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A MIRACLE PHYTOMEDICINE: MORINGA OLEIFERA

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ABSTRACT:-

Moringa oleifera is a valued medicinal plant in traditional folk medicine. Many pharmacological studies have shown the ability of this plant to exhibit analgesic, anti-inflammatory, antipyretic, anticancer, antioxidant, nootropic, hepatoprotective, gastroprotective, anti-ulcer, cardiovascular, anti-obesity, antiepileptic, antiasthmatic, antidiabetic, anti-urolithiatic, diuretic, local anesthetic, anti-allergic, anthelmintic, wound healing, antimicrobial, immunomodulatory, and antidiarrheal properties. This review is a comprehensive summary of the phytochemical and pharmacological activities as well as the traditional and therapeutic uses of this plant. M. oleifera has wide traditional and pharmacological uses in various pathophysiological conditions. We will review the various properties of M. oleifera (drumstick tree) and focus on its various medicinal properties. We think that it is an attractive subject for further experimental and clinical investigations.

INTRODUCTION:-

Moringa oleifera belonging to the family of Moringaceae an effective remedy for malnutrition. Moringa isrich in nutrition owing to the presence of a variety of essential phytochemicals present in its leaves, pods and seeds. In fact, moringa is said to provide 7 times more vitamin C than oranges, 10 times more vitamin A than carrots, 17 times more calcium than milk,9 times more protein than yoghurt, 15 times more potassium than bananas and 25 times more iron than spinach [1]. The fact Peer review under responsibility of Beijing Academy of Food Sciences.that moringa is easily cultivable makes it a sustainable remedy for malnutrition. Countries like Senegal and Benin treat children with moringa [2]. Children deprived of breast milk tendto show symptoms of malnutrition. Lactogogues are generally prescribed to lactating mothers to augment milk production.The lactogogue, made of phytosterols, acts as a precursor forhormones required for reproductive growth. Moringa is rich in phytosterols like stigmasterol, sitosterol and kampesterol which are precursors for hormones. These compounds increase the estrogen production, which in turn stimulates the proliferation of the mammary gland ducts to produce milk. It is used totreat malnutrition in children younger than 3 years [3]. About 6 spoonfuls of leaf powder can meet a woman's daily iron and calcium requirements, during pregnancy. Thisstudy provides anoverview on the cultivation, nutritional values, medicinal proprrties for commercial use and pharmacological properties of moringa. There are no elaborate reports on treatment of diabetes and cancer using moringa. This study aims to bridge the gap.

KEY WORD's:- Introduction,Botonical Descreption, Taxonomy ,Cultivation ,Phytochemistry.,Pharmacological Activity.

BOTONICAL DESCREPTION:-

M. oleifera is a fast-growing, deciduous tree[4] that can reach a height of 10–12 m (32–40 ft) and trunk diameter of 45 cm (1.5 ft).The bark has a whitish-grey color and is surrounded by thick cork. Young shoots have purplish or greenish-white, hairy bark. The tree has an open crown of drooping, fragile branches, and the leaves build up a feathery foliage of tripinnate leaves.

The flowers are fragrant and hermaphroditic, surrounded by five unequal, thinly veined, yellowish-white petals. The flowers are about 1.0–1.5 cm (1/2 in) long and 2.0 cm (3/4 in) broad. They grow on slender, hairy stalks in spreading or drooping flower clusters, which have a length of 10–25 cm.[5]

Flowering begins within the first six months after planting. In seasonally cool regions, flowering only occurs once a year between April and June. In more constant seasonal temperatures and with constant rainfall, flowering can happen twice or even all year-round.The fruit is a hanging, three-sided brown capsule of 20–45 cm size, which holds dark brown, globular seeds with a diameter around 1 cm. The seeds have three whitish papery wings and are dispersed by wind and water.In cultivation, it is often cut back annually to 1–2 m (3–6 ft) and allowed to regrow so the pods and leaves remain within arm's reach.[5]

TAXONOMY:-[6]

Kingdome	**Plantae**
Sub-kingdome	**Tracheobionta**
Superdivision	**Spermatophyta**
Division	**Magnoliophyta**
Class	**Magnoliopsida**
Sub class	**Dilleniidae**
Order	**Capparales**
Family	**Moringaceae**
Genus	**Moringa**
Species	**Olifera**

CULTIVATION:-

The moringa tree is grown mainly in semiarid, tropical, and subtropical areas, corresponding in the United States to USDA hardiness zones 9 and 10. It tolerates a wide range of soil conditions, but prefers a neutral to slightly acidic (pH 6.3 to 7.0), well-drained, sandy or loamy soil.[7] In waterlogged soil, the roots have a tendency to rot.Moringa is a sun- and heat-loving plant, and does not tolerate freezing or frost. Moringa is particularly suitable for dry regions, as it can be grown using rainwater without expensive irrigation techniques.[7].

