MIT International Journal of Pharmaceutical Sciences, Vol. 5, No. 1, January 2019, pp. 40–46
ISSN 2394-5338 (Print); 2394-5346 (Online) © MIT Publications

Review Article

Amazing health benefits of *Moringa Oliefera* and *Rosa Canina*

Sarika Gupta, Kislaya Mishra*

Hygia Institute of Pharmaceutical Education and Research, Prabandh Nagar, Lucknow, India.

*** Corresponding Author:** *Tel.: +917800020461, E-mail: kisalayamishra@yahoo.in*

ARTICLE INFO
Received 26 Nov 2018
Revised 25 Jan 2019
Accepted 30 Jan 2019

Keywords:
- Drumstick tree
- Osteoarthritis
- Rheumatism
- Carotenoids
- Lactation
- Malnutrition

ABSTRACT

Moringa Oliefera and *Rosa Canina* are well known plant for their high nutritive and medicinal value. *Moringa Oliefera* is also known as drumstick or horseradish tree. Moringa leaves are very rich source of vitamins, antioxidants, iron etc. The plant is a boon for poor people suffering from malnutrition. It is also helpful for lactating mothers. It is rich in macro and micro nutrients like protein, carbohydrate, calcium, phosphorus, potassium, iron, vitamins, beta carotene and other bioactive compounds which are important for normal functioning of the body and prevention of certain diseases. *Rosa canina* L. is a perennial shrub that belongs to Rosacea family. *Rosa canina* L. has been used for long years as a source of vitamins, medicinal supplements, and food throughout the world. It contains various vitamins (especially vitamin C) and other valuable compounds such as polyphenols, carotenoids, carbohydrates and fatty acids. The medicinal properties of rose hip in the symptomatic treatment of osteoarthritis, rheumatism and common cold are discussed in this paper. Moreover, there are evidences about anti-bacterial, anti-cancer, anti-diabetic and anti-obesity properties of this medicinal plant that have been reviewed in this article.

1. *MORINGA OLEIFERA*

Moringa oleifera (M.oleifera) is an effective remedy for malnutrition belonging to the family *Moringaceae. Moringa* is rich source of nutrition owing to the presence of a variety of essential phytochemicals present in its leaves, pods and seeds. In fact, moringa provides 7 times more vitamin C than oranges [1]. *M. oleifera* can be planted in any tropical and subtropical regions of the world with a temperature around 25–35 °C. It needs sandy or loamy soil with a slightly acidic to slightly alkaline pH and a net rainfall of 250–3000 mm [2].

M. oleifera is also known by various regional names as Benzolive, Drumstick tree, Kelor, Marango, Mlonge, Saijan, and Sajna. Over the past two decades, many description have been published describing its nutritional and medicinal properties. The plant *M. oleifera* is inherent to the Indian sub-continent and naturalized in tropical and sub-tropical areas around the world. It is a deciduous tree or shrub, fast-growing, drought resistance, average height of 12 meter at maturity [3].

Fig.1. Plant *Moringa oleifera (M.oleifera)*

2. NUTRITIONAL COMPOSITION OF *MORINGA OLEIFERA*

The Moringa contains many essential nutrients such as vitamins, minerals, amino acids, beta carotene, antioxidants,

ISSN 2394-5338 (Print); 2394-5346 (Online) © MIT Publications

anti-inflammatory nutrients & omega 3&6 fatty acids. Nutrition content of a plant plays an essential function in medicinal, nutritional, and therapeutic properties. It is believed that Moringa leaves contain high source of vitamin C, Calcium, Beta Carotene, potassium as well as protein [4].

Many reports on the nutritional qualities of Moringa now exist in both the scientific and the popular literature. Moringa has been in use since centuries for nutritional as well medicinal purposes. These include vitamin C, which fights a host of illness including colds and flu, vitamin A, which acts as a shield against eye disease, skin disease, heart ailments, diarrhoea and many others diseases; calcium, which builds strong bones and teeth and helps prevent osteoporosis; potassium, which is essential for the functioning of the brain and nerves, proteins, the basic building blocks of all our body cells [5].

