

**ANTI-DIABETIC POTENTIAL OF *ALOE VERA***

**Dr. Arvind Maurya<sup>1\*</sup>, Mr. Pankaj Chaudhary<sup>2</sup>, Dr. Atul Jain<sup>3</sup>, Dr. Asha Pathak<sup>4</sup>,  
Mr. Vinay Gupta<sup>5</sup>, Dr. Neeraj Rajdan<sup>6</sup>**

<sup>1</sup>2<sup>nd</sup> Year Resident, Department of Pharmacology, UP RIMS and R, Etawah, UP, India.

<sup>2</sup>Demonstrator of pharmacology, UP RIMS and R, Etawah, UP, India.

<sup>3</sup>Professor of Pharmacology, UP RIMS and R, Etawah, UP, India.

<sup>4</sup>Associate Professor of Pharmacology, UP RIMS and R, Etawah, UP, India.

<sup>5</sup>Lecturer of Pharmacology, UP RIMS and R, Etawah, UP, India.

<sup>6</sup>1<sup>st</sup> Year Resident, Department of Pharmacology, UP RIMS and R, Etawah, UP, India.

Article Received on  
12 June 2015,

Revised on 05 June 2015,  
Accepted on 27 July 2015

**\*Correspondence for  
Author**

**Dr. Arvind Maurya**

2<sup>nd</sup> Year Resident,  
Department of  
Pharmacology, UP RIMS  
and R, Etawah, UP, India.

**ABSTRACT**

*Aloe vera* is an herb which is being used clinically throughout the world for ancient time. It is useful in various pathological conditions like constipation, anorexia, psoriasis, Diabetes Mellitus type –II, as immune enhancer, anti-inflammatory, as moisturizer, as antiseptic and many more. *Aloe vera* can also be used in advanced conditions like cancer. It has been proved in many experimental studies and clinical trial that *Aloe vera* and its extract of various solvents like water, ethanol and methanol has antidiabetic potential. Many studies have shown that *Aloe vera* has not only antihyperglycaemic effect but also has hypolipidemic and antioxidant effect. Its Antidiabetic compound may become a potent antidiabetic drug in near future. Although it has

been using in many above mentioned condition the present review article is an attempt to highlight its pharmacological activities against Diabetes Mellitus type-II and its related complications.

**KEYWORDS:** *Aloe vera*(*A.vera*), Diabetes Mellitus type -2 , Alloxan, Streptozocin(STZ), Intraperitoneal(I.P.)

**INTRODUCTION**

According to ADA (American Diabetic Association) the prevalence of diabetes has reached at an alarming level despite its advances in approach of treatment. About 387 million people

were suffering from diabetes mellitus worldwide according to international diabetes federation 2013 and this situation is going to be worsen by 2035 with approximately 592 million diabetic patients.<sup>[1]</sup>

The Indian scenario accounts about 65.1 million persons were suffering by diabetes till 2013, and this number is estimated to increase up to 109.0 million by 2035<sup>1</sup>. The currently available anti-diabetic drugs has many limitations and side effects. WHO has been emphasising on the use and development of the herbal preparation for the treatment of diabetes. Many herbal preparations have shown antihyperglycemic effect in animal model as well as in patients.<sup>[2]</sup>

*A. vera* has many pharmacological actions but, we are focusing its anti-hyperglycemic effect in this review article.

*Aloe* : *Aloe* is the genus which comprises about 400 species throughout the world, All Aloes have some common features like all have rosettes of fleshy leaves, which is either smooth or spined, spines along the edges of their succulent leaves and bearing tubular shaped colour full flowers ranging from near white to yellow to orange to near red. Some of the common species are *A. arborescens*, *A. brevifolia*, *A. microstigma*, *A. buhrii*, *A. ferox*, *A. hereroensis*, *A. humilis*, *A. maculate*, *A. marlothii*, *A. mitriformis*, *A. nobilis*, *A. plicatilis*, *A. polyphylla*, *A. spinosissima*, *A. striata*, *A. suprafoliata*, *A. variegata*, *A. vera*, *A. zebrine*, *A. africana*, *A. comosa*, *A. littoralis*, *A. melanacantha*, *A. peglerae*, *A. porphyrostachys*, *A. succotrina*, *A. striatula*, *A. tomentosa*.<sup>[3]</sup>

But screening of the antidiabetic potential have been done only with few species like *A. vera*, *A. arborescens*, *A. ferox* and *A. Greatheadii*<sup>[4]</sup> among which *A. vera* is a well known and most commonly used species for their antidiabetic potential and other pathological conditions.

