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A review of phytochemistry,medicinal uses and pharmacological actions of shigru

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Abstract

Shigru (Moringa oleifera Lam.) is a medicinally important plant and is used for the treatment of different diseases. In Ayurveda Samhita, Shigru is mentioned nearly by all Aachrayas for nutritional as well as medicinal purpose. Different parts of the plants like bark leaves, seeds, flowers, roots, and immature pods contains abundance of important phyto-constituents like terpenoids, alkaloids, tannins, steroidal aglycones and reducing sugars. Various preperations of Moringa oleifera are used for their anti-inflammatory, anti-hypertentisive , diuretic, anti-microbial, anti-oxidant, anti-diabetic, anti-hyperlipidemic, anti-neoplastic, antipyretics, anti-ulcer, cardio-protectant and Hepato-protectant activities. The present study aims to collect nearly all available information about Ayurvedic aspect Phyto-chemical constituents, medicinal uses as well as pharmacological properties.

Introduction

Moringa oleifera is additionally referred to as horse radish tree and drum stick tree. This plant belonging to family Moringaceae and it is native to sub-Himalayan tracts of India, Pakistan, Bangladesh and Afghanistan. Shigru is popular in develop countries because it's obtained from natural source and shows less advrerse effects. It is small, fast growing evergreen or deciduous tree. It usually grows up to 10 to 12 m in height [38]. Different parts of the plants like bark leaves, seeds, flowers, roots, and immature pods contains large number of important phyto-constituents such as terpenoids, alkaloids, tannins, steroidal aglycones and reducing sugars. According to Ayurveda Shigru has Katu Tikta Rasa, Katu Vipaka and Ushna Veerya. Due to this properties it is Vata-Kapha nashaka and Rakta-Pitta prakopaka. Various preperations of Moringa oleifera are used for their anti-inflammatory, anti-hypertentisive, diuretic, anti-microbial, anti-oxidant, anti-diabetic, anti-hyperlipidemic, anti-neoplastic, antipyretics, anti-ulcer, cardio-protectant and Hepato-protectant activities. The present review is an effort to compile all the previous data on the core of its phytochemistry, medicinal uses and pharmacology reported within the previous articles.

Mophology of Shigru: Moringa oleifera tree is a small, fast-growing evergreen or deciduous tree that usually grows up to 10 or 12 m in height. It has a spreading, open crown of drooping, fragile branches, feathery foliage of tripinnate leaves, and thick, corky, whitish Bark [7].

Moringa oleifera Lam.

Distribution: Shigru is basically native from sub-Himalayan tracts of Northren India, distributed worldwide in the tropics and sub- tropic. Due to its nutritive and medicinal value it is now cultivated in all over India and other counties. All Moringa species are native to India from where they have been introduced into many warm countries in Africa, Arabia, Southeast Asia, South America and the pacific and Caribbean Islands [8].

Habit: Shigru is small to medium evergreen or deciduous tree that can grow to a height of 10:12m. It shows spreading open crown, typically umbrella shaped.

Leaf: The leaves are bipinnate or more commonly tripinnate, up to 45 cm long, and are alternate and spirally arranged on the twings. Pinnae and pinnules are opposite; leaflets are 1.2 to 2.0 cm long and 0.6 to 1.0 cm wide, the lateral leaflets elliptic, the terminal ones obovate; petioles of lateral leaflets are 1.5 to 2.5 mm long, those of terminal ones 3 to 6 mm long, The leaflets are finely hairy, green and almost hairless on the side, paler and hairless beneath, with red:tinged midveins, with entire (not toothed) margins, and are rounded or blunt:pointed at the apex and short:pointed at the bottom. The twings are finely hairy and green, becoming brown.

Leaf base: Base acute, obtuse or rounded, often oblique, apex obtuse, rounded or emarginated, entire, dull green on both sides, lighter coloured beneath, pinnately nerved, at first shortly grey, pubescent.

