

Anti Diabetic Plants Present In West Godavari District Of Andhra Pradesh India- A Short Review.

Venkata Narasimha Kadali*¹, Sudhakara Rao Pola¹, Tadi Ramesh² and B V Sandeep¹

Department of Biotechnology, Andhra University, Visakhapatnam, Andhra Pradesh, India-530003¹.

Department of Biotechnology, S V K P & Dr. K. S. Raju Arts and Science college, Penugonda, Andhra Pradesh, India².

*vnsimhakadali@gmail.com,

9989340062.

ABSTRACT

Diabetes is considered as one of the chronic disease more prevalent in India and rest of the world. Chronic hyperglycemia leads to the destruction of different organs in the body. There are lots of synthetic drugs present in the market for the treatment of diabetes but they are prone to noxious effects to human systems. Herbs have natural inhibiting potency against various sorts of diseases and they are the ultimate source of bio active compounds which lacks toxic effects. Medicinal plants which have potent anti hyperglycemic effect have been identified and proved experimentally. In this short review an attempt has been made to review some of the medicinal plants such as *Annona reticulata*, *Carica papaya*, *Coccinia grandis*, *Moringa oleifera*, *Murraya koenigi* etc., of about 10 species which are proved to be anti diabetic present in the west godavari district of Andhra Pradesh, India.

KEYWORDS: Diabetes, Hyperglycemia, Herbs, Medicinal plants.

INTRODUCTION

Diabetes mellitus is caused by the abnormality of carbohydrate metabolism which is linked to low blood insulin level or insensitivity of target organs to insulin [1]. This metabolic disorder is rising global and is likely to hit 300 million by 2025 with India projected to have largest number of diabetic cases [2]. Now a days there are number of allopathic drugs are available to treat diabetes but all the agents causing serious side effects after prolonged use [3]. It has already been established that chronic hyperglycemia of diabetes is associated with long term damage, dysfunction and eventually the failure of organs, especially the eyes, kidneys, nerves, heart and blood vessels [4]. The best source of drugs without hazardous effect to human systems could be the plant source and this has been proved by the Traditional healing system and the recent studies conducted on the experimental animals [5]. Lot of information from the traditional healers still to be known and has to be gathered and necessarily formulated [6]. Due to the effect of traditional plant healing, the whole scientific community is shifted towards the plant kingdom in search of new herbal drugs especially for diabetes [7]. The herbal drugs with antidiabetic activity are yet to be commercially formulated as modern medicines, even though they have been acclaimed for their therapeutic properties in the traditional systems of medicine [8]. Plants contain glycosides, alkaloids, terpenoids, flavonoids, cardenoids, etc. that are frequently implicated as having antidiabetic activity [9].

Types and Causes of Diabetes [10].

1. Type 1 diabetes

Immune system attacks and destroys the insulin-producing cells in the pancreas. So the sugar increases in the blood. Type 1 is thought to be caused by a combination of genetic susceptibility and environmental factors, many of the factors are still unclear.

2. Type 2 diabetes

The cells become resistant to the action of insulin. Pancreas unable to produce enough insulin. Exact causes are unclear but genetic and environmental factors may help to become type 2 diabetic. Overweight is the main risk factor for type 2 diabetes.

3. Gestational diabetes

During pregnancy, in order to sustain the pregnancy placenta produces hormones that makes the cells to be resistant. The pancreas can not produce enough insulin to overcome resistance, so the glucose resides in the blood leads to gestational diabetic.

Symptoms of Diabetes [11].

1. The early symptoms are elevated blood sugar levels, and loss of glucose in the urine. High amounts of glucose in the urine causes increased urine output that leads to dehydration causes increased thirst and water consumption.
2. The inability of insulin to perform normally has effects on protein, fat and carbohydrate metabolism. Insulin is an anabolic hormone, that is, one that encourages storage of fat and protein.
3. Insulin deficiency eventually leads to weight loss despite an increase in appetite.
4. Some untreated diabetes patients also complain of fatigue, nausea and vomiting.
5. Diabetes patients are prone to developing infections of the bladder, skin, and vaginal areas.
6. Blood glucose level fluctuations can lead to blurred vision. Extremely elevated glucose levels can lead to lethargy and coma.