Plant Parts	Phytoconstituents	Reference
Leaves	Two nitrile glycosides, niazirin and niazirinin and three mustard oil glycosides, 4-[(4'-O-acetyl-α-Lrhamnosyloxy) benzyl] isothiocyanate, niaziminin A and B, α-Lrhamnosides of 4-hydroxy-benzyl compounds with nitrile, carbamate and thiocarbamate groups, flavonoids, anthocyanins, proanthocyanidin and cinnamates, quercetin-3-O-glucoside and quercetin-3-O-(6"-malonyl-glucoside), and lower amounts of kaempferol-3-Oglucoside and kaempferol-3-O-(6"- malonyl-glucoside). They also contained 3-caffeoylquinic and 5-caffeoylquinic acid	Bennett et al. 2003; Faizi et al. 1994; Faizi et al. 1995
Bark	4-(α-Lrhamnopyranosyloxy) -benzylglucosinolate	Bennett et al. 2003
Stem	4-hydroxymellein, vanillin, β-sitosterone, octacosanic acid and β-sitosterol	Saluja et al. 1978
Roots	4-(α-Lrhamnopyranosyloxy)-benzylglucosinolate and benzylglucosinolate	Bennett et al. 2003
Flowers	Sugars, D-mannose and D-glucose , G-galactose and D-glucuronic acid	Pramanik et al. 1998
Pods	Nitriles, an isothiocyanate and Thicarbamates and O-[2'-hydroxy-3'-(2"-heptenyloxy)]-propylundecanoate and O-ethyl-4-[(α-l-rhamnosyloxy)-benzyl] carbamate, methyl-phydroxybenzoate and β-sitosterol	Bennett et al. 2003; Faizi et al. 1998; Faizi et al. 1995; Faizi et al. 1994

Fig.2. Phytoconstituents present in plant *Moringa oleifera (M.oleifera)*

3. MEDICINAL ACTIVITIES OF *MORINGA OLEIFERA*

3.1 Anti-fertility activity

It is very prevalent in rural area to use medicinal plants as abortifacient drug. The knowledge of their antifertility activities transferred from generation to generation and *Moringa oleifera* can be used as an abortifacient drug [6]. Aqueous extract of *Moringa oleifera* was found be effective as anti-fertility in presence as well as absence of estradiol dipropionate and progesterone and shown increased histo-architecture of uterine wall [7].

3.2 Hepatoprotective activity

Ethanolic extract of leaves and alcoholic extract of seeds of *Moringa oleifera* shown hepatoprotective effect in isoniazid, rifampicin, pyrazinamide induced liver damage and diclofenac induced hepatic toxicity in rat, respectively [7].

3.3 Anti-oxidant activity

Aqueous, methanolic (70%), ethanolic extract (80%) of leaves of *Moringa oleifera* exhibit strong anti-oxidant and radical scavenging activity [7].The antioxidant activity of *Moringa oleifera* leaves is due to presence of Kaemferol [8]. The antioxidant activity of leaves as well as roots of *Moringa oleifera* also reported by Sultana B *et al*., Verma AK *et al*. and Singh BN *et al*. [9-11].

3.4 Cardiovascular activity

It was found that ethanolic extract of *Moringa oleifera* leaves shows antihypertensive or hypotensive activity and thiocarbamate and isothiocyanate glycosides are responsible for this promising hypotensive activity [7]. Six new and three synthetically known glycosides from the ethanolic extract of the leaves of *Moringa oleifera* was reported by S. Faizi *et al.* Most of these compounds, bearing thiocarbamate, carbamate or nitrile groups, are fully acetylated glycosides, thiocarbamates showed hypotensive activity [12].

3.5 Diuretic activity

Hot water infusion of flowers, leaves, roots, seeds and bark of *Moringa oleifera* shows increased urine output in rat [13].

3.6 CNS activity

Treatment with *Moringa oleifera* leave extract restores mono amine levels of brain which may be useful in Alzheimer's disease. Methanolic extract of *Moringa oleifera* root bark was tested on frog and guinea pig and it shown local anaesthetic activity in both animal models [13].

3.7 Anti-spasmodic activity

Caceres *et. al* had found that *M. oleifera* roots to possess anti-spasmodic activity [14]. Moringa leaves have been extensively studied pharmacologically and it has been found that the ethanol extract and its constituents exhibit antispasmodic effects possibly through calcium channel blockade [15].

3.8 Anti-diabetic activity

Aqueous extract *Moringa oleifera* leaves shows anti-diabetic activity on glucose tolerance in Goto-Kakizaki and wistar rats [16]. Aqueous extract of *Moringa oleifera* leaves shows antidiabetic control and thus exhibit glycemic control [17].

