



## INTERCONTINENTAL JOURNAL OF PHARMACEUTICAL INVESTIGATIONS AND RESEARCH

ICJPIR | Volume 3 | Issue 4 | Oct – Dec- 2016

Research Article

### A review on plants act on both antidiabetic and antihyperlipidemic plants

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#### ABSTRACT

Since ancient times, plants have been an exemplary source of medicine. Ayurveda and other Indian literature mentioned the use of plants in treatment of various human ailments. Medical plants play an important role in the management of diabetes mellitus especially in developing countries where resources are meager. Oral hypoglycemic agents like sulphonylureas and biguanides are still the major players in the management of the disease but there is growing interest in herbal remedies due to the side effects associated with the oral hypoglycemic agents. Herbal medicines have been the highly esteemed source of medicine throughout human history. Hyperlipidemia has been ranked as one of the greatest risk factors contributing to prevalence and severity of coronary heart diseases. Hyperlipidemia is a condition when abnormally high levels of lipids i.e. the fatty substances are found in the blood. Hypolipidemic drugs are extensively used as prophylactic agents to prevent such atherosclerosis induced disorders. But these hypolipidemic drugs are not free from adverse effects. Many plant derivatives and domestic remedies have been screened for their hypolipidemic action. More than 70 medicinal plants have been documented to have significant hypolipidemic action. During the last decade, an increase in the use of medicinal plants has been observed in metropolitan areas of developed countries. Medicinal plants play a major role in diabetes and hypolipidemic activity. The advantages of herbal medicines reported are effectiveness, safety, affordability and acceptability, this review focus on diabetes and hyperlipidemia and the role of plants used for the treatment of diabetes and hyperlipidemia.

**Keywords:** Diabetes, Hyperlipidemia, Oral hypoglycaemic

#### INTRODUCTION

Diabetes mellitus (DM) is a common and epidemic disease affecting the people of both the developed and developing countries. DM is caused

by the abnormality or dysfunction of carbohydrate metabolism [1]. The food we eat is broken into simple sugar called glucose. Glucose is the main source to get energy for the body. After digestion,

it reaches our blood stream and the body cells utilize it for energy. Insulin is very essential for the glucose uptake into the cells. Insulin is a hormone secreted by the pancreas. If the pancreas does not produce enough insulin, glucose get into the body cells so, glucose stays in the blood. This makes the blood as hyperglycemic condition [2].

### Symptoms of diabetes

- Fatigue or severe weakness
- Abnormal thirst
- Irritability
- Unexplained weight loss
- Increased hunger
- Recurrent infections
- Blurred vision
- Increased urination and nocturia

In normal individuals, the liver acts a storehouse of carbohydrates and releases glucose whenever the need arises. The pancreas produces insulin, which circulates in the blood and allows the entry of sugar in the cells. It also helps lowering the blood sugar levels. In case of prediabetic patients, the pancreas does not produce enough insulin leading to increased levels of sugar in the blood up to 100-125 mg/dl. Nowadays, Diabetes is 'killer' of mankind when compared to the disease like cancer and cardiovascular disease. In India, the number of adults suffering from diabetes is expected to increase in threefold from 19.4 million in 1995 to 57.2 million in 2025 [3]. The three main important classical symptoms of diabetic conditions are, polyuria (frequent urination), polydipsia (increased thirst), and polyphagia (increased hunger) [2].

### Classification of Diabetes mellitus

Diabetes have been identified and mainly classified into 3 types.

#### Type I Diabetes

It is also referred as IDDM (Insulin dependent diabetes mellitus or juvenile diabetes). Type I Diabetes results the pancreas (a large gland behind the stomach) fail to produce insulin, without insulin, the body's cells cannot use glucose (sugar), which the body needs for energy. It begins to burn its own fats as a substitute. The type 1 diabetic

patient needs insulin injection every day, to control the glucose level in blood.

#### Type II Diabetes

It is also referred as NIDDM (Non-insulin dependent diabetes mellitus or adult-onset diabetes). Type II DM results from insulin resistance, in which cells fails to use insulin properly. This causes glucose (sugar) to accumulate in the blood stream.