*A. vera*: This plant is widely distributed and cultivated throughout the world but its native place was Africa, it have many synonyms like *A. barbadensis* Mill, *A. barbadensis* var. *chinensis* Haw, *A. chinensis* (Haw.) Baker, *A. elongata* Murray, *A. flava* Pers, *A. indica* Royle, *A. lanzae* Tod, *A. maculata* Forssk. (illegitimate), *A. perfoliata* var. *vera* L, *A. rubescens* DC, *A. variegata* Forssk. (illegitimate), *A. vera* Mill. (Illegitimate), *A. vera* var. *chinensis* (Haw.) *A. Berger*, *A. vera* var. *lanzae* Baker, *A. vera* var. *littoralis* J. Koenig ex Baker, *A. vulgaris* Lam.<sup>[5,6]</sup> but According to the International Rules of Botanical Nomenclature, *A. vera* (L.) *Burm. f.* is the legitimate name of this species.<sup>[7]</sup>

### Taxonomy of *A.vera*

*A.vera* has either no stem or very short-stem. It is succulent plant growing about 60–100 cm (24–39 inch) tall, spreading by offsets. Their leaves are thick and fleshy, green to grey-green in colour. Some varieties shows white flecks on their upper and lower stem surfaces.<sup>[3]</sup> The margin of their leaf is serrated and has small white teeth. Flowering occurs in summer on a spike up to 90 cm (35 inch) tall, the flower being pendulous, with a yellow tubular corolla 0.8–1.2 inch long.<sup>[8,9]</sup> Like other *Aloe* species, *A.vera* forms arbuscular mycorrhiza asymbiosis that allows the plant for better accessment of mineral & nutrients in soil.<sup>[10]</sup>

### Taxonomical classification of the genus *Aloe*<sup>[5,6]</sup>

Kingdom	:	Plantae
Clade	:	Angiosperms
Clade	:	Monocots
Order	:	Asparagales
Family	:	Xanthorrhoeaceae
Subfamily	:	Asphodeloideae
Genus	:	<i>Aloe</i>
Species	:	<i>A. Vera</i>

The name *A. vera* derives from the Arabic word "Alloeh" meaning "shining bitter substance," while "vera" in Latin means "true." About 2000 years ago, the Greek scientists regarded *A. vera* as the universal panacea. The Egyptians called Aloe "the plant of immortality." *A.vera* is being used for medicinal purposes in several cultures for thousands of years in several countries like Egypt, Greece, Mexico, Japan, India and China.<sup>[11]</sup> *A.Vera* have been used by Alexander the Great, and Christopher Columbus to treat soldiers' wounds. The first reference of *A.vera* was found in English which was a translation of Dioscorides' Medical treatise De Materia Medica done by John Goodyew in 1655 A.D.<sup>[12]</sup> In early 18<sup>th</sup> century, It was used as a laxative in the United States. In Mid-1930 there was a remarkable success seen with *A.Vera* when it was successfully used to treat radiation dermatitis. The *A.vera* plant has been known and used for centuries for its health, beauty, medicinal and skin care properties. *A.vera* has anti-hyperglycemic efficacy as evaluated by many inventors over world. *A.vera* is also useful in the treatment of diabetes since it has not only anti-hyperglycemic activity but also have hypolipidemic and antioxidant property. These properties have been explored in various studies. We are making an effort to elaborate the Anti-hyperglycemic effect of *A. vera* through this review article.

***A.vera* leaf gel extract**

The fresh leaves of plant were taken and gel was obtained. It was treated with activated carbon to decolorize the gel and remove aloin and anthraquinones because it has laxative effects. The gel was freeze-dried & simultaneously dried to produce a pure powder. Three hundred (300) mg of powder were filled in the gelatin capsule. In this randomized double-blind placebo-controlled clinical trial with hyperlipidemic type 2 diabetic patients aged between 40 to 60 years where other anti-hyperlipidemic agents were not used and they were resistant to 5mg glyburide BD and metformin 1000 mg tablets daily, Aloe gel 300mg capsule two times for two months were given in combination with the aforementioned drugs in treatment of 30 patients & then they were compared with the placebo group of 30 patients treated only with 5mg glyburide BD and metformin 1000 mg tablets daily. The *A.Vera* gel lowered the plasma level of following parameters which were fasting blood glucose, HbA1c, total cholesterol, and LDL levels significantly ( $p=0.036$ ,  $p=0.036$ ,  $p=0.006$ , and  $p=0.004$ , respectively) without deteriorating any other biochemical parameter like blood lipid levels and liver/kidney function tests ( $p>0.05$ ) compared with the placebo at the endpoint. No adverse effects were reported. This result suggests that aloe gel may be used as a safe anti-diabetic agent in patients with type –II diabetes mellitus with dyslipidemia.<sup>[13]</sup>