3.9 Anti-microbial and anti-fungal activity

Leaves, roots, bark and seeds of *Moringa oleifera* shown *in-vitro* antimicrobial activity against bacteria (*Bacillus cereus, Candida albicans, Streptococcus faecalis, Staphylococcus aureus, Staphylococcus epidermidis, Bacillus subtilis, Shigella shinga, Shigella sonnei, Pseudomonas aeruginosa, E. coli and Aspergillus niger*), yeast, dermatophytes and helminthes in a disk diffusion technique. It was also reported that *Moringa oleifera* exhibit antifungal activity in both broth dilution and agar plate

ISSN 2394-5338 (Print); 2394-5346 (Online) © MIT Publications

methods against *Trichophyton rubrum* and *T. mentagraphytes*, *Trichophyton mentagrophytes, Epidermophyton Xoccosum,* and *Microsporum canis*, *Fusarium solani* and *Rhizopus solani* [13-18]. Moringa seed powder is used to purify the drinking water.

3.10 Anti-epileptic activity

Methanolic extract of *Moringa oleifera* leaves were investigated its anti-convulsant activity using pentylenetetrazole (PTZ) and maximum electric shock (MES) on male albino mice [19].

3.11 Anti-asthmatic activity

Alcoholic extracts of *Moringa oleifera* seed kernels were found spasmolytic in acetylcholine, histamine, $BaCl_2$ and 5HT induced bronchospasm. In same study, it shown protection against egg albumin and compound 48/80 induced mast cell degranulation as well as pretreatment with alcoholic extract of *Moringa oleifera* seed kernel, decrease carrageenan induced paw edema [20].

3.12 Anti-urolithiatic activity

The aqueous extract of bark of *Moringa oleifera* shows reduction in weight of stone produced using ethylene glycol (1%) induced urolithiasis model. It was proved that it possesses both preventive and curative property in this study [21].

3.13 Anti-inflammatory activity

Methanolic extract of root bark, aqueous extract of roots, methanolic extract of leaves and flowers as well as ethanolic extract of seeds of *Moringa oleifera* has shown anti-inflammatory activity in carrageenin induced paw edema model. A urantiamide acetate and 1,3-dibenzyl urea, isolated from roots shown this anti-inflammatory activity so they responsible for anti-inflammatory activity of *Moringa oleifera roots* [13].

3.14 Anti-cancer activity

Various extracts of leaves and ethanolic extract of seeds of *Moringa oleifera* shows antitumor activity in *in-vitro* tests. Thiocarbamate and isothiocyanate related compounds were isolated, which act as inhibitor of tumor promoter teleocidin B-4-induced Epstein- Barr virus (EBV) activation in Raji cells [13].

3.15 Anthelmintic activity

Ethanolic extract of *Moringa oleifera* leaves shown more anthelmintic activity against Indian earthworm Pheritima posthuma, compare to *Vitex negundo*. Time for paralysis and time for death of worms with *Moringa oleifera* leaves were less compared to roots of *Vitex negundo* [22].

3.16 Anti-ulcer activity

Aqueous extract of *Moringa oleifera* leaves exhibits antiulcer activity in various animal models on adult holtzman albino rats of either sex [13].

3.17 Wound healing activity

Aqueous extract of *Moringa oleifera* leaves shown wound healing property on male swiss albino mice. It significantly increases wound closure rate, skin breaking strength, granuloma breaking strength as well as decrease in scar area [13]. This was supported by Hukkeri *et al*. who investigated antipyretic and wound healing property of ethanolic and ethyl acetate extract of *Moringa oleifera* leaves [23].

3.18 Analgesic activity

Methanolic extract of *Moringa oleifera* root bark shown analgesic activity in Acetic acid induced writhing model in mice using acetic acid-induced writhing method for analgesic activity [13].

3.19 Anti-depressant activity

This study suggested that combined administration of *Moringa Oleifera* leaf extract with low doses of fluoxetine or other SSRI drugs showed to have anti-depressant activity [24]. They found that a significant change in all tested activities (FST, TST, LAT) of chronically dosed mice were observed, especially in animals given simultaneously combined doses of 200 mg/kg/day MOE + 10 mg/kg/day fluoxetine for 14 days. The antidepressant effect of MOE may have been due to noradrenergic-serotonergic neurotransmission pathway, which is the hallmark of selective serotonin reuptake inhibitors (SSRI) class of drugs [24].