ANTI DIABETIC PLANTS***Annona reticulata* (Annonaceae)**

The local name of *Annona reticulata* is Rama phalamu. It is commonly known as bullock's heart is widely distributed all over India and leaves are used as insecticides, anthelmintic, styptic and are also used externally as suppurant. Rout *et al.*, (2013) determined the effectiveness of Hydro-Alcoholic extract of leaves of *Annona reticulata* L. (HAAR) for potential hypoglycemic activity against streptozotocin (STZ) induced hyperglycemic rats. Hyperglycemia was induced in rats by administration of multiple low doses (40 mg/kg) of Streptozotocin (STZ) to the overnight fasted rats for five consecutive days intraperitoneally. After 12days of STZ administration, the fasting blood glucose levels (FBG) were measured and the rats with FBG level >250 mg/dL were considered to be diabetic and were used in the study. Results of the studies showed that, the fasting blood glucose level in hyperglycemic and in oral glucose tolerance test, showed a significant ($p < 0.05$) decrease at defined time points, while the observed biochemical and physical parameters showed a good agreement with hypoglycemic property of the extract. This study suggested that *Annona reticulata* leaves possess potent glucose lowering effect [12].

***Azadirachta indica* (Meliaceae)**

The local name of *Azadirachta indica* is Vepa. This study was conducted to elucidate whether treatment of *Azadirachta indica* leaf extract after streptozotocin (STZ) - induced diabetes has anti-hyperglycemic and anti-dyslipidaemic action or not. Ethanolic extract of *A. indica* after induction of diabetes, normalized glucose level and lipid profile. It can be concluded that STZ-induced hyperglycaemia can be ameliorated by treatment with ethanolic extract of *A. indica*. *A. indica* ethanolic leaves extract after diabetic induction, reverses dyslipidaemia [13].

***Carica papaya* (caricaceae)**

The local name of *Carica papaya* is Boppayi. A crude extract of *Carica papaya* seeds was prepared in boiling water and the aqueous extract was dried. At a dose of 100 mg/kg, 200mg/kg the extract was given to Male Sprague- Dawley rats for 14 days to evaluate the anti hyperglycemic and anti hyperlipidaemic activity in Streptozotocin - Nicotinamide induced diabetic rats. Glibenclamide was used as a standard drug. The blood glucose levels were determined at different times by glucose oxidase method. Serum Glutamate Oxaloacetate Transaminase (SGOT), Serum Glutamate Pyruvate Transaminase (SGPT) levels and lipid profile was also determined. Dosage of 100mg/kg and 200mg/kg of the extract significantly ($P < 0.001$, $P < 0.01$) decreased blood glucose levels and the decrease was found to be dose dependent. SGOT, SGPT levels were decreased ($P < 0.01$, $P < 0.05$). Lipid profile was also decreased significantly ($P < 0.01$, $P < 0.05$). In this study the anti hyperglycemic potential of *Carica papaya* was demonstrated in rats. It also has beneficial effects in diabetes associated complications [14].

***Coccinia grandis* (Cucurbitaceae)**

The local name of *Coccinia grandis* is Donda kaya It occurs throughout the world and has intensive popular use in the treatment of infections. The main aim of the present work was to investigate the antidiabetic effects of aqueous extracts of leaves of *C. grandis* obtained by Decoction method. Graded doses of the aqueous extract were administered to normal and experimental diabetic rats for 10 days. Significant ($p < 0.05$) reduction in fasting blood glucose levels were observed in the normal as well as in the treated diabetic animals. Serum insulin levels were not stimulated in the animals treated with the extract. The changes in body weight, serum lipid profiles, liver glycogen levels were assessed in the extract treated diabetic rats and compared with diabetic control and normal animals. *C. grandis* leaf extract showed significant anti-diabetic effect in diabetic rats after oral administration. Thus, the claim made by the Indian systems of medicine regarding the use of leaf extract of this plant in the treatment of diabetes is validated [15].

Moringa oleifera (Moringaceae)

Local name is Munagakaya. The leaves of *Moringa oleifera* Lam (Moringaceae) are used by the Indians in their herbal medicine for many decades. In this study the scientific basis for their use in NDDM in obese patients was therefore examined. It was found that supplementation of the powder of *Moringa oleifera* leaf decreased serum glucose and LDL. These values were also found to be statistically Significant. And it is concluded that the leaves of *Moringa oleifera* have definite hypoglycemic and hypocholesterolemic activity in type II diabetes mellitus in obese people [16].

Murraya koenigii (Rutaceae)

Local name of the plant is Karevapaku. The effect of daily oral administration of aqueous extract (600 mg/kg b.wt.) and methanol extract (200 mg/kg b.wt.) of *Murraya koenigii* Spreng leaves for a period of eight weeks was studied on blood glucose and plasma insulin level in alloxan-induced diabetic rats. Blood glucose levels of diabetic rats treated with aqueous and methanol extracts of *Murraya koenigii* Spreng showed significant reduction ($P < 0.05$) as compared to diabetic control groups. Plasma insulin showed significantly high on 43rd and 58th days of treatment in aqueous and methanol extracts of *Murraya koenigii* treated groups. This suggests that the hypoglycemic effect may be mediated through stimulating insulin synthesis and/or secretion from the beta cells of pancreatic islets of Langerhans [17].