PHYTOCHEMISTRY:-

Every part of M. oleifera is a storehouse of important nutrients and antinutrients. The leaves of M. oleifera are rich in minerals like calcium, potassium, zinc, magnesium, iron and copper [2]. Vitamins like beta-carotene of vitamin A, vitamin B such as folic acid, pyridoxine and nicotinic acid, vitamin C, D and E also present in M. oleifera [8]. Phytochemicals such as tannins, sterols, terpenoids, flavonoids, saponins,anthraquinones, alkaloids and reducing sugar present along with anti-cancerous agents like glucosinolates, isothiocyanates, glycoside compounds and glycerol-1-9-octadecanoate [9]. Moringa leaves also have a lowcalorific value and can be used in the diet of the obese. The pods are fibrous and are valuable to treat digestive problems and thwart colon cancer[10]. A research showsthat immature pods contain around 46.78% fiber and around 20.66% protein content. Pods have 30% of amino acid content, the leaves have 44% and flowers have 31%. The immature pods and flowers showed similar amounts of palmitic, linolenic, linoleic and

oleic acids [11].Moringa has lot of minerals that are essential for growth and development among which, calcium is considered as one of

the important minerals for human growth. While 8 ounces of milk can provide 300–400 mg, moringa leaves can provide 1000 mg and moringa powder can provide more than 4000 mg. Moringa powder can be used as a substitute for iron tablets, hence as a treatment for anemia. Beef has only 2 mg of iron while moringa leaf powder has 28 mg of iron. It has been reported that moringa contains more iron than spinach [12]. A good dietary intake of zinc is essential for proper growth of sperm cells and is also necessary for the synthesis of DNA and RNA. M. oleifera leavesshow around 25.5–31.03 mg of zinc/kg, which isthe daily requirement of zinc in the diet [13]. PUFAs are linoleic acid, linolenic acid and oleic acid; these PUFAs have the ability to control cholesterol. Research show that moringa seed oil contains around 76% PUFA, making it ideal for use as a substitute for olive oil [14]. A point to note is that the nutrient composition varies depending on the location.Fuglie [12] revealed that seasons influence the nutrient content.It was shown that vitamin A was found abundantly in the hot wet season, while vitamin C and iron were more in the cool-dry season [15]. The difference in results can be attributed to the fact that the location, climate and the environmental factors significantly influence nutrient content of the tree.

PHARMACOLOGICAL ACTIVITY:-

ANTI OXIDENT:- The antioxidant property of Moringa may be due to the presence of phenolic compounds that was confirmed by phytochemical screening of the hydro-ethanolic extract. In this respect, Moringa pods contain important bioactive compounds including glucosinolates, isothiocyanates, thiocarbamates, and flavonoids [16]. These compounds quench ROS, chelate metal ions and regenerate membrane-bound antioxidants [17.]

β-carotene, the major component reported from the drumsticks of the plant[16] and vitamin A and C present in M. oleifera serve as an explanation for their mode of action in the induction of antioxidant profiles in the present investigation. The biochemical basis of the chemopreventive potency of M. oleifera extract may be attributed to the synergistic action of the constituents of the extract and the induction of Phase-II enzymes (GSTs) and antioxidant enzymes, which might be implicated in the anticarcinogenic activity [18.]

The aqueous extract of Moringa oleifera exhibited strong scavenging effect on 2, 2-diphenyl-2-picryl hydrazyl (DPPH) free radical, superoxide, nitric oxide radical and inhibition of lipid per oxidation. The free radical scavenging effect of Moringa oleifera leaf extract was comparable with that of the reference antioxidants. The extracts of Moringa oleifera both mature and tender leaves have potent antioxidant activity against free radicals, prevent oxidative to major biomolecules and afford significant protection against oxidative damage [19.]

The Moringa oleifera hydro- alcoholic leaf extracts (1000 mg/kg) and Moringa oleifera aqueous pod (fruit) extract (750 mg/kg) contain high amount of tannin, phenolic compounds and flavonoids. The poly phenolic constituents of this plant could be contributory to their ethano-medical use. Thus, it can be concluded that extracts of Moringa oleifera produce significant antioxidant activity [20] and the presence of kaempferol in leaves of Moringa oleifera showed the antioxidant activity which was also reported by[21].

ANTI HYPERTENSIVE,DIURETICS,AND CHOLESTROL LOWERING ACTIVITIES :-The widespread combination of diuretic along with lipid and blood pressure lowering constituents make this plant highly useful in cardiovascular disordersMoring leaf juice is known to have a stabilizing effect on blood pressure [22]Nitrile, mustard oil glycosides, and thiocarbamate glycosides have been isolated from Moringa leaves, which were found to be responsible for the blood pressure lowering effect. Most of these compounds, bearing thiocarbamate, carbamate or nitrile groups, are fully acetylated glycosides, which are very rare in nature. Bioassayguided fractionation of the active ethanol extract of Moringa leaves led to the isolation of four pure compounds, niazinin A 1, niazinin 1 B, niazimicin 4 and niazinin A-B which showed a blood pressure lowering effect in rats mediated possibly through a calcium antagonist effect [23,24]