3.20 Anti-hypertensive activity

Moringa oleifera leaves have traditionally been used in Ayurvedic medicine for their antihypertensive activity. In this study it was found that a water extract of leaves of this tree is efficacious in reducing the chronotropic and inotropic effects on the isolated frog heart [25].

3.21 Anti-hyperlipidemic activity

The study showed that aqueous and 70% ethanol extracts significantly prevented blood pressure increment in a dose dependent manner comparable to that of the standard drug. Similarly, the extracts suppressed increment in lipid profile (cholesterol, glucose, and triglycerides) compared with negative control. The biochemical test revealed that extracts produced a rise in liver but no effect on kidney function indicators compared with normal control. They concluded that crude extracts of *M. stenopetala* (Baker f.) Cufod. possess antihypertensive and antihyperlipidemic effect [26].

3.22 Anti-obesity activity

The results revealed chronic administration of high fat diet in rats led to an increase in body weight that is in group B1 significant increase in thoracic (TC) and abdominal (AC) circumferences as well as body mass index (BMI) in obese group. On the other side, in group B2 treatment with *Moringa oleifera* leaf powder in single dose reduce food intake and BMI in obese groups. Group B3 treatment with *Moringa oleifera* leaf powder in BID dose resulted in significant decrease in BMI compared to obese

ISSN 2394-5338 (Print); 2394-5346 (Online) © MIT Publications

control group. They concluded that the data of the current study provides experimental evidence for the anti-obesity effect of *Moringa oleifera* ethanol extract. Thus, present findings reinforce the advice recommending consumption of *Moringa oleifera* to modulate obesity [27].

3.23 Local anaesthetic activity

Methanolic extract of *Moringa oleifera* root bark in frog and guinea pig models showed local anaesthetic activity. The local anaesthetic activity was seen in both animal models [28].

3.24 Anti-allergic activity

Ethanolic extract *Moringa oleifera* seeds showed inhibitory action on systemic and local anaphylaxis. The potential anti-anaphylactic effect of extract was studied in a mouse model of Compound 48/80-induced systemic anaphylactic shock. Passive cutaneous anaphylaxis activated by anti IgE-antibody was also used to assess the effect of extract [29].

4. *ROSA CANINA* (ROSE HIP)

Rose hips are the fruits of rose bush (rose plant) belonging to Rosa genus in the Rosaceae family. Rose hips have long been used as an herbal tea and vitamin supplement as well as incorporated as ingredients in the preparations of several food products such as soups, jam, jellies, syrups, wine, beverages and soft drinks [30].

5. ACTIVE CONSTITUENTS OF *ROSA CANINA*

The *Rosa canina* shows its health benefit due to the presence of the following bioactive compounds including the anti-inflammatory galactolipid: (2S)-1,2-di-O-[(9Z,12Z,15Z)-octadeca-9,12,15-trienoyl]-3-Oβ-D-galactopyranosyl glycerol (GOPO), vitamin C, phenolics, lycopene, lutein, zeaxanthin, and other carotenoids. As cyclooxygenase inhibitors, RH compounds may reduce the risk of cancer, heart disease, and various inflammatory conditions. Rose hip is the pseudo fruit of the rose plant. RH of some species, especially Rosa canina L. (dog rose), are considered valuable sources of polyphenols and vitamin C [31].

Fig. 3. Plant *Rosa canina*

6. MEDICINAL ACTIVITIES OF *ROSA CANINA*

6.1 Anti-inflammatory and immunomodulatory activity

The anti-inflammatory and immunomodulatory effects of RH have been well documented in numerous studies. RH helps to alleviate symptoms of OA (osteoarthritis), RA (Rheumatoid arthritis) and other diseases. OA is the most common form of arthritis. It is a chronic condition in which cartilage breaks down. This causes the bones to rub against each other, leading to stiffness, pain, and loss of joint mobility. RA is a chronic inflammatory autoimmune disorder that affects the joints in a polyarticular manner [31].