Punica granatum (Punicaceae)

The local name of *Punica granatum* is Danimma kaya. Radhika et al., (2011) evaluated the antidiabetic and hypoglycemic activity of *Punica granatum*. Diabetes & hyperlipidemia was induced by the intra peritoneal injection of alloxan mono hydrate (120mg/kg) for 2 consecutive days. Diabetes was confirmed 2 days after the last alloxan dose administration by determining the blood glucose concentration. Treatments were started after confirmation of diabetes in rats. During diabetes, the excess glucose present in the blood reacts with hemoglobin to form glycosylated hemoglobin. So the total hemoglobin level was lowered in alloxan induced diabetic rats. Alloxan induced diabetes has been observed to cause a massive reduction of the beta cells of the islets of pancreas leading to hyperglycemia. Rats treated with alloxan (120mg/kg), for 2 consecutive days, showed an increase in the concentration of glucose, triglycerides, cholesterol, LDL cholesterol, VLDL cholesterol and a decrease in the level of HDL cholesterol and hemoglobin content. Administration of crude powder of *Punica granatum* husk reduced the concentration of glucose, triglycerides, cholesterol, LDL cholesterol, VLDL cholesterol and raised the level of HDL cholesterol and hemoglobin content in the blood of both group-I normal and group III alloxan diabetic rats treated [18].

Psidium guajava (Myrtaceae)

Local name is Jamachettu. Manikandan et al., (2013) investigated the phytochemical bioactive compounds of the methanolic extract of *Psidium guajava* leaves, its in vitro anti-diabetic activity. The assay results suggested that the presence of bioactive compounds, could be responsible for the versatile medicinal properties of this plant including diabetes, the extract exhibit the dose-dependent increase in inhibitory effect on alpha-glucosidase enzyme (upto 89.4%), and alpha-amylase enzyme (upto 96.3%). The current study proves that the antidiabetic activity of methanolic extract of *Psidium guajava* leaves by in vitro studies [19].

Piper nigrum (Piperaceae)

Local name is Miriyalu. The effect of ethanol leaves extract of *Piper nigrum* on some biochemical parameters in alloxan induced diabetic rats, was carried out. The graded doses of ethanol leaves extract of this plant was fed to alloxan-induced diabetic rats for a period of 21 days and its effect on some biochemical parameters on the blood serum of the rats were assayed. The result of this study indicated that ethanol leaves extract of *Piper nigrum* has hypoglycemic tendencies in diabetic conditions [20].

Zingiber officinale (Zingiberaceae)

Local name is Allamu. Venkata Kullai Setty N et al (2011), investigated the various phytochemicals present in the petroleum ether and ethanol extract of the rhizomes of *zingiber officinale* and also the study has been under taken to corroborate the anti-diabetic property of ethonolic extract of *Zingiber officinale* in alloxan induced diabetic rats. It appeared that ethanolic extract of *Zingiber officinale* shows pronounced blood glucose – lowering in alloxan induced diabetic rats [21].

Table 1: Shows the Anti Diabetic Compounds isolated from plants

S.No	Plant Name	Anti Diabetic Compound	Reference
1	<i>Swertia punicea</i>	Methylswertianin, bellidifolin	[22]
2	<i>Eleutherine americana</i>	Eleutherinoside A	[23]
3	<i>Curcuma longa</i>	Curcumin, Demethoxycurcumin, Bisdemethoxycurcumin	[24]
4	<i>Carissa carandas</i>	Gallic Acid, Flavonoids	[25]
5	<i>Marrubium vulgare</i>	Flavonoids	[26]
6	<i>Stevia rebaudiana</i>	Alkaloids, Flavonoids	[27]
7	<i>Panax japonicus</i>	Polyacetylenes, Compounds	Phenolic [28]
8	<i>Syzygium cumini</i>	Mycaminose	[29], [30]
9	<i>Capparis moon</i>	Gallotannins	[31]
10	<i>Ocimum sanctum</i>	Polyphenols, Caffeic Acid	[32]

CONCLUSION

Medicinal plants have been known for several years but they remains enigma for researchers. The feasibility of making efficient drugs from plant sources is very much near. As this chronic hyperglycemic disease is accelerating, there is an emergency for finding herbal inhibitors. It is the responsibility of the scientific community to find efficient bioactive compounds from plant sources and they should be necessarily formulated to cure diabetes.