***A. vera* leaves aqueous extract**

This study was carried out to evaluate the antihyperglycemic effect of aqueous extract of *A.vera* in normal as well as in alloxan induced diabetic rats. In this study 40 albino rats were included and they were divided in four groups, 10 animals in each group viz. A,B,C and D. Group A and B rats were normal and diabetes was induced in group C and D rats by intraperitoneal injection of freshly prepared solution of alloxan in 1mL of distilled water with a dose of 125 mg/kg body weight. Aqueous extract of *A.vera* was given to group B and D at a dose of 150mg/kg of body weight. No treatment was given to Group A and C rats. The blood samples were collected at 30<sup>th</sup> days and at 45<sup>th</sup> days from the tail vein of every rat. All collected samples were analyzed for glucose by using enzymatic kits. The blood glucose level of treated groups of rats showed significant reduction after 30 days of treatment.<sup>[14]</sup>

***A. vera* leaves aqueous extract**

The aqueous extract was prepared by boiling 500g of fresh leaves in one litre distilled water for 10 min and stored in refrigerator. Forty albino rats were divided into four groups and were compared for the effect of *A.vera* in normal control and diabetic control. Group A was non

diabetic control group received nothing except normal diet and water, Group B was also non diabetic but received extract. Diabetes was induced in group C and D by alloxan i.p at a dose of 65 mg/kg body weight dissolved in 0.5ml acetate buffer (pH 5.5) immediately before use and group C was kept as diabetic control which received no treatment. Group D received extract. After 30 days of treatment with extract both group diabetic and nondiabetic showed significant ( $P < 0.05$ ) decrease in their blood glucose level. After 30 days five animal of each group were killed by decapitation. Another five animals of each group were kept under observation for another 15 days without any further treatment as recovery period. Serum glucose level of group B and D remained significantly lower than the control group A and C.<sup>[15]</sup>

#### **A. vera leaves gel extract**

Inner gel part of fresh leaves was homogenized in an electric blender and it was subsequently lyophilized and stored at 4°C. Forty male albino rats were divided into four groups; 1<sup>st</sup> group was normal control which received only pillet diet and water ad libitum. 3<sup>rd</sup> group was also normal but received extract at the dose of 0.5ml/day for 5 weeks orally and food and water ad libitum. Group no 2<sup>nd</sup> and 4<sup>th</sup> were diabetic. Diabetes was induced by i.p injection of alloxan 100mg/Kg body weight, 2<sup>nd</sup> Group received only food and water ad libitum and 4<sup>th</sup> group received extract at the dose of 0.5ml/day for 5 weeks orally. Serum glucose, Total cholesterol and Triacylglycerol was determined by enzymatic colorimetric method according to the method described by Trinder (1969), Richmond (1973), Fassati and Prencipe (1982) respectively. MDA, Nitric oxide and Total antioxidant capacity was determined according to the colorimetric method described by Ohkawa *et al.* (1979), Montgomery and Dymok (1961) and Koracevic *et al.* (2001) respectively. All above biochemical parameters were significantly improved after oral administration of *A. vera* gel extract ( $p < 0.05$ ) in treated diabetic group as compared with diabetic control group.<sup>[16]</sup>

#### **Processed A. vera Gel(PAG)**

In this study Processed *A. vera* Gel(PAG) were used to evaluate its antidiabetic effects in diet induced type -2 diabetes mellitus in C57BL/6j mice. High fat diet were used to induced type-2 diabetes mellitus in C57BL/6j mice model. PAG were used orally in Diet Induced Obese (DIO) mice with blood glucose level 180mg/dl for 8 week and the blood glucose level came to normal range. PAG also decreased insulin resistance which was suggested by decrease in plasma insulin level, it also decreased triglycerides level in liver as well as in plasma. These

results suggest that oral use of PAG prevent progression and related complications of diabetes mellitus type-2. Hence PAG could be useful in the treatment of diabetes mellitus type -2.<sup>[17]</sup>