6.2 Anti-cancer activity

The role of rose hip in cancer treatment has been widely tested among a wide variety of cancer cell lines, and promising results have been obtained in most cases. The anticancer properties of *Rosa canina* have been evaluated in various cancer cell lines. All groups found significant decreases in cell viability after incubating these cancer cell lines with whole rose hip extract or with purified fractions of its most relevant components (vitamin C and neutral and/or acid phenolic compounds) [32].

6.3 Diabetes

Diabetes mellitus is a group of physiological dysfunctions characterized by hyperglycemia resulting directly from inadequate insulin secretion, insulin resistance, or excessive glucagon secretion [33]. One of the main causes of diabetes mellitus is the deficiency of pancreatic β-cell viability and performance. *Rosa canina* extract with the concentration of 0.001 mg/mL significantly increased proliferation of βTC6 cell line compared with control cells. These results were supported by Orhan *et al* [34].

6.4 Anti-microbial activity

Rosa canina flowers were screened against various plant pathogenic microbial strains to study the antimicrobial properties of the plant. Ethanolic and methanolic extracts of flowers were

ISSN 2394-5338 (Print); 2394-5346 (Online) © MIT Publications

screened applying agar well diffusion method against two Gram-negative bacteria including *Escherichia coli* and *Pseudomonas aeruginosa* and three microscopic filamentous fungi strains *Aspergillus niger*, *Fusarium culmorum* and *Alternaria alternata*, respectively. The best antimicrobial effect of ethanolic extract of *Rosa canina* flowers was found against *Pseudomonas aeruginosa* and the best antimicrobial effect of methanolic extract of *Rosa canina* flowers was found against *Escherichia coli* [35].

6.5 Hyperlipidaemia

Hyperlipidaemia is a condition consisting of elevated plasma cholesterol and/or triglyceride levels. Hyperlipidaemia is associated with an increased risk of cardiovascular disease (CVD), high risk of developing premature coronary artery disease (CAD), hypercoagulability, hyperinsulinemia, insulin resistance, and glucose intolerance pancreatitis [36]. 80% aqueous acetone extracts from the fruit (50 mg/kg/day and seeds (12.5 and 25 mg/kg/day) of *Rosa canina* significantly reduced plasma triglyceride (TG) and free fatty acid (FFA) levels after 14 days of treatment in mice [37].

6.6 Anti-ulcerogenic effect

Peptic ulcer disease is an increasing incidence disorder that presents epigastric pain among other common symptoms such as bloating or nausea [38]. Anti-ulcerogenic effect from *Rosa canina* extracts was first discovered by Gurbuz et al. [39]. By inducing ulcerogenesis on rat models, they observed that *Rosa canina* were able to totally prevent ulcer formation. However, they did not propose any mechanism of action that explains the observed effects. Lattanzio et al. went deeper in their studies and observed that treatment with *Rosa canina* prevented gastric mucosa erosion and avoided haemorrhagic ulcer formation [40]. Results from Horvath et al. showed that some carotenoids from *Rosa canina* had certain anti-*Helicobacter pylori* activity[41].

6.7 Anti-diarrheal activity

Methanol extract *Rosa canina* had a significant antidiarrheal activity mediated by an anti-secretory mechanism that reduce intestinal transit thereby increasing the absorption of water and electrolytes and inducing fluid accumulation [42].

6.8 Cardiovascular diseases

It was found that the daily consumption of rose hip powder could noticeably decrease the risk of cardiovascular diseases in obese individuals without any side effects (43).

6.9 Obesity

Obesity rates have experienced such a great increase over these last years that it is now considered to be global epidemic. Changes in diet and lifestyle are the major causes for this increase in incidence and the consequences of obesity include a wide range of disorders, from diabetes to cancer [44 - 46].

6.10 Skin disorders and aging

The effect of quercetin isolated from *Rosa canina* on melanogenesis in B16 mouse melanoma cells investigated by Fuji *et al.* [47]. Melanin is responsible for the pigmentation of human skin, hair and eyes, but its excessive biosynthesis leads to skin disorders like age spots or melanoma [48]. The oral administration of rose hip extracts to brown guinea pigs decreased skin pigmentation, proving their melanogenesis inhibitor effects in vivo and suggesting the potential use of *Rosa canina* as a skin-lightening agent in cosmetic [49].