Root: Seedlings develop a swollen, tuberous, white taproot which features a characteristics pungent odor, and really sparse lateral roots. Trees grown from seeds develop a deep, stout taproot with a good spreading system of thick, tuberous lateral roots. Taproots do not develop on trees propogated from cuttings.

Stem: The bark is whitish-gray, thick, soft, fissured and warty or corky, becoming rough. When wounded, the bark exudes a gum which is initially white in colour but changes to sepia or brown or brownish black on exposure.

Flower: The flowers of Moringa oleifera are grouped in loose axillary panicle (at the upper axils of the leaves). Bisexual, usually more or less zygomorphic, with a saucer-shaped or shortly tubular, often oblique hypanthium, formed partly by an invaginated receptacle. The peduncle is 5:8 cm long, flowers sweet smelling [9].

Fruits (Pods): The fruits are initially light green in colour. Slim and tender, eventually turning dark green and firm. Depending on genotype, they're up to 120 cm long. While most are straight a few are wavy and some curly.

Seed: Seeds are surrounded by a lightly wooded shell with three papery wings. Looks creamson white in appearance.

DESCRIPTION [10]

a) Macroscopic

Drug occuts in pieces of variable sizes, external surface, light greyish-brown,

rough, reticulated, marked with transverse row of lenticels; outer bark, thin, shedding in small bits, internal surface, white.

b) Microscopic

Mature bark shows a very wide zone of cork, consisting of 25 or more rows ofrectangular cells, arranged radially, a few inner layers, larger and cubicular in shape; secondary cortex composed of rectangular, thin-walled cells, a few containing starch grains and rosette crystals of calcium oxalate and a few others containing oil globules and coloured resinous matter; starch grains mostly simple and rarely compound, composed of 2 or 3 components, round to oval in shape, measuring 6 to 28 μ in dia., groups of stone cells, round to rectangular, of various sizes, present in secondary cortex; mucilagenous cavities found scattered towards inner secondary cortical region; secondary phloem appreciably wide, consisting mainly of phloem fibres and phloem 124 Parenchyma; phloem fibres in large patches, alternating with phloem parenchyma; numerous starch grains and cell contents as described above also present in phloem cells; phloem rays numerous, long, 2 to 4 seriate, consisting of radially elongated, thin-walled cells containing numerous starch grains, similar to those present in secondary cortex.

Powder - Pinkish-brown; shows stone cells, phloem fibres, starch grains, measuring 6 to 28 μ in dia., rosette crystals of calcium oxalate and oil globules.

Identity, Purity and Strength

Foreign matter Not more than 2 per cent, Appendix 2.2.2.

Total Ash Not more than 18 per cent, Appendix 2.2.3. Acid-insoluble ash Not more than 10 per cent, Appendix 2.2.4.

Alcohol-soluble extractive Not less than 3 per cent, Appendix 2.2.6. Water-soluble extractive Not less than 11 per cent, Appendix 2.2.7.

T.L.C.

T.L.C. of the alcoholic extract on Silica gel 'G' using Toluene: Ethylacetate (9:1)shows under U.V. (366 nm) two fluorescent zones at Rf. 0.06 and 0.52 (both green). On exposure to Iodine vapour seven spots appear at Rf. 0.06, 0.33, 0.43, 0.54, 0.70, 0.78 and 0.87 (all yellow). On spraying with Vanillin-Sulphuric aeid reagent and heating the plate at 105°C for ten minutes six spots appear at Rf. 0.33, 0.43, 0.54, 0.70, 0.78 and 0.87 (allviolet).

Constituents: Alkaloids and Essential Oil

Phytochemical constituents [11,12]

Different part of the Moringa oleifera tree have been estabilished as being good sources of unique glucosinolates , flavonoids, and phenolic acids, carotenoids, tocopherols, polyunsaturated fatty acids, highly bio-available minerals and folate. Among glucosinolates, 4-0-(a-L-rhamnopyranosyloxy)-benzylglucosinolate (glucomoringin) is the most predominant in the stem, leaves, flowers, pods and seeds of M.oleifera. Although within the roots, benzyl glucosinolate is that the most prominent.

