringa oleifera* was reported that expressed in terms of the time it took for the worms to be paralysed and die. The reference standard was piperazine citrate (10 mg/ml), while the control group was pure water. Moringa oleifera oil was found to have strong efficacy that was comparable to that of the*Moringa oleifera* oil was found to have significant action that was comparable to the standard used[77].

At 100 mg/ ml concentrations, *Moringa oleifera* seed extract exhibits anthelmintic action, whereas Chloroform has moderate activity and Petroleum ether extract exhibits the least anthelmintic activity, Piperazine citrate (22.36±1.5) (43±6.8),Petroleum ether (60.22±1.2)(55.13±0.2)(81.08±2 .8)(65.14±3 .1 4),Chloroform (39.11±1.8)(33.05±1.2)(60.04±2 .1)(52.11±1 .1 5),Methanolic extract (32.13±0.3)(28.11±1.3)(45.22±1 .9)(38.12±0 .7) min required for paralysis and death of 10 ,50 ,100mg/ml concentration of extract has been reported [78]

Antifungal activity: As you know from ancient times plant are used as for the cure diseases The fungus *Saccharomyces cerevisiae, Candida albicans*, and *Candida tropicalis* were tested against *Moringa oleifera* has been reported . The ethanol and aqueous leaf extracts *of Moringa oleifera* had the best antifungal activity against *Saccharomyces cerevisiae and Candida tropicalis*, whereas the water extract of *Moringa oleifera* had the worst antifungal activity against *Saccharomyces cerevisiae and Candida tropicalis* was reported .Water and ethanol extracts of *Moringa oleifera* produced the biggest inhibitory zone against *Saccharomyces cerevisiae*. Because of their excellent therapeutic capabilities against pathogenic organisms, antifungal activity was reported by several author .Previous research has shown that the medicinal herb *Moringa oleifera* has antifungal properties against a variety of species, including

Saccharomyces cerevisiae and Candida tropicalis[17].The antifungal activity of the leaves extracts is shown in All of the fungal organisms developed resistance to both the aqueous and methanolic extracts of the leaves, with the exception of *A. Flavus*, which was sensitive to the methanolic extract with a growth inhibition zone of 12 mm at a concentration of 30 mg/ml.The ethanolic extract, on the other hand, reduced the development of several fungal organisms, resulting in a growth inhibition zone of 22 mm against *T. mentagrophyte*, 20 mm against *Pullariumsp*, and 15 mm against *A. flavus and Penicilliums*p has been reported [30].

Cancer cell Antiproliferation :

In the United States of America, almost 35% of cancer patients took herbal medications [74]Extracts of *Moringa. oleifera*has been used treatment in model likehepatocarcinoma (HepG2), colorectal adenocarcinoma (Caco-2) and breast adenocarcinoma (MCF-7), and human fibroblast cells were used to test the antiproliferation [73].*Moringa oleifera* has antitumor potential against a variety of malignancies. Hepatocellular carcinoma, acute lymphoblastic, and myeloid leukaemia cell viability were all decreased by*Moringa oleifera* leaf extract [76]. It was reported that methanol and dichloromethane extracts (ME and DE) Cancer cell viability patterns were similar whether of both extracts (0 to 250 g/ml) were used.DE was more harmful to cells than ME. It had IC50s of 120.37±2.55, 112.46±3.74 and 133.58±2.47 µg/ml for HepG2, Caco-2, and MCF-7, respectively, but ME had a lower cytotoxicity (IC50 > 250 g/ml) for all cancer cell lines. Both extracts were also tested in human fibroblasts to see if they inhibited cell proliferation in healthy cells. Both extracts demonstrated no toxicity on human fibroblasts at concentrations of 0 to 400 g/ml. The cancer cell growth inhibitor cisplatin was utilised as a positive control. For HepG2, Caco-2, and MCF-7, the IC50 13.34±1.44, 19.45±2.12 and 17.24±2.39 µM, respectively. According to the findings, M. oleifera extracts not only inhibit cancer cell proliferation but also [9]Niazimicin, -sitosterol-3-O—D-glucopyranoside, and 4-(-L-rhamnosyloxy) benzylisothiocyanate were identified as the bioactive chemicals responsible for the inhibition. MO leaves suppressed the proliferation of pancreatic cancer cells[75]