6.11 Hepatotoxicity

Liver plays a key role in metabolism, detoxification and energy storage in animals. Due to its functions, this organ is highly exposed to multiple xenobiotics and suffers from high levels of oxidative stress, which can cause deleterious effects to its function [50]. *In-vivo* studies revealed that treatment with the fruit extract of *Rosa canina* at 500 and 750 mg/kg doses restored the levels of ALT, AST, ALP, ALB and TB serum in a model of hepatic injury induced by CCl_4 [51].

6.12 Renal disturbances

Acute kidney injury (AKI) is a disorder characterized by a disruption of regular kidney function that causes renal failure [52]. To test the effect of *Rosa canina* extracts on calcium oxalate stones formation, a nephrolithiasic rat model was used. They observed a decrease in calcium oxalate content in treated rats as well as a drop-in number of calcium oxalate calculi. This effect is supposed to be result of the antioxidant activity of *Rosa canina*, since they found a significant reduction in lipid peroxidation in kidney, one of the main risk factor for nephrolithiasis [53]. In conclusion, all data collected showed the potential therapeutic role of *Rosa canina* in prevention and even treatment of nephrolithiasis [53].

7. CONCLUSION

After reviewing a multiple of research articles, it was found that the parts of *Moringa oleifera* and *Rosa canina* have a lots of health benefits, including anticonvulsant, antioxidant (for cardiovascular diseases), antidiabetic, anti-nephrotoxicity, anti-bacterial and anti-fungal, antiulcer, anti-cancer, antiurilhiatic, antitumor, anti-inflammatory and anti-hypertensive, diuretic, analgesic, anti-asthmatic, antispasmodic, hepatoprotective, wound healing, anti-depressant, hypolipidemic activity and antiobesity activity. Rose hip extracts are specially used to prepare medicines used in osteoarthritis. Due to all these benefits *Moringa oleifera* can be called as an amazing tree or Miracle tree. Moringa is very easily available plant to treat malnutrition and anaemia. According to latest reseach, Moringa has antimicrobial property and can purify contaminated water. There should be an awareness regarding moringa and rose hip in general population.

REFERENCES

[1] Gopalakrishnan L, Doriya K, Kumar DS. Moringaoleifera: A review on nutritive importance and its medicinal application. Foo Sci and Hum Well 2016; 5(2): 49-56.

[2] Thurber MD, Fahey JW. Adoption of Moringa oleifera to combat under-nutrition viewed through the lens of the diffusion of innovations theory. Ecol. Food Sci. Nutr 2009; 48(3): 212-25.

[3] Dixit S, Tripathi A, Kumar P. Medicinal properties of Moringa oleifera: A review. IJESRR 2016; 3(2): 2348-6457.

[4] Faizal A, Razis A, Ibrahim MD, Kntayya SB. Health Benefits of Morienga Oleifera. APJCP 2014; 15 (20): 8571-8576

[5] Mahmood KT, Mugal T, Ikram UH. Moringa oleifera: a natural gift-A review. J Pharm Sci& Res 2010; 2 (11):775-81

[6] Sethi N, Nath D, Shukla SC, Dyal R. Abortifacient activity of a medicinal plant Moringa oleifera. Ancient Science of Life 1988; 7(3, 4):172-74.

[7] Tejas GH, Joshi UH, Bhalodia PB, Desai TR, Tirgar PR. A panoramic view on Pharmacognostic, Pharmacological, Nutritional, Therapeutic and Prophylactic values of moringa oleifera lam. IRJP 2012; 3(6): 2230-8407.

[8] Bajpai M, Pande A, Tewari SK, Prakash D. Phenolic contents and antioxidant activity of some food and medicinal plants. Int J Food Sci Nutr 2005; 56(4): 287-91.

[9] Sultana B, Anwar F, Ashraf M. Effect of extraction solvent/ technique on the antioxidant activity of selected medicinal plant extracts. Molecules 2009; 14 (6): 2167-80.

[10] Verma AR, Vijayakumar M, Mathela CS, Rao CV. In vitro and in vivo antioxidant properties of different fractions of Moringa oleifera leaves. Food Chem Toxicol 2009; 47(9): 2196-3001.

[11] Singh BN. Oxidative DNA damage protective activity, antioxidant and anti-quorum sensing potentials of Moringa oleifera. Food Chem Toxicol 2009; 47(6):1109-16.