Phytoconstituents of plant moringa oleifera

Sr. No.	Plant Part	Extract	Constituents
1	Leaves	Aqueous and alcoholic	Niazirin and Niazirinin – nitrile glycosides,4-[(4′-O-acetylalpha- L-rhamnosyloxy)benzyl isothiocyanate, Niaziminin A, and Niaziminin B, three mustard oil glycosides, niaziminin, a thiocarbamate,4- (alpha-1-rhamnopyranosyloxy)-benzylglucosinolate, quercetin-3- O-glucoside and quercetin-3-O-(6′′-Malonyl-glucoside),Niazimicin.
2	Seeds	Aqueous and Hydro-alcoholic	Methionine, cysteine, 4-(alpha-L-rhamnopyranosyloxy) benzylglucosinolate, Moringine, benzylglucosinolate, niazimicin niazirin.
3	Pods	Hydro-alcoholic	Isothiocyanate, nitrites, thiocarbamates,O-(1heptenyloxy) propyl undecanoate, O-ethyl-4-(alpha-L-rhamnosyloxy) benzyl carbamate, methyl-p-hydroxybenzoate, beta- sitosterol .
4	Bark	Alcoholic	4-(alpha-L-rhamnopyranosyloxy) benzylgiucosinolate.
5	Flowers	Hydro-alcoholic	D-glucose, quercetin, isoquercetin, kaemopherol, kaempferitin and ascorbic acid, protein, D-mannose.
6	Root	Alcoholic	Moringine, moringinine, spirachin, 1,3-dibenzyl urea, alpha- phellandrene, p-cymene, Deoxy-niazimicine, 4-(alpha-L-rhamnopyranosyloxy)benzyl glucosinolate.
7	Stem	Aqueous and Hydro-alcoholic	4-hydroxyl mellein, vanillin, octacosonoic acid, beta-sitosterone.

Nutritional value of Moringa: Every part of M. oleifera is a storehouse of important nutri-ents and antinutrients. The leaves of M. oleifera are rich inminerals like calcium, potassium, zinc, magnesium, iron and copper.[40] Vitamins like beta-carotene of vitamin A, vitaminB such as folic acid, pyridoxine and nicotinic acid, vitaminC, D and E also present in M. oleifera.[41] Phytochemi-cals such as tannins, sterols, terpenoids, flavonoids, saponins,anthraquinones, alkaloids and reducing sugar present along withanti-cancerous agents like glucosinolates, isothiocyanates, gly-coside

compounds and glycerol-1-9-octadecanoate.[42] Moringa leaves also have a low calorific value and can be used in the diet of the obese. The pods are fibrous and are valuable to treat digestive eproblems and thwart colon cancer.[43,44] A research shows that that 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 flow-ers showed similar amounts of palmitic, linolenic, linoleic andoleic acids.[45] 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.[46] 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 leaves show around 25.5–31.03 mg of zinc/kg, which is the daily requirement of zinc in the diet.[47] PUFAs are linoleic acid, linolenic acid and oleic acid; thesePUFAs 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.[48] A point to note is that the nutrient composition varies depending on the location. Fuglie.[46] 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.[49] 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.[50] A complete list of nutrients available in leaves, pods and seeds are shown in Table.

The nutrient composition of leaves, leaf powder, seeds and pods.