Application :

Anemia, arthritis, asthma, cancer, constipation, diabetes, epilepsy, hypertension, kidney stones, thyroid disorders, and infections are all conditions that *M. oleifera* can usefull*Moringa* has been demonstrated to have potent neuroprotective properties. Cerebral ischemia is caused by a blockage of blood flow to the brain. As a result, lipid peroxidation and reperfusion occur, resulting in reactive oxygen speciesThe antioxidants in moringa can help protect the brain by reducing reactive oxygen species[58,59].Most serious diseases like AIDS patients should take moringa, a plant that herbalists prescribe. Moringa is recommended as a food to include in one's diet to help HIV-positive persons enhance their immune system. However, more research is needed to prove moringa's effect on antiretroviral drugs. [60]*Moringa oleifera* is a medicinal plant commonly used in African and Asian folk medicine to cure ulcers, wounds, inflammation, heart problems, cancer, stroke, obesity, anaemia, and liver damage. *Moringa oleifera* is the nutrient-dense plant that has yet to be discovered.Since the 1970s, major nutritional study has been undertaken on this humble plant, which has been making strides in less-developed communities for thousands of years. They are employed in human and animal nutrition as well as traditional medicine in specific locations.Moringa leaves are used as dietary integrators in food preparations. These leaves are used to cure a variety of maladies in traditional medicine, including malaria, typhoid fever, parasite diseases, arthritis, swellings, and wounds, skin problems, genito-urinary ailments, hypertension, and diabetes.Protein, minerals, beta-carotene, and antioxidant chemicals are abundant in leaves, which are commonly insufficient in populations in undeveloped or developing countries. Moringa helps lower cholesterol levels in the blood, which lowers the risk of a heart attack. It also aids in the reduction of blood sugar levels.Malnourished people, particularly newborns and nursing mothers, have benefited from Moringa trees. One rounded tablespoon (8 g) of leaf powder supplies nearly all of a kid's protein, 40% of calcium, 23% of iron, and nearly all of the vitamin A requirements for a child aged 1-3.Six rounded spoonfuls of leaf powder offer nearly all of a woman's daily iron and calcium needs throughout pregnancy and breastfeeding[64].

We chose Moringa oleifera as a dietary ingredient for the most part because of its nutritional worth and health benefits.

Moringa Oleifera has anticancer, hepatoprotective, hypoglycemic, anti-inflammatory, antibacterial, antifungal, antiviral, and anti-sickling effects.They may also aid in cholesterol reduction, wound healing, Alzheimer's disease prevention, and stomach ulcer prevention [63]Vision, reproduction, embryonic growth and development, immunological competence, cell differentiation, cell proliferation and apoptosis, epithelial tissue maintenance, and brain function are just a few of the physiological processes in which vitamin A plays a critical part. Its deficiency is still common in many impoverished nations, and it's thought to be the cause of infant and maternal death.Cattle fed moringa leaves gained up to 32% more weight every day. Milk cows were fed 15 to 17 kg of fresh Moringa leaves each day, and milk output increased by 43%. Milk output increased by 58% when the feed was supplemented with 2 kg dry matter.According to sources, leaves can be eaten raw, roasted, or stored as a dry powder for months without losing their nutritional value. To improve nutrients without modifying flavour, a tablespoon of the powder can be added to baby food, soups, and vegetables[61].The milk output increased by 65 percent after the feed was supplemented with 3 kg dry matter each day. Consider what would be possible if developing-country milk output could be expanded in this manner. It has the potential to save patients suffering from protein deficiency a lot of pain. Moringa powder must be prepared and sold in urban marketplaces, thus the economic benefits must be examined.It was also discovered that rural Ugandans use *M. oleifera* leaves for twenty-four different HIV/AIDS-related illnesses. External sores/ulcers, Bronchiasis Malaria/Fever, Gastritis/ulcers, Diabetes mellitus, Coliti, Insufficiency, Syphilis, Flu, Asthma, and other respiratory illnesses Bone setting, heartburn Humans and livestock are both infested with worms. a skin condition, tenseness, Lactation booster, Malnutrition, Energy, Protein, Malnutrition, Malnutrition, Malnutrition, Malnutrition,,Antiseptic Soap, Tea Spices, and Vegetables [4].