#### Gestational Diabetes

Gestational Diabetes is a form of diabetes consisting of high blood glucose levels during pregnancy and goes away after the baby is born. It develops towards the middle of the pregnancy as a result of the changes in the mother's hormones. To treating the diabetes without any complication or any side effects is a challenging problem in the medical community [4]. For the treatment of diabetes, the traditional medicine is used. More than 1200 plants are used to treat diabetes around the world. About 30% of the traditionally used plants serve as a major source of therapeutic agents for the treatment for diabetes as well as the human disease [5]. Nowadays herbal medicine is an interestingly growing field, because the drugs are having less or no side effects [6]. The treatment of diabetes using the naturally derived agents has more beneficial effects, and does not cause any side effects, or any toxic symptoms. These herbal drugs protect the  $\beta$ -cells during the diabetic condition and reduce the amount of glucose level in the blood [7]. The medicinal plants used on anti diabetic treatments possess pancreatic  $\beta$ -cells regenerating, insulin releasing activity and also fight the problem of Insulin resistance. These herbs also used to increase the insulin secretion, enhancing the glucose uptake by an adipose tissue, and inhibit the glucose absorption from the intestine [1].

#### Hypercholesterolemia

Hypercholesterolemia is a disorder of lipid metabolism manifested by elevation of plasma concentrations of the various lipid and lipoprotein fractions, which is the key risk factor for cardiovascular disorders [8] and has been reported as the most common cause of death in developed as well as developing nations [9,10]. The modern lifestyle, with a high fat diet and little physical

activity, significantly contributes to hypercholesterolemia and cardiovascular diseases [11]. The abnormal cholesterol levels are the result of an unhealthy lifestyle including taking high-fat diet and other lifestyle factors like being overweight, smoking, heavy alcohol use and lack of exercise. Other factors include diabetes, kidney disease, pregnancy, and an underactive thyroid gland [12]. Other illnesses that may elevate cholesterol levels include polycystic ovary syndrome and kidney disease. The higher levels of female hormones like oestrogen, have been noted to increase or change cholesterol levels. In addition, drugs like diuretics, beta-blockers and medicines used to treat depression have also been reported to raise cholesterol levels [13]. Another modifying factors in the development and progression of hyperlipidemia are age and gender. It has been shown that cholesterol levels rise as the person gets older [14,15,16]. High levels of low-density lipoprotein (LDL) cholesterol accumulate in the extracellular sub endothelial space of arteries; these are highly atherogenic and toxic to vascular cells, leading to atherosclerosis, hypertension, obesity, diabetes, and functional depression in organs such as the liver, heart, and kidneys [17]. Clinical trials have shown that lowering lipids reduces the morbidity and mortality associated with cardiovascular complications [18].

### **Classification of lipid concentrations**

The lipids can be classified as TC, triglycerides, LDL, HDL and very low density lipoprotein (VLDL) cholesterol.

### **Total cholesterol**

According to guidelines of National Cholesterol Education Program (NCEP), TC concentrations below 200 mg/dL have been regarded as desirable, whereas, concentrations greater than 240 mg/dL are referred to as hyperlipidemic. However, epidemiological evidence suggests that the risk of cardiac events decreases as TC levels fall approximately to 150mg/dL. Moreover, TC should be less than 180 mg/dL for children.

### **Triglyceride**

The excess calories, alcohol or sugar in the body get converted into triglycerides and stored in fat cells throughout the body. The triglyceride concentration less than 150 mg/dL is regarded as

normal, whereas, concentrations of 200-499 mg/dL are considered as high.

### **LDL cholesterol**

LDL is commonly known as the bad cholesterol, which is produced by the liver and carry cholesterol and other lipids from the liver to different areas of the body like muscles, tissues, organs and heart. The high levels of LDL indicate much more cholesterol in the blood stream than necessary and hence, increase the risk of heart disease. According to NCEP guidelines, LDL cholesterol concentrations below 100mg/dL are considered optimal, whereas concentrations in the range of 160-189 mg/dL are considered to the higher side. However, increasing evidence supports that normal human LDL cholesterol concentration can be as low as 50 to 70 mg/dl

### **HDL cholesterol**

HDL is commonly referred to as the good cholesterol, which is produced by the liver to carry cholesterol and other lipids from tissues back to the liver for degradation. High levels of HDL cholesterol have been considered as a good indicator of a healthy heart. The concentrations of 60 mg/dL or higher have been considered as optimal. However, HDL is often interpreted in the context of TC and LDL concentrations, and hence may be regarded as less significant when LDL is low.