Nutrients	Fresh leaves	Dry leaves	Leaf powder	Seed	Pods
Calories (Cal)	92	329	205	-	26
Protein (g)	6.7	29.4	27.1	35.97 +_0.19	2.5
Fat (g)	1.7	5.2	2.3	38.67 +_0.03	0.1
Carbohydrate (g)	12.5	41.2	38.2	8.67+_0.12	3.7
Fibre (g)	0.9	12.5	19.2	2.87+_0.03	4.8
Vitamin B1 (mg)	0.06	2.02	2.64	0.05	0.05
Vitamin B2 (mg)	0.05	21.3	20.5	0.06	0.07
Vitamin B3 (mg)	0.8	7.6	8.2	0.2	0.2
Vitamin C (mg)	220	15.8	17.3	4.5 +_0.17	120
Vitamin E (mg)	448	10.8	113	751.67+_4.41	-
Calcium (mg)	440	2185	2003	45	30
Magnesium (mg)	42	448	368	635+_8.66	24
Phosphorus (mg)	70	252	204	75	110
Potassium (mg)	259	1236	1324	-	259
Copper (mg)	0.07	0.49	0.57	5.20+_0.15	3.1
Iron (mg)	0.85	25.6	28.2	-	5.3
Sulphur (mg)	-	-	870	0.05	137

All values are in 100 g per plant material.

A 2g teaspoon of Moringa Harvest dired Moringa leaf powder contains [51]

Energy Values	Per 100g	Per 2g Teaspoon	
Energy (Kcal)	320 Kcal	6.4 Kcal	
Energy (Kj)	1349 Kj	26.98 kj	
Protein	27.1g	0.542 g	
Carbohydrate	38.2g	0.764 g	
Fat	2.3g	0.046 g	
Fibre	19.2g	0.384 g	
Dietary Fibre	19g	0.38 mg	
Starch	38g	0.76 g	
Vitamins			**2g as % of RDA**
Vitamin A	18.9 mg	0.378 mg	47.2 %
Vitamin B1	2.64 mg	0.0528 mg	4.8 %

Vitamin B12	0.64 mg	12.8 mg	
Vitamin B2	20.5 mg	0.41 mg	29.3 %
Vitamin C	17.3 mg	0.346 mg	0.43 %
Vitamin E	113 mg	2.26 mg	18.8 %
Niacin	8 mg	0.16 mg	1 %
Retinol	16 mg	0.32 mg	
Minerals			**2g as % of RDA**
Calcium	2003 mg	40.06 mg	5 %
Magnesium	368 mg	7.36 mg	2%

Types of Shigru [1] There are two kinds of shigru in classical texts of medicine on the basis of flower colour viz. white and Red, which are bitter and sweet (Katu: Madhura) in taste & they are specifically known as Katushigru & Madhushigru respectively.

Types of Shigru	**Description**	**Latin name**
MadhuShigru	Red flower	Moringa concanensis Nimmo
KatuShigru	White flower	Moringa oleifera Lam

Rasa-Panchaka [1]

- Rasa: Katu, Tikta
- Guna: Laghu, Ruksha, Teekshna
- Veerya: Ushna
- Vipaka: Katu
- Doshaghnata: Vaata, Kapha
- Karma: Deepana, Hrudya, Vidahakruta, Vishgna, Shukrala, Chakushya, Vaataghna

Gunakarma:[13,1,3,4]

Gunakarma	**Sushruta**	**Bhavaprakasha N.**	**Rajanighantu**	**Dhanavantari N.**
Deepana	+	+	+	
Shophgna	+	+		+
Krimi-hara	+	+	+	+
Vidahkruta		+		
Hrudya		+		
Shukrala		+		
Chakushya		+		
Kapha-Vatahara	+	+	+	+
Mukhajadya-hara			+	
Ruchya		+	+	
Vrana-dosh hara			+	
Visha-nashaka		+		+

Indication [1]

Krimi, pliharoga, Galaganda, Shirashula, Kandu, Shotha, Apachi, Vrana, Medo roga, Vidradhi, Gulma.

Medicinal uses[39].