Although oral and dental health in industrialised countries has dramatically improved over the last century, dental caries continues to be a serious clinical problem in developing countries like India. Cavities, often known as tooth decay, are a microbiological condition produced by bacteria in the mouth.The methanolic extract of *Moringa oleifera* possesses antibacterial properties and can be used as

an oral medicine to treat dental caries. The antibacterial action of *M. oleifera* methanolic extract is mostly due to the presence of phenolic compounds, particularly Flavonoids, and their synergistic effect with aerial components[61].Moringa's entire plant is beneficial, from the root stem to the leaf flower seed, with various uses such as antilithic, rubefacient, vesicant, carminative, antifertility, anti-inflammatory, stimulating in paralytic ailments; act as a cardiac/circulatory tonic, laxative, stimulant, aphrodisiac, abortifacient, and cholagogue, as listed in Table No 1.

Table no 1 :Plant Part uses of *Moringa oliefera*

Sr no	Plant part	Uses	References
1	Root	Antilithic, rubefacient, vesicant, carminative, antifertility, anti-inflammatory, stimulating in paralytic diseases; cardiac/circulatory tonic, laxative, abortifacient; used to treat rheumatism, inflammations, articular aches, lower back or kidney discomfort, and constipation.	[45,69]
2	Leaves	Purgative, used to sores as a poultice, massaged on the temples for headaches, used for piles, fevers, sore throats, bronchitis, eye and ear infections, scurvy, and catarrh; leaf juice is supposed to control glucose levels, applied to reduce glandular swelling.	[42,70]
3	Stem bark	Rubefacient, vesicant, and used to treat delirium, prevent spleen growth and the formation of tuberculous glands in the neck, eradicate tumours, and heal ulcers. Earaches can be treated with the root bark juice, which can also be used to ease discomfort in a tooth cavity. Anti-tubercular capabilities are also present..	[70,69]

4	Gum	Rubefacient and vesicant, it is used to cure delirious patients, inhibit spleen expansion and tuberculous gland growth in the neck, remove tumours, and heal wounds. Earaches are treated with root bark juice, which can also be utilised as a pain reliever in a dental cavity. It possesses antitubercular effects as well.	[42]
5	Flower	Used to cure inflammations, muscle illnesses, hysteria, tumours, and spleen enlargement; high therapeutic value as a stimulant, aphrodisiac, abortifacient, and cholagogue; In hypercholesterolaemic rabbits, lower serum cholesterol, phospholipid, triglyceride, VLDL, LDL cholesterol to phospholipid ratio, and atherogenic index; lowered lipid profile of liver, heart, and brain	[68, 70 .69]
6	Seed	The antihypertensive compounds thiocarbamate and isothiocyanate glycosids have been isolated from the acetate phase of Moringa pod ethanolic extract, and seed extract protects the liver by decreasing lipid peroxides.	[67 66 65]

Figures:

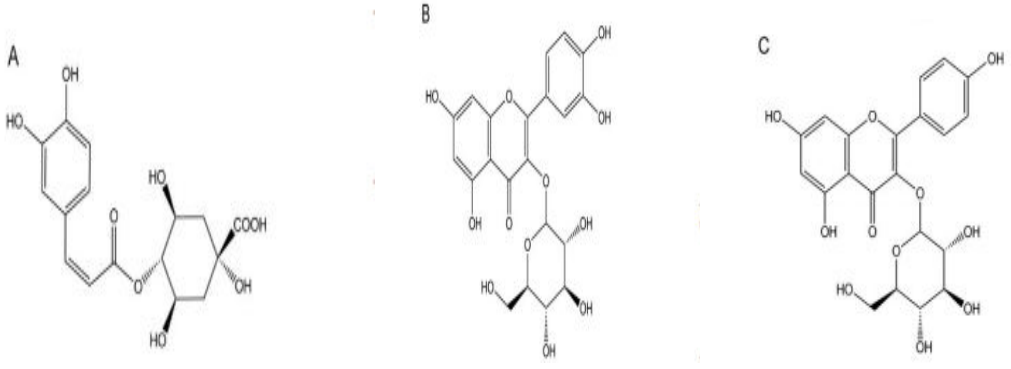

Fig no 2:Structure of crypto-chlorogenic acid, isoquercetin, and astragalin [71]