REFERENCES

- [1] Maiti R, Jana D, Das UK, Ghosh D. Antidiabetic effect of aqueous extract of seed of Tamarindus indica in streptozotocin induced diabetic rats. J Ethnopharmacol 2004; 92: 85-91.
- [2] Mohan V Why are Indians more prone to diabetes? J Assoc Physicians India. 2004 Jun; 52:468-74.
- [3] M. Siddaiah, Jayaveera K.N, K. Souris, Yashodha Krishna J.P and P. Vasanth Kumar. Phytochemical Screening and Anti Diabetic Activity of Methanolic Extract of Leaves of Ximenia Americana in Rats. International Journal of Innovative Pharmaceutical Research. 2011, 2(1), 78-83.
- [4] Huang THW, Peng G, Kota BP, Li GQ, Yamahara J, Roufogalis BD et al. Anti-diabetic action of Punica granatum flower extract: activation of PPAR- α and identification of an active component. Toxicol App Pharmacol 2005; 207:160-169.
- [5] Venkata Narasimha Kadali, Kameswara Rao Kindangi, Angela E Peter, Sudhakara Rao P, Bindiya P, BV Sandeep. Hepato-Protective Herbs- Present In West Godavari District Of Andhra Pradesh, India- A Mini Review. International Journal of Medical and Health Research. Volume: 1, Issue: 1, 15-18 Sep 2015.
- [6] Venkata Narasimha Kadali, Kameswara Rao K, BV Sandeep. Medicinal plants with anti-Snake Venom property-A review. The Pharma Innovation Journal 2015; 4(7): 11-15.
- [7] Kadali VN and Sandeep BV: Anti-hyperglycemic plants used by the traditional healer of west Godavari District, Andhra Pradesh, India. Int J Pharmacognosy 2015; 2(9): 473-77. doi link: [http://dx.doi.org/10.13040/IJPSR.0975-8232.IJP.2\(9\).473-77](http://dx.doi.org/10.13040/IJPSR.0975-8232.IJP.2(9).473-77).
- [8] Wadkar KA, Magdum CS, Patil SS, Naikwade NS. Antidiabetic potential and Indian medicinal plants. J Herbal Med Toxicol 2008; 2: 45-50.
- [9] Neelesh Malviya, Sanjay Jain, and Sapna Malviya. Antidiabetic potential of medicinal plants. Acta Poloniae Pharmaceutica n Drug Research, Vol. 67 No. 2 pp. 113-118, 2010.
- [10] <http://www.mayoclinic.org/diseases-conditions/diabetes/basics/causes/con-20033091>
- [11] http://www.medicinenet.com/diabetes_mellitus/page3.htm, 2015.
- [12] Soumya P, Rout, Durga M, Kar, Santosh B, Mohapatra, Sharada P, Swain. Anti-Hyperglycemic Effect Annona Reticulata L. Leaves On Experimental Diabetic Rat Model. Asian J Pharm Clin Res, Vol 6, Suppl 1, 2013, 56-60.
- [13] Shradha Bisht, S.S.Sisodia. Anti-Hyperglycemic And Antidyslipidemic Potential Of Azadirachta indica Leaf Extract In STZ- Induced Diabetes Mellitus. J. Pharm. Sci. & Res. Vol.2 (10), 2010,622-627.
- [14] Venkateshwarlu E, Dileep P, Rakesh Kumar Reddy P, Sandhya P. Evaluation Of Anti Diabetic Activity Of Carica Papaya Seeds On Streptozotocin- Induced Type-II Diabetic Rats. J Adv Sci Res, 2013, 4(2): 38-41.
- [15] A. Doss and R. Dhanabalan. Anti-hyperglycaemic and Insulin Release Effects of Coccinia grandis (L.) Voigt Leaves in Normal and Alloxan Diabetic Rats. Ethnobotanical Leaflets 12: 1172-75. 2008.
- [16] Prasanna Kumar, K, Ravi Teja Mandapaka. Effect Of Moringa Oleifera On Blood Glucose, Ldl Levels In Types Ii Diabetic Obese People. Innovative Journal of Medical and Health Science 3: 1 Jan – Feb (2013) 23 - 25.