External uses: A paste of bark and leaves produces burning sensation, is anti-inflammatory and acts on abscesses. It is applied topically on inflammation and abscess. Seed powder is the best shirovirechan nasya, seed powder is administered nasally in headache and heaviness of the head produced by kapha. Seed oil is analgesic hence utilized in rheumatoid arthritis and painful diseases.

Internal uses:

Nervous system – Because it is tikshna and ushna, it is a nerve stimulant. The non crystalline part of the bark is very strong and it acts through afferent nerves of the body. Because of this, it cause hypertention, increases heart rate and contracts the blood vessels. It towers the function of muscles in respiratory as well as gastrointestinal system. Dilatation of pupil occurs similar to the action of adrenaline and ephedrine. Tender plant root is beneficial in epilepsy.

Digestive system: As it is pungent and tikshna, it improves appetite, is digestive, vidahi, grahi, analgesic, antibacterial and deworming agent. Madhu Shigru is viscous and sweet and so it's purgative. It is useful in loss of appetite, tastelessness, pain in abdomen, ascities, gulma and worms.

Circulatory system: Due to ushna guna it acts as a stimulant to heart, creates hypertention and is anti-inflammatory. It is useful in weakness of heart and inflammation.

Respiratory system: Kaphaghna Useful in kaphaj kasa. Seed powder is useful for shodhan nasya.

Urinary system: As it is Ushna, tikshna, it stimulates the kidneys and increases the quantity of urine. It is useful in dysuria. In calculi its decoction is useful. It is not used in hydronephrosis, as it irritates the kidneys and increases inflammation.

Reproductive system: It stimulates menstruation and because it is ushna and anti-inflammatory, it's useful in dysmenorrhoea and obstructed menstruation.

Skin: Tikshna and ushna, induces sweating. Therefore its hot infusion is employed in skin diseases. If there are maggots in the wound, fresh bark paste is applied and bandaged on the wound. Due to its smell, all maggots begin.

Excess Intake: As it is ushna, tikshna, it produces raktpitta and burning sensation if taken in excess dose. It is contra-indicated in pitta prakriti and raktpitta. To counteract the effects of excessive intake of shigru, it should always be taken along with milk and ghee. Cow's milk and ghee are more useful for this purpose.

Aamayika prayoga

- According to Aacharya Charaka decoction of Shigru useful in Shushkarsha (Haemorrhoids) for tub bath [14]. Also in Granthivisarpa, paste of Shigru bark is useful [15]. In Hikka and Shwasa vyadhi (Respiratory disorders) decoction of Shigru leaves give for internal use [16].
- Acharya Sushruta mentioned application of Shigru oil in Kustha kshata (Leprosy) [17]. In Apachi moringa seed powder is used for Nasya [18].
- Madhu Shigru is very useful in meal, drink and also for external application by Aacharya Vagbhata [19].
- According to Aacharya Harita Moringa root juice with jaggaery is useful in headache for Nasya.
- If decoction of Shigru given along with Madhu then Krimiroga (Microbial diseases) will be disappear as early.
- In Dadru vyadhi (Skin disoreder) Shigrumool twak applya externally.

Pharmacological actions: The plant Moringa oleifera posses broad pharmacological activities. Some of them are discussed below.

Antioxidant activity: Aqueous and alcoholic extracts (methanolic & ethanolic) of leaves and roots of Moringa oleifera exhibit strong in-vitro anti-oxidant and radical scavenging activity. Its leaves are rich source of antioxidant compounds; they might protect the animals against diseases induced by oxidative stress. Administration of Moringa oleifera leaves extract seems to prevent oxidative damage caused by high-fat diet [20].

Antiepileptic activity: Methanolic extract of Moringa oleifera leaves exhibit potent anti-convulsant activity against pentylenetetrazole and maximal electroshock induced convulsions at the dose levels of 200 mg/kg and 400 mg/kg administered intraperitonially. Diazepam and phenytoin were used as reference standard. Methanolic extract significantly delayed the onset of seizures in Ptz induced convulsions and significantly reduced duration of limb extension in MES test at both the dose levels. This may be because of the presence of alkaloids, flavonoids and tannins present in the extract [21].