### **VLDL cholesterol**

VLDL is similar to LDL cholesterol in the sense that it contains mostly fat and not much protein. They are formed by a combination of cholesterol and triglycerides. Moreover, VLDLs are heavier than LDL, and are also associated with atherosclerosis and heart disease.

### **Mechanism of lipid transport**

Lipids are insoluble in water. Hence, they are transported around the body as lipoproteins. Lipids originate from two sources: endogenous lipids, synthesized in the liver, and exogenous lipids, ingested and processed in the intestine. Approximately 7% of body's cholesterol circulates in plasma in the form of low density lipoproteins (LDL). The level of plasma cholesterol is

influenced by its synthesis and catabolism in which liver plays a crucial role.

### Causes of hyperlipidemia

The main cause of hyperlipidemia includes changes in lifestyle habits in which risk factor is mainly poor diet i.e. with a fat intake greater than 40 percent of total calories, saturated fat intake greater than 10 percent of total calories; and cholesterol intake greater than 300 milligrams per day or treatable medical conditions. The abnormal cholesterol levels are the result of an unhealthy lifestyle including taking high-fat diet and other lifestyle factors like being overweight, smoking heavy alcohol use and lack of exercise. Other factors include diabetes, kidney disease, pregnancy, and an underactive thyroid gland.

### Medicinal weeds with anti-diabetic and anti-hyperlipidaemic activity

#### *Ageratum conyzoides* L. (Asteraceae)

##### Common names

Billygoat-weed, Goatweed, Whiteweed or Chickweed.

##### Description

It is an annual herb ramified and up to 1 m tall. Its stem and leaves are covered with tiny white hairs. Leaves are opposite, pubescent with long petioles and include glandular trichomes. The flowers are purple and white and the fruits are black and easily dispersed.

##### Parts used

Whole plant and leaves.

##### Medicinal uses

Pharmacological studies have revealed that the plant has anti-diarrhoeal and antibacterial, antiparasitic, anti-inflammatory anticoagulant, myorelaxant, haemostatic, analgesic, antifungal and hypothermic properties. In traditional medicine, a decoction or infusion of *A. conyzoides* is used for the treatment of constipation, hepatitis, eczema, epilepsy, wounds, dizziness, diarrhoea, vomiting, fever, headaches, intestinal worms and filariasis. Fresh leaf aqueous extract is used in treating painful menstruation, itching of eye and against lice. An ethno-botanical study reported that, leaves, or entire plant decoction is useful for the treatment

of diabetes [19]. The hypoglycaemic and anti-hyperglycaemic properties of the aqueous extracts of the leaves of *A. conyzoides* L. have been validated in normo- and hyperglycaemic rats. Toxicity The plant has been reported to have hepatotoxic activities. It contains pyrrolizidine alkaloids and echinatin which form covalent bonds with nucleic acids of the hepatocytes to disrupt cellular protein synthesis and replication which cause liver lesions and tumours.

#### *Bauhinia rufescens* Lam. (Fabaceae)

##### Description

*B. rufescens* is a shrub usually 1-3 m high and sometimes reaching 8 m. The bark is ash-grey, smooth and very fibrous. The leaves are very small with greenish-yellow to white and pale pink flowers. Fruits aggregated with 4-10 seeds each [20]

##### Parts used

Whole plant roots and leaves.

##### Medicinal uses

The plant is used in the treatment of gout, gingivitis, diarrhoea, dysentery, diabetes, leprosy and malaria. The leaves and fruit are for the treatment of diarrhoea, dysentery and ophthalmic diseases. An extract of the root is used as an astringent or antipyretic. The bark of the roots and trunk is used to cure chest complaints, syphilis and other venereal diseases and to reduce fever. An investigation carried out by [21] showed that methanolic leaf extracts of *Bauhinia rufescens* has beneficial effects on diabetic hyperlipidemia as such could be advanced in preventing the development of atherosclerosis and possible related cardiovascular pathologies associated with diabetes

#### *Cassia auriculata* L. (Fabaceae)

##### Common name

Tanner's cassia

##### Description

*C. auriculata* is a much branched shrub with smooth cinnamon brown bark and closely pubescent branchlets. The leaves are alternate, stipulate, paripinnate compound, very numerous, closely placed. Its flowers are irregular, bisexual, bright yellow and large. The fruit is a short legume,

oblong, obtuse, tipped with long style base, flat, thin, papery, undulately crimped, pilose, pale brown [22].