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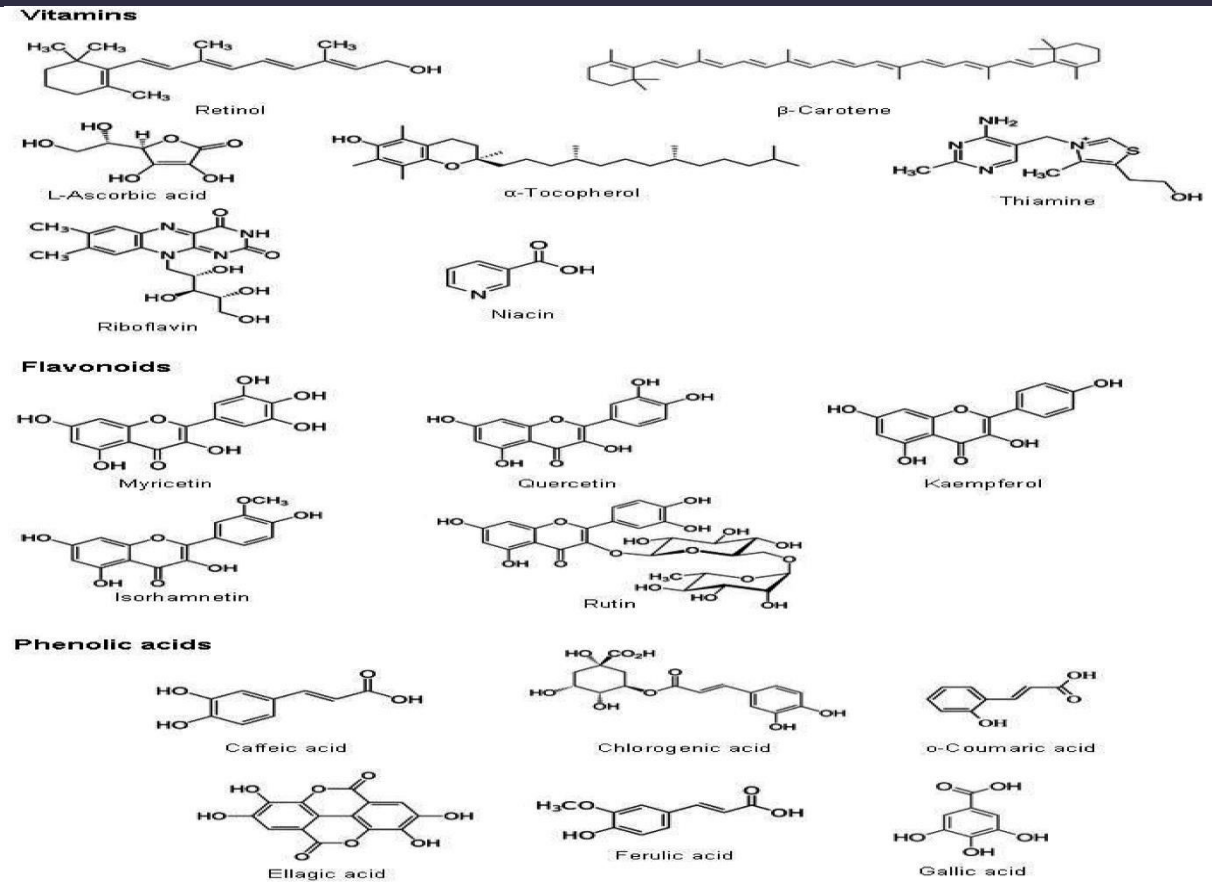

Fig no 1: Biochemical compound and secondary Metabolite found in Moringa oleifera

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