Anticonvulsant activity: Studies were performed to determine the in-vivo anti-convulsant effect of ethanolic extract of Moringa concanensis leaves (200 mg/kg, i.p) on MES and PTZ-induced seizures in Swiss albino mice. Observation revealed MES seizures, suppression of tonic limb extension. In PTZ seizures, abolition of the convulsions was noted. The ethanolic extract of Moringa concanensis leaves may produce its anti-convulsant effects via multiple mechanisms since it abolished the hind limb extension induced by MES as well as abolished seizures produced by PTZ [22].

Anti-diabetic activity: Aqueous extract of Moringa oleifera leaves shows anti-diabetic activity and controls diabetes and thus exhibit glycemic control [23].

The investigation of in-vitro antioxidant and in-vivo antidiabetic effects of methanol extracts of Moringa oleifera pods in streptozotocin (STZ)-induced diabetic albino rats was performed. Diabetic rats were treated with 150 or 300 mg/kg of extract for 21 days and therefore the antidiabetic effects were evaluated by measuring changes in biochemical parameters in serum and pancreatic tissue. The progression of diabetes was significantly reduced after treatment with the extract. In treated rats, both doses of extract induced a big reduction in serum glucose and gas, with concomitant increases in serum insulin and protein levels [24].

The antidiabetic activity of two doses of Moringa seed powder 50 and 100 mg/kg on STZ induced diabetes male rats was investigated. The diabetic positive control group showed increased IL-6, increased lipid peroxide, and de- creased antioxidant enzyme in the serum and kidney tis- sue homogenate compared with that of the negative con- trol group [25].

Cardiovascular activity: Ethanolic extract of Moringa oleifera leaves showed prominent anti- hypertensive or hypotensive activity. The in-vivo activity was done in animal's heart and it was found that thiocarbamate and isothiocyanate glycosides were responsible for this powerful hypotensive activity [26].

Anti-fertility activity: Aqueous extract of Moringa oleifera roots was found to be effective as anti-fertility in presence or absence of estradiol dipropionate and progesterone. The in-vivo antifertility activity and

histopathology study was done using aqueous extract to investigate the effect on histoarchitecture of the uterus during pre and post–implantation stages [27].

Antiurolithiatic activity: The in-vitro anti-urolithiatic activity was performed in aqueous and alcoholic extract of bark of Moringa oleifera. It showed reduction in weight of stone produced using glycol induced urothiasis. It also possesses both preventive and curative property [28].

Anti-asthmatic activity: A study was carried out to investigate the usefulness of Moringa oleifera seed kernel in patients of bronchial asthma. The patients of either sex with mild-to-moderate asthma were treated with finely powdered dried seed kernels in dose of three g for 3 weeks. The clinical efficacy was assessed employing a spirometer prior before and at the top of the treatment. The majority of patients showed increase in hemoglobin (Hb) values and reduction in Erythrocyte sedimentation rate (ESR). Improvement was also observed in symptom score and severity of asthmatic attacks. After 3 weeks treatment in asthmatic subjects the drug produced significant improvement in forced capacity, forced expiratory volume in one second, and peak expiratory flow rate values by 32.97 ± 6.03%, 30.05 ± 8.12%, and 32.09 ± 11.75% respectively [29].

Alcoholic extracts of Moringa oleifera seed kernels were found spasmolytic in acetylcholine, histamine, Bacl2 and 5HT, induced bronchospasm [30].

Hepatoprotective activity: In-vivo hepatoprotective activity of ethanolic extract of leaves and alcoholic extract of seed of Moringa oleifera was estimated against isoniazid, rifampicin, and pyrizinamide induced liver damage. Haematological along with hepatorenal functions of methanolic extract of Moringa oleifera roots, doses of the crude extract (CE) on liver and kidney functions were also reported [31].