### Parts used

Roots, leaves, flowers and seeds.

### Medicinal uses

This plant is said to contain a cardiac glucoside (sennapicrin) and sap, leaves and bark yield anthraquinones, while the latter contains tannins. The root is used in decoctions against fevers, diabetes, diseases of urinary system and constipation. The leaves have laxative properties. The dried flowers and flower buds are used as a substitute for tea in case of diabetes patients. The powdered seed is also applied to the eye, in case of chronic purulent conjunctivitis. In Africa, the bark and seeds are said to give relief in rheumatism, eye diseases, gonorrhoea, diabetes and gout. The plant has been shown to have antibacterial activity in laboratory animals. A study conducted by [23] on *Cassia auriculata* flower extract (CFEt), at doses of 0.15, 0.30 and 0.45 g/kg body weight for 30 days, observed the suppression of elevated blood glucose and lipid levels in diabetic rats. *C.auriculata* at 0.45 g/kg was found to be comparable to glibenclamide. These findings indicate that the *C.auriculata* flowers possess antihyperlipidaemic effect in addition to antidiabetic activity.

### Gongronema latifolium (Asclepiadaceae)

Description this is a climbing shrub with hollow stems and fleshy roots, containing latex. Leaves are opposite, simple and entire with petioles. Its blade is broadly ovate, base deeply cordate, apex acuminate, papery. Inflorescence is terminal and axillary cymose panicle. Flowers are bisexual, small, 5-merous, regular, yellowgreen, and fragrant; calyx lobes elliptical to rounded, hairy at apex.

### Parts used

Whole plant, leaf and stem bark Medicinal value: *G.latifolium* is reported to have anti-inflammatory, antibacterial, antioxidant, anti-asthmatic and antiplasmodal activities. The leaf extracts have analgesic effects, antipyretic and anti-sickling activities. The stem bark extracts have anti-ulcerative property. It is used to treat malaria,

stomach disorders, diabetes, hypertension, muscular pains, arthritis and inflammation, cough and loss of appetite. It has also been reported that the plant is used for the treatment of sore gums, colic, dyspepsia and anthelmintic, worm infections and for maintaining healthy blood glucose level. The plant contains phytochemicals such as polyphenols, alkaloids, glycosides, flavonoids, terpenes, tannins, saponins, alkaloids,  $\beta$ -sistosterol, lupenyl esters, pregnane ester and essential oils [24] Work done by [25] showed the presence proteins, flavonoids, saponins, alkaloids, terpenoids, and steroids in methanol extract and fractions giving credence to the use of *G. latifolium* in the management of diabetes mellitus.

### Hyptis suaveolens (L.) Poit (Lamiaceae)

#### Common name

Pignut or Chan

#### Description

It is an annual to perennial subshrub which grows up to 2m high having branches and long white piliferous stems, its flowers are purple, the leaves are ovate with serrulate margins; the flowers are whorly arranged and the fruits are broadly obovoidal [26, 27]

#### Part used

Leaves Medicinal uses: The leaves serve as antiseptic, sudorific, galactagogue and antidiabetic. The essential oils have mild antifungal activity against *Candida albicans* and *Aspergillus niger*. Phytochemicals present are alkaloids, glycosides, phytosterols, saponins, phenolic compounds and tannins. A significant reduction in blood glucose was observed in diabetic animals treated with *H. suaveolens* at different doses when compared with diabetic rats. Levels of triglyceride, total cholesterol, low density lipoprotein, very low density lipoprotein were decreased. The results therefore showed that *H. suaveolens* possesses significant antihyperglycemic activity which might be attributed to stimulating effects on glucose utilization and antioxidant enzyme [28]



### **Ipomoea sepiaria Roxb**

(Convolvulaceae) **Synonym: Ipomoea aquatica** **Common name: Purple Heart Glory**