#### **A. vera leaf gel alcoholic extract**

In this study, researcher evaluated the presence of antioxidant and antidiabetic property of the alcoholic extract of A.vera leaf gel and compared these effects with glibenclamide. Blood glucose and glycosylated hemoglobin were significantly decreased after oral administration of A.vera gel extract at a dose of 300 mg/kg to diabetic rats. A.vera extract reduced not only diabetic parameter but also decreased lipid peroxidation and hydroperoxides in tissues of diabetic rats. After the treatment with A. vera extract the level of reduced glutathione, superoxide dismutase, catalase, glutathione peroxidase and glutathione-S-transferase in the liver and kidney of diabetic rats were significantly increased. These results clearly showed an antioxidant and antidiabetic property of A. vera gel extract. The extract was also more effective than glibenclamide in restoring the antioxidant values<sup>[18]</sup>

#### **CONCLUSION**

In recent years, prevalence of diabetes increased even after many effective antidiabetic drugs and that's the reason that there has increasing demand to look for traditional herbal medicine with positive hopes. There are many herbal plants that have been used in all parts of world for the treatment of diabetes and A.vera is among one of them having potent anti-diabetic potential. A.vera received much attention after it was well tested for their efficacy and safety for patient of diabetes mellitus. A.Vera deserve scrutiny on modern scientific lines like biological evaluation, physiochemical characterization, investigation of molecular mechanism of action(s) of isolated phytoprinciple, toxicity studies, and their clinical trials. These are the necessary approaches in search of new lead molecule of plant which can be used in treatment of diabetes A.vera needs to be evaluated in scientific manner using various innovative experimental models and clinical trials to understand its mechanism of action, in search of their active constituents against diabetes mellitus. So that its anti-diabetic uses can be widely explored.

#### **REFERENCES**

1. The International Diabetes Federation. The global burden. In: Leonor Guariguata, Tim Nolan, Jessica Beagley, Ute Linnenkamp, Olivier Jacqmain. The IDF Diabetes Atlas. 6<sup>th</sup> Edition. Switzerland: International Diabetes Federation; 2013; 29-34.

2. Ajabnoor MA Effect of Aloes on blood glucose levels in normal and alloxan diabetic mice. *J Ethnopharmacol* 1990; 28: 215-20.
3. University of California davis botanical conservatory volume 1, issue 1.0 July, 2009.
4. Du Toit Loots<sup>I</sup>; Marlien Pieters<sup>II</sup>; Md Shahidul Islam<sup>II</sup>; Lisa Botes<sup>II</sup> *S. Afr. j. sci.* vol.107 n.7-8 Pretoria Aug. 2011.
5. Aloe vera (L.) Burm f. Tropicos.org.
6. Aloe vera (L.) Burm.f. is an accepted name. theplantlist.org.
7. Grindlay D, Reynolds T. The Aloe vera phenomenon: a review of the properties and modern uses of the leaf parenchyma gel. *Journal of Ethnopharmacology*, 1986; 16: 117-151.
8. Yates A. (2002) Yates Garden Guide. Harper Collins Australia.
9. Random House Australia Botanica's Pocket Gardening Encyclopedia for Australian Gardeners Random House Publishers, Australia.
10. Gong M, Wang F, Chen Y (2002). "[Study on application of arbuscular-mycorrhizas in growing seedlings of Aloe vera]". *Zhong Yao Cai* (in Chinese) 25 (1): 1–3.)
11. Marshall JM. Aloe vera gel: What is the evidence? *Pharma Jr*, 1990; 24: 360-2.
12. Davis RH. Aloe vera: A scientific approach. New York: Vantage.
13. Huseini HF et al. Anti-hyperglycemic and Anti-hypercholesterolemic... *Planta Med* 2012; 78: 311–316.
14. Saif-Ur-Rehman, Saghir Ahmad Jafri, Sajid Hassan, Ishtiaq Ahmed and Muhammad Naim; Study on Antidiabetic Effect of Aloe vera Extract on Alloxan Induced Diabetic Rats. *Libyan Agriculture Research Center Journal International*, 2011; 2(1): 29-32.
15. Sahgir A. Jafri, Syed S. Hasan, Aftab Nadeem, Kalsoom, Jawed Iqbal *Medical Journal of Islamic World Academy of Sciences*, 2011; 19(3): 127-130.
16. Enas Ali Kamel Mohamed *Australian Journal of Basic and Applied Sciences*, 5(11): 1321-1327, 2011 ISSN 1991-8178.
17. Kim K., et.al ,Hypoglycemic & hypolipidemic effects of PAG in mouse model of NIDDM. *Phytomedicine* (2009)doi:10.1016/ J phymed.2009.02.014
18. Rajasekaran, S. Sivagnanam K, Subramanian S. Antioxidant effect of aloe vera gel extract in streptozotocin-induced diabetes in rats. *Pharmacological Reports*. 2005; 57: 90-96.