[12] Faizi S, Siddiqui BS, Saleem R, Siddiqui S, Aftab K, Gilani AH. Fully acetylated carbamate and hypotensive thiocarbamate glycosides from Moringa oleifera. Phytochemistry 1995; 38(4): 957-63.

[13] Mishra G. Traditional uses, phytochemistry and pharmacological properties of Moringa oleifera Plant: An overview. Der Pharmacia Lettre, 2011, 3(2): 141-164.

[14] Caceres A, Saravia A, Rizzo S, Zabala L, De Leon E, Nave F. Pharmacologic properties of Moringa oleifera. 2: Screening for antispasmodic, antiinflammatory and diuretic activity. J Ethnopharmacol 1992; 36(3):233-7.

[15] Anwar F, Latif S, Ashraf M, Gilani AH. Moringa oleifera: a food plant with multiple medicinal uses. Phytother Res 2007; 21(1):17-25.

[16] Suzuki K. Evaluation of antidiabetic activity of *Moringa oleifera*. Journal of Clinical and Biochemistry Nutrition 2007; 40: 229– 233.

[17] Jaiswal D, Kumar Rai P, Kumar A, Mehta S, Watal G. Effect of Moringa oleifera Lam. leaves aqueous extract therapy on hyperglycemic rats. J Ethnopharmacol 2009; 123(3): 392-6.

[18] Nadkarni KM. "Indian Materia Medica"; Bombay Popular Prakashan; Volume: 1; Pg No: 811.

[19] Amrutia JN. Anticonvulsant activity of *Moringa oleifera* Lam. Leaves. International Research Journal of Pharmacy 2011; 2(7):160-2.

[20] Mehta A, Agrawal B. Investigation into the mechanism of action of *Moringa oleifera* for its anti-asthmatic activity. Oriental Pharmacy and Experimental Medicine 2008; 8(1): 24-31.

[21] Fahaad J. Antiurolithiatic activity of aqueous extract of bark of *Moringa oleifera* (lam.) in rats. Health 2010; 2 (4): 352-5.

[22] Rastogi T. Comparative Studies on Anthelmintic Activity of *Moringa oleifera* and *Vitex Negundo*. Asian Journal of Research Chem. 2009; 2(2):181-2.

[23] Hukkeri VI, Nagathan CV, Karadi RV, Patil BS. Antipyretic and Wound Healing Activities of Moringa oleifera Lam. in rats. Indian J. Pharm. Sci., 2006; 68 (1): 124-6.

[24] Ginpreet K, Mihir I, Resham S, Harpal SB. Evaluation of the antidepressant activity of *Moringa oleifera* alone and in combination with fluoxetine. J Ayurveda Integr Med 2015; 6 (4): 273–9.

[25] Dangi SY, Jolly CI, Narayanan S. Antihypertensive Activity of the Total Alkaloids from the Leaves of Moringa oleifera". Pharmaceutical Biology 2002; 40(2):144-8.

[26] Bekesho G, Eyasu M, Asfaw D, Ashenif T. *In-vivo* Antihypertensive and Antihyperlipidemic Effects of the Crude Extracts and Fractions of *Moringa stenopetala* (Baker f.) Cufod Leaves in Rats. Front Pharmacol 2016; 7: 97.

[27] Shamsun N, Ferdous MF, Jalaluddin I, Mizanur RM, Abdullah YM. Antiobesity activity of Moringa oleifera leaves against high fat diet-induced obesity in rats. IJBCP 2016; 5(4): 1263-8.

[28] Medhi B, Khanikor HN, Lahon LC, Mohan P, Barua CC. Analgesic, Anti-inflammatory and Local Anaesthetic Activity of Moringa pterygosperma in Laboratory Animals. International journal of Pharmacognosy 1996; 34(3):207-12.

[29] Mishra G. Traditional uses, phytochemistry and pharmacological properties of Moringa oleifera plant: An overview. Der Pharmacia Lettre, 2011, 3(2): 141-4.

[30] Ahmad N, Anwar F, Gilani AUH. Rose Hip (Rosa canina L.) Oils. Essential Oils in Food Preservation, Flavor and Safety, First Edition, 2016, 667-675.

[31] Fan C, Pacier C, Danik M. Rose hip (Rosa canina L): A functional food perspective. Functional Foods in Health and Disease 2014; 4(11): 493-509

[32] Marol I. Therapeutic Applications of Rose Hips from Different Rosa Species. Int J Mol Sci 2017; 18(6): 1137.