#### **Description**

It is a perennial slender herb with hairy stems; the leaves are simple, alternate, petiolate, ovate to cordate in shape; the flowers pale purple and subumbellate axillary cymes and the fruits are void [29, 30] Parts used: Whole plant, leaves and roots. Medicinal uses The root is used in the treatment of leucorrhoea and infertility. Whole plant serves as a tonic, aphrodisiac, antidiuretic, antidiabetic and hyperdipsia. The leaves have antibacterial activity. The phytochemicals reported to be present are carbohydrates, alkaloids, glycosides, flavonoids, phenolic compounds, tannin and saponin. The antidiabetic effect has been studied in streptozotocin induced diabetic Wistar rats, and Type II diabetic patients. The results revealed that consumption of the shredded, fresh, edible portion of *I. aquatica* for one week, effectively reduced the fasting blood sugar level of streptozotocin-induced diabetic rats ( $p = 0.01$ ). When subjected to a glucose challenge, the Type II diabetic subjects showed a significant reduction ( $p = 0.001$ ) in the serum glucose concentration 2 h after the glucose load. However, it was not significantly reduced at 1 h ( $p < 0.09$ ) post glucose load. There was a 29.4% decrease in the serum glucose concentration of the diabetic patients when treated with the plant extract [31].

### **Mimosa pudica L. (Fabaceae)**

**Common Name: Touch- Me-Not**

Description it is a prickly perennial herb that grows up between 0.5- 0.9m high; leaves are bipinnate, opposite, compound in nature and sensitive to touch; flowers are axillary positioned, clustered in fluffy balls, radially symmetrical and campanulate; fruits occur in aggregate of 2-8 pods [32].

Parts used: Root, leaf and whole plant Medicinal uses The root extract is used to treat leprosy, dysentery, asthma, insomnia, premenstrual syndrome, menorrhagia, jaundice, impotence and haemorrhoid. The leaves are used to treat type-I diabetes. The whole plant is used to treat asthma. In a study conducted by [33], attempts were made to

study anti-diabetic activity of the leaves of *Mimosa pudica* Linn. ethanolic extract showed significant decrease in blood glucose level which compared well with metformin as standard drug (500mg/kg) in alloxan-induced (150mg/kg) diabetic rats.

### **Mollugo nudicaulis Lamk. (Molluginaceae)**

**Common name: Daisey-leaved chickweed**

#### **Description**

It is an annual plant which grows up to 22 cm tall. Leaves are broad, spatulate to oblanceolate, glabrous, and attenuate. Flowers are in dichasial cymes; scapes slender, glabrous; involucre bracts ovate-oblong, scarious; sepals oblong, mucronate, imbricate persistent. Filaments are persistent. Ovary is sub-globose. Seeds are muricate, minutely strophiolate, black and shiny [34],

Parts used: Whole plant. Medicinal value *Mollugo nudicaulis* a medicinal herb, used by traditional practitioners to cure whooping cough, jaundice, cold, cough, fever, body pain and wounds. It is useful mainly in preventing small ring worms in stomach, to control diabetes and to increase the life energy of blood cells. The antidiabetic and antioxidant potential of *M. nudicaulis* whole plant ethanol extract has been demonstrated in alloxan-induced diabetic rats. At a dose 200mg/kg administered orally to the diabetic rats for 21 days, significant decreases in the level of blood glucose, cholesterol, triglycerides, low density lipoprotein (LDL), lipid peroxidation, liver glycogen, serum creatinine, urea, uric acid and liver marker enzymes such as AST, ALT, ALP were observed. It also produced significant increase in high density lipoprotein (HDL), superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GPx), glutathione-S-transferase (GST), reduced glutathione (GSH), and Vitamin C, which clearly showed the antioxidant property of extract.

### **Pergularia daemia (Forsk.) Chiov. (Apocynaceae)**

Description It is a perennial herbaceous plant; the leaves are opposite, simple and broadly ovate to cordate with petioles.

#### **Part used: Whole plant**

Medicinal uses: The whole plant serves as antidiabetic, laxative, antimalarial, anthelmintic,

anti-pyretic and analgesic [35]. Phytochemicals reported to be present are alkaloids, steroids, saponins, terpenoids and flavonoids. A study to evaluate the antidiabetic activities of methanol and aqueous extracts of *P. daemia* in alloxan induced diabetic rats showed that oral administration of alcoholic extract of *P. daemia* leaves to diabetic rats for 21 days significantly reduced the levels of blood glucose levels in both acute and sub-acute study. The results were suggestive that the methanol extract of *P. daemia* possess antidiabetic effect on alloxan induced diabetic rats and it can be recommended for the prevention of diabetes mellitus [36].