Anti–cancer activity: Ethanolic extracts of leaves and seeds of Moringa oleifera shows potent anti–tumor activ- ity. Thiocarbamate and isothiocyanate related compounds were isolated and which act as inhibitor of tumor promoter. The in-vivo antitumor potential was due the presence of three known thiocarbamate and isothiocynate related compounds which act as inhibitors of tumor promoter teleocidin B-4-induced Epstein–barr virus, interestingly.[32]

Anti-inflammatory activity: Methanolic and aqueous extract of root and bark, methanolic extract of leaves and flowers and ethanolic extract of seeds of Moringa oleifera posses anti-inflammatory activity. In-vitro anti-inflammatory activity from the hot water infusions of flowers, leaves, roots, seeds and stalks or bark of Moringa oleifera using carrageenan-induced and the extract was pharmacologically evaluated [33].

Anti-microbial activity: Leaves, roots, bark and seeds of Moringa oleifera show anti-microbial activity against bacteria and fungi. The plant shows in vitro activity against bacteria, yeast, dermatophytes and helminths by disc- diffusion method. The fresh leaves and aqueous extract from the seeds inhibit the growth of Pseudomonas aeruginosa and staphylococcus aureus [34].

Anthelmintic activity: In-vitro study assessed the efficacy of macerated and infused aqueous extract as well ethanolic extract of Moringa oleifera against fresh eggs, embryonated eggs, L1 and L2 larvae of Haemonchus contortus. Five different concentrations of extracts were prepared (0.625, 1.25, 2.5, 3.75 and 5 mg/mL). Fresh eggs were exposed to those different concentrations for 48 hours, while embryonated eggs and larvae were exposed for six and 24 hours respectively. Distilled water and 1.5% DMSO were used as negative control. Results revealed that ethanolic leaf extract of Moringa oleifera was most effective on eggs by in- hibiting 60.3% ± 8.2% and 92.8% ± 6.2% eggs embryonation at 3.75 and 5 mg/mL respectively [35].

Different concentrations of ethanolic extracts of Moringa oleifera and Vitex negundo were assessed for antihelmentic activity against Pheritima posthuma. Piperazine citrate (10 mg/mL) was used as a reference standard and water served as a impact group. The results were expressed in were expressed in terms of your time for paralysis and time for death of worms. Moringa oleifera shows more activity as compared to Vitex negundo in dose dependent manner [36].

CNS activity: Moringa oleifera leaves extract restores mono amine levels of brain, which can be useful in Alzheimer's disease. In-vitro anticonvulsant activity from the aqueous extract of Moringa oleifera roots and ethanolic extract of leaves was studied on penicillin induced convulsion, locomotor behaviour, brain serotonin (5-HT), dopamine and norepinephrine level and evaluated [37].

Conclusion

Moringa oleifera Lam. is an small, fast-growing evergreen or deciduous tree with abundant nutritional contents. Due to nutritional value it is thoroughly used in cooking. Different parts of the plants like bark leaves, seeds, flowers, roots, and immature pods contains sizable amount of important phyto-constituents like

terpenoids, alkaloids, tannins, steroidal aglycones and reducing sugars. Shigru have Katu, Tikta rasa, Katu vipaka and Ushna veerya therefore it will be used in Krimi, pliharoga, Galaganda, Shirashula, Kandu, Shotha, Apachi, Vrana, Medo roga, Vidradhi and Gulma vyadhi. In short Shigru is used commonly in Vata-Kapha vyadhi. Various preperations of Moringa oleifera are used for their anti-inflammatory, anti-hypertentisive, diuretic, anti-microbial, anti-oxidant, anti-diabetic, anti- hyperlipidemic, anti-neoplastic, antipyretics, anti-ulcer, cardio-protectant and Hepato-protectant activities. The present review is an effort to compile all the previous data on the idea of its phytochemistry, medicinal uses and pharmacology reported within the previous articles.

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