[33] Blair M. Diabetes mellitus review. Urol Nurs 2016; 36:27–36.

[34] Orhan N, Aslan M, Hosbas S, Deliorman OD. Antidiabetic effect and antioxidant potential of Rosa canina fruits. Pharmacogn Mag 2009; 5: 309.

[35] Katarina R, Jana P, Margarita T, Jana C, Miroslava K. Antimicrobial activity of rosa canina flowers against selected microorganism. J Microbiol Biotech Food Sci 2015; 4 (1): 62-64.

[36] Patel D, Kumar R, Laloo D, Hemalatha S. Diabetes mellitus: An overview on its pharmacological aspects and reported medicinal plants having antidiabetic activity". Asian Pac J Trop Biomed 2012; 2:411–20.

[37] Ninomiya K. Potent anti-obese principle from Rosa canina: Structural requirements and mode of action of trans-tiliroside. Bioorg Med Chem Lett 2007; 17: 3059–64.

[38] Carlo GD, Mascolo N, Izzo AA, Capasso F. Effects of quercetin on the gastrointestinal tract in rats and mice. Phytother Res 1994; 8: 42–5.

[39] Meli R, Di Carlo G, Capasso F. Inhibitory action of quercetin on intestinal transit in mice. Phytother. Res 1990; 4: 201–2.

[40] Lattanzio F, Greco E, Carretta D, Cervellati R, Govoni P, Speroni E. In vivo anti-inflammatory effect of Rosa canina L. extract. J Ethnopharmacol 2011; 137: 880–5.

[41] Horvath G. Carotenoid composition and in vitro pharmacological activity of rose hips. Acta Biochim Pol 2012; 59: 129–32.

[42] Malfertheiner P, Chan FK, McColl KE. Peptic ulcer disease. Lancet 2009; 374: 1449–61.

[43] Andersson U, Berger K, Hogberg A, Landin-Olsson M, Holm C. Effects of rose hip intake on risk markers of type 2 diabetes and cardiovascular disease: a randomized, double-blind, crossover investigation in obese persons. European journal of clinical nutrition 2012; 66(5): 585.

[44] Morgen CS, Sorensen TI. Obesity: Global trends in the prevalence of overweight and obesity". Nat Rev Endocrinol 2014; 10: 513–4.

[45] Nam SY. Obesity-related digestive diseases and their pathophysiology. Gut Liver 2017; 11: 323–34.

[46] Lastra G, Sowers JR. Obesity and cardiovascular disease: Role of adipose tissue, inflammation, and the renin-angiotensin-aldosterone system. Horm Mol Biol Clin Investig 2013; 15: 49–57.

[47] Fujii T, Saito M. Inhibitory effect of quercetin isolated from rose hip (Rosa canina L.) against melanogenesis by mouse melanoma cells. Biosci Biotechnol Biochem 2009; 73: 1989–93.

[48] Pillaiyar T, Manickam M, Namasivayam V. Skin whitening agents: Medicinal chemistry perspective of tyrosinase inhibitors. J Enzyme Inhib Med Chem 2017; 32: 403–25.

[49] Fujii T, Ikeda K, Saito M. Inhibitory effect of rose hip (Rosa canina L.) on melanogenesis in mouse melanoma cells and on pigmentation in brown guinea pigs. Biosci Biotechnol Biochem 2011; 75:489–95.

[50] Kale I, Khan MA, Irfan Y, Veerana GA. Hepatoprotective potential of ethanolic and aqueous extract of flowers of Sesbania grandiflora (linn) induced by ccl4. Asian Pac J Trop Biomed 2012; 2: S670–S679.

[51] Sadeghi H, Hosseinzadeh S, Touri MA, Ghavamzadeh M, Barmak MJ. Hepatoprotective effect of Rosa canina fruit extract against carbon tetrachloride induced hepatotoxicity in rat. Avicenna J Phytomed 2016; 6:181.

[52] Zuk A, Bonventre JV. Acute kidney injury. Annu Rev Med 2016; 67: 293–307.

[53] Tayefi-Nasrabadi H, Sadigh-Eteghad S, Aghdam Z. The effects of the hydro alcohol of Rosa canina, Fruit on experimentally nephrolithiasic wistar rats. Phytother Res 2012; 26: 78-85.