Another study on the ethanol and aqueous extracts of whole pods and its parts, i.e., coat, pulp, and seed revealed that the blood pressure lowering effect of seed was more pronounced with comparable results in both ethanol and water extracts indicating that the activity is widely distributed. Activity-directed fractionation of the ethanol extract of pods of M. oleifera has led to the isolation of thiocarbamate and isothiocyanate glycosides which are known to be the hypotensive principles. Methyl p-hydroxybenzoate and β-sitosterol 14, investigated in the pods of M. oleifera have also shown promising hypotensive activity. Moringa roots, leaves, flowers, gum and the aqueous infusion of seeds have been found to possess diuretic activity, and such diuretic components are likely to play a complementary role in the overall blood pressure lowering effect of this plant [24,]

ANTI UROLITHIATIC ACTIVITY: -The effect of oral administration of aqueous and alcoholic extract of M. oleifera root-wood on calcium oxalate urolithiasis has been studied in male Wistar albino rats. Ethylene glycol feeding resulted in hyperoxaluria as well as increased renal excretion of calcium and phosphate. Supplementation with aqueous and alcoholic extract of M. oleifera root-wood significantly reduced the elevated urinary oxalate, showing a regulatory action on endogenous oxalate synthesis. The increased deposition of stone forming constituents in the kidneys of calculogenic rats was also significantly lowered by curative and preventive treatment using aqueous and alcoholic extracts. Thus the results indicate that the root-wood of M. oleifera is endowed with antiurolithiatic activity [25]

ANTI BACTERIAL AND ANTI FUNGAL ACTIVITY:-

Moringa roots have antibacterial activity and are reported to be rich in antimicrobial agents. These are reported to contain an active antibiotic principle, pterygospermin,, which has powerful antibacterial and fungicidal effects. A similar compound is found to be responsible for the antibacterial and fungicidal effects of its flowers . The root extract also possesses antimicrobial activity attributed to the presence of 4-α-L-rhamnosyloxy benzyl isothiocyanate [26]The aglycone of deoxy-niazimicine (N-benzyl, Sethyl thioformate) 7 isolated from the chloroform fraction of an ethanol extract of the root bark was found to be responsible for the antibacterial and antifungal activities. The bark extract has been shown to possess antifungal activity [27]while the juice from the stem bark showed an antibacterial effect against Staphylococcus aureus The fresh leaf juice was found to inhibit the growth of microorganisms (Pseudomonas aeruginosa and Staphylococcus aureus), pathogenic to man [28]

ANTI DIABETIC ACTIVITY:-

Moringa has been shown to cure both Type 1 and Type 2diabetes. Type 1 diabetes is one where the patients suffer from non-production of insulin, which is a hormone that maintainsthe blood glucose level at the required normal value. Type 2 diabetesis one associated with insulin resistance. Type 2 diabetes might also be due to Beta cell dysfunction, which fails to sense glucose levels, hence reduces the signaling to insulin, resulting in high blood glucose levels [29]. Several studies have shown that,

moringa can act as an anti-diabetic agent. A study has shownthat the aqueous extracts of M. oleifera can cure streptozotocin inducedType 1 diabetes and also insulin resistantType 2 diabetesin rats [30]. In another study, the researchers fed the STZ induced diabetes rats with Moringa seed powder and noticedthat the fasting blood glucose dropped . Also, when the ratswere treated with about 500 mg of moringa seed powder/kg bodyweight, the antioxidant enzymes increased in the serum. Thisshows that the antioxidants present in moringa can bring downthe ROS caused in the Beta-cells due to the STZ induction .STZcausesATP dephosphorylation reactions and helps xanthine oxidase in the formation of superoxides and reactive oxygen species (ROS) in Beta cells[29] . In hyperglycemic patients, thebeta cells get destructed (Fig. 1). Therefore, high glucose entersthe mitochondria and releases reactive oxygen species. Sincebeta cells have low number of antioxidants, this in turn causes apoptosis of the beta cells[30]. Thisreducesinsulin secretionleading to hyperglycemia and in turn diabetes mellitus Type-2.The flavonoids like quercitin and phenolics have been attributedas antioxidants that bring about a scavenging

effect on ROS.It can be hypothesized that the flavonoids in Moringa scavenge theROS released from mitochondria, thereby protecting the betacells and in turn keeping hyperglycemia under control [31]

CONCLUSION AND RECOMMENDATION:

Moringa oleifera is dicotyledonous which can grow in the tropical and subtropical area. Phytochemically Moringa oleifera contains proteins, carbohydrates, tannins, glycosides, fatty acids, flavonoids, and carotenoids. Moringa oleifera has both nutritional and multi medicinal activity. Some of the medicinal effects include anti-microbial, antifungal, antihypertensive, anti-hyperlipidemic, anti-hyperglycemic, antipyretic, wound healing, antitumor, anticancer, anti-inflammatory and for purification of water. Since, Moringa oleifera can survive drought condition and its diet content is superior to vitamins and even than milk in protein content, its nutritional benefit is indivisible.

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