### **Phyllanthus amarus Schum. & Thonn. (Euphorbiaceae)**

Common names: Stonebreaker or seed-under-leaf

Description *P. amarus* is a small pantropical herb that grows to about 50 cm. Leaf is in one plane. Flowers are all pendent from one side of the branch, separate male and female. Fruits globular-depressed, splits into 3 seeds ribbed [37].

Part used: Whole plant Medicinal uses *P. amarus* is a potential diabetic and hypotensive drug for humans. Whole plant is used in the traditional and folk medicines for the treatment of jaundice, asthma, hepatitis, tuberculosis, ulcer and urinary diseases. It is also used in stomach ailments like dyspepsia, colic, diarrhoea, dysentery, dropsy, urinogenital problems, kidney stones, gall stones and for external application in case of swelling and inflammation (Xavier et al., 2012).

### **Amaranthus viridis L. (Amaranthaceae)**

#### **Common names**

Slender Amaranth or Green Amaranth [38].

#### **Description**

*A. viridis* grows annually as an erect, monoecious herb, and is around 100-300 cm tall.

#### **Parts used**

Whole plant.

#### **Medicinal uses**

*A. viridis* has been reported to have anti-inflammatory, antipyretic, antirheumatic, antiulcer, antiemetic, antidiabetic, diuretic, analgetic,

laxative, antileprotic and hypolipidemic properties. The plant has been used in India traditionally to reduce labour pain, treat respiratory and eye problems, asthma and used for the improvement of appetite. A study was conducted to investigate the antihyperglycemic and hypolipidemic effects of methanolic extract of leaves of *A. viridis* (MEAV) in normal and streptozotocin (STZ) induced diabetic rats. The statistical data indicated a significant increase in the body weight, decrease in the blood glucose, total cholesterol and serum triglycerides after treatment with MEAV. High density lipoprotein (HDL) cholesterol level was significantly increased when treated with extract. Histologically, focal necrosis was observed in the diabetic rat pancreas, however, was less obvious in treated groups. The MEAV has beneficial effects in reducing the elevated blood glucose level and body weight changes, and improves the lipid profile of STZ induced rats. Toxicity, the pollen grains from this plant are known to be highly allergenic and a potential cause of respiratory allergic diseases [39]

### **Euphorbia prostrata Aiton (Euphorbiaceae)**

Common name: Prostrate sandmat, red euphorbia, prostrate spurge.

Description *E. prostrata* (L) is an annual herb with slender prostrate, purple-tinted stems up to about 20 cm long. The oval-shaped leaves are up to 1 cm long with finely toothed edges. The inflorescence is a cyathium with white petal-like appendages surrounding the actual flowers. There are four male flowers and a single female flower, the latter developing into a lobed, hairy fruit.

#### **Parts used: Whole plant.**

Medicinal value *E. prostrata* has been reported to have antihemorrhoidal, anti-inflammatory, analgesic, hypolipidemic, antidiabetic, antidiarrheal, antiasthmatic and astringent properties. It also has antioxidant, haemostatic, antithrombotic and vasoprotective actions for various skin diseases and used traditionally as snake bite remedy. It is effective against various signs and symptoms of haemorrhoids including bleeding, anal discomfort, anal itching, pain at prolapse and proctitis in haemorrhoids [40] The active constituents of *Euphorbia prostrata* include tannins, flavonoids such as apigenin, luteolin and quercetin. It also contains phenolic acids such as

ellagic acid, gallic acid (Sharma *et al.*, 2011). Hypolipidaemic evaluations of *E. prostate* observed a deduction to near normal increased cholesterol levels; from 940.7 to 230.41 (75.55%) and further to 119.2 (87.32%) by the end of the experiment. Similarly, phospholipids and triglycerides levels were reduced. The tissues lipids profiles of liver and heart muscle showed similar changes in those noticed in serum lipids [41].

## CONCLUSION

Twelve plants which are considered as weeds have medicinal values. These plants belong to

about 10 families. The whole plant or different parts of the plants such as roots, stem, flowers, leaves, fruits and seeds are used as medicine. Apart from serving as anti-diabetic and anti-hyperlipidaemic, they are used in the treatment of other various diseases such as dysuria, wounds, jaundice, diarrhoea, skin diseases, malaria, gonorrhoea, toothaches, eye problems, asthma, among others. Most of these weeds are edible and are used as vegetables. It can finally be concluded that weeds are valuable medicines and should be protected. The awareness of the medicinal values of weeds should be made in order to help in the conservation of these plants.

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