- [17] Vinuthan M. K., Girish Kumar V., Ravindra J. P., Jayaprakash And Narayana K. Effect Of Extracts Of *Murraya Koenigii* Leaves On The Levels Of Blood Glucose And Plasma Insulin In Alloxan-Induced Diabetic Rats. *Indian J Physiol Pharmacol* 2004; 48 (3) : 348–352.
- [18] S. Radhika, K.H. Smila and R. Muthezhilan. Antidiabetic and Hypolipidemic Activity of *Punica granatum* Linn on Alloxan Induced Rats. *World Journal of Medical Sciences* 6 (4): 178-182, 2011.
- [19] R. Manikandan, A.Vijaya Anand and G. Durai Muthumani. Phytochemical and in vitro anti-diabetic activity of methanolic extract of *Psidium guajava* leaves. *Int.J.Curr.Microbiol.App.Sci* (2013) 2(2):15-19.
- [20] ONYESIFE, Chioma O, OGUGUA, Victor N. and ANADUAKA, Emeka G. Hypoglycemic Potentials of Ethanol Leaves Extract of Black Pepper(*Piper Nigrum*) on Alloxan-Induced Diabetic Rats. *Annals of Biological Research*, 2014, 5 (6):26-31.
- [21] Venkata Kullai Setty N, Santhosh D., Narasimha Rao D., Sanjeeva Kumar A. and Charles Martin A. Preliminary phytochemical screening and anti diabetic activity of *Zingiber officinale* rhizomes. *Int. J. of Pharm. & Life Sci. (IJPLS)*, Vol. 2, Issue 12: Dec.: 2011, 1287-1292.
- [22] Tian LY, Bai X, Chen XH, Fang JB, Liu SH, Chen JC (2010). Anti-diabetic effect of methylswertianin and bellidifolin from *Swertia punicea* Hemsl. and its potential mechanism. *Phytomed* 17:533-539.
- [23] Ieyama T, Gunawan-Puteri MDPT, Kawabata J (2011). α -Glucosidase inhibitors from the bulb of *Eleutherine americana*. *Food Chem* 128:308-311.
- [24] Kuroda M, Mimaki Y, Nishiyama T, Mae T, Kishida H, Tsukawa M, Takahashi K, Kawada T, Nakagawa K, Kitahara M (2005). Hypoglycemic effects of Turmeric (*Curcuma longa* L. Rhizomes) on genetically diabetic KK-Ay mice. *Biol Pharm Bull* 28:937-939.
- [25] Itankar PR, Lokhande SJ, Verma PR, Arora SK, Sahu RA, Patil AT (2011). Antidiabetic potential of unripe *Carissa carandas* Linn. fruit extract. *J Ethnopharmacol* 135:430-433.
- [26] Elberry AA, Harraz FM, Ghareib SA, Gabr SA, Nagy AA, Abdel-Sattar E (2011). Methanolic extract of *Marrubium vulgare* ameliorates hyperglycemia and dyslipidemia in streptozotocin-induced diabetic rats. *Int J Diabetes Mellitus* doi:10.1016/j.ijdm.2011.01.004
- [27] Kujur RS, Singh V, Ram M, Yadava HN, Singh KK, Kumari S, Roy BK (2010). Antidiabetic activity and phytochemical screening of crude extract of *Stevia rebaudiana* in aloxan-induced diabetic rats. *Pharmacognosy Res* 2:258-263.
- [28] Chan H-H, Sun H-D, Reddy MVB, Wu T-S (2010). Potent α -glucosidase inhibitors from the roots of *Panax japonicus* C. A. Meyer var. major. *Phytochem* 71:1360-1364.
- [29] Trojan-Rodrigues M, Alves TLS, Soares GLG, Ritter MR (2011) Plants used as antidiabetics in popular medicine in Rio Grande do Sul, southern Brazil. *J Ethnopharmacol* 139(1):155-63.
- [30] Kumar A, Ilavarasan R, Jayachandran T, Decaraman M, Aravindan P, Padmanabhan N, Krishnan MV (2008). Anti-diabetic activity of *Syzygium cumini* and its isolated compound against streptozotocin-induced diabetic rats. *J Med Plant Res* 2:246-249.
- [31] Kanaujia A, Duggar R, Pannakal ST, Yadav SS, Katiyar CK, Bansal V, Anand S, Sujatha S, Lakshmi BS (2010). Insulinomimetic activity of two new gallotannins from the fruits of *Capparis moonii*. *Bioorg Med Chem* 18:3940-3945.
- [32] Wongsap P, Chaiwarit J, Zamaludien A (2012). In vitro screening of phenolic compounds, potential inhibition against α -amylase and α -glucosidase of culinary herbs in Thailand. *Food Chem* 131:964-971.