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Hypoglycemic and Anti-Diabetic Effect of the Methanol Leaf Extract of *Luffa Cylindrica* in Streptozocin Induced Wister Albino Rats

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Abstract: *The major merits of herbal medicine seem to be their perceived efficacy, low incidence of serious adverse effects and low cost. Luffa (Luffa cylindrica (L.) commonly called sponge gourd, loofa, vegetable sponge, bath sponge or dish cloth gourd, is a member of cucurbitaceouse family. The plant has been reported to be effective in the treatment of fever, enteritis, as well as in the treatment of asthma, sinusitis fever and diabetes. The results of the phyto-evaluation of its methanol extract revealed the presences of some bioactive secondary metabolites such as steroids, alkaloids, flavonoids, tannins and saponins. The result of the pharmacological evaluation against oral hypoglycemic and antihyperglycemic activity also revealed that the leaf extract is effective at the doses of 400 and 600 mg/kg body weight, thus acted dose dependently, demonstrating effective hypoglycemic and antihyperglycemic activity in normal-glycemic, glucose overloaded induced diabetic rats; and the improved the altered serum biochemical parameters towards normal.*

TRODUCTION

Diabetes mellitus or simple diabetes is a group of metabolic diseases in which a person has high blood sugar. This high blood sugar produces the symptoms of frequent urination, increased thirst, and increased hunger. Untreated diabetes can cause many complications. Acute complications include diabetic ketoacidosis and nonketotic hyperosmolar coma. Serious long-term complications include heart disease, kidney failure and damage to the eyes ***(Alberti et al., 1998; WHO, 2014).***

Diabetes occurs as a result of either the inability of the pancreas to produce enough insulin or because cells of the body do not respond properly to the insulin that is produced ***(Gardner and Dolores et al., 2011).*** Globally, as of 2013, an estimated 382 million people have diabetes

worldwide, with type 2diabetes making up about 90% of the cases. This is equal to 3.3% of the population, with equal rates in both women and men **(Vos *et al.,* 2012)**. In 2011 diabetes resulted in 1.4million deaths worldwide, making it the 8th leading cause of death (WHO, 2013). The number of people with diabetes is expected to rise to 592 million by 2035.

Luffa (Luffa cylindrica (L.) syn Luffa aegyptiaca Mill] commonly called sponge gourd, loofa, vegetable sponge, bath sponge or dish cloth gourd, is a member of *cucurbitaceouse* family. The fruits of *Luffa Cylindrica* are smooth and cylindrical shaped. One mature Luffa sponge will produce at least 30 seeds. *Luffa Cylindrica* has been reported to possess both medicinal and nutritional properties. In oriental medicine, *L. Cylindrica* has effect on the treatment of fever, enteritis and swell etc **(Lee and Yoo, 2006).** They are used for bathing, removing toxins and regenerating the skin. They help varicose veins and cellulite by stimulating circulation. Immature fruit is used as vegetables, which is good for diabetes **(Bal *et al.,* 2004).** The seeds have been used in the treatment of asthma, sinusitis, and fever. **(Stephens and Hortic, 2003).** It has also been reported that the leaf possesses an inhibiting property on the replication of HIV infected lymphocyte and phagocyte cells explain its potential as a therapeutic agent for AIDS. **(McGrath *et al*. 1989)**

Diabetes mellitus (DM) is one of the most common noncommunicable diseases in the world. Diabetes affect about 135 million people in 1995 and the prevalence is expected to rise to 300 million in the year 2025 **(King et al. 1998).** Studies from different parts of India showed an increasing trend in the prevalence of diabetes. A series of epidemiological studies carried out by the Diabetes Research Centre in Chennai showed that the prevalence of diabetes had steadily increased among urban Indian adults from 5.2 per cent in 1984 to 13.9 per cent in 2000 **(Ramachandran *et al*. 2002).**Despite considerable progress in therapies using expensive synthetic drugs, the search for herbal remedies is growing which can be accounted for the effectiveness, minimal side effects in clinical experience and relatively low cost of the herbal drugs. Herbal drugs or their extracts are prescribed widely, even when their biological active compounds are unknown **(Valiathan *et al.* 1998).**

Plants have a long therapeutic history in the traditional healthcare system, and many herbal drugs are used for the treatment of Diabetes Mellitus. Plant extracts are thought to act on a variety of targets to exert their beneficial effects **(**Momin A et al Mukherjee P et al. 2006). Most of the plants prescribed for Diabetes Mellitus are not edible and therefore, the studies on edible plants which have a hypoglycemic effect would be of great value in the dietary management of the disease. It is the purpose of this experiment is to evaluate the effect of dried leaves powder or the methanolic extract of Luffa Cylindrica on blood glucose levels of Streptozotocin-Induced diabetic's rats.

METHODOLOGY

Collection and Identification of plant materials

Fresh leaf of *Luffa Cylindrica* was collected from Delta-I in front of Green City Hospital, Greater Noida Area, India and was identified by Indian Agricultural Research Institute (IARI), PUSA New Delhi, India. Then the leaf was washed and dried in a shade at room temperature 25 °C.

Preparation of extract of *Luffa Cylindrica* leaf.

The shade dried leaf After the washing and drying of leaves the fresh leaf were grinded with the help of a mechanical grinder into paste. The pasty masses of leaves were successively extracted

with ethanol in soxhlet extraction apparatus. Then the ethanol extract was completely removed under reduced pressure to obtain the dry extract and refrigerated until use on -20°C.

Preliminary phytochemical Screening

The ethanolic leaf extract of *Luffa Cylindrica* was screened for Alkaloids (Gheeta *et al*, 2014), Glycoside (Moses *et al*, 20 14), Flavanoids (Gheeta et. al, 2014), Tannins (Krishnaiali, 2009) Terpenoids (Khan et. al, 2011) Saponins (Gheetaet. al, 2014) Reducing Sugar (C.K.Kokateet. al) respectively.

Animals

Wistar albino rats (6—8 weeks) of both sexes were obtained from the animal house of Lalalajpat rai University of Veterinary and Animal Sciences (LUVAS), Hisar, Haryana, India. Before and during the experiment, the rats were fed with standard diet (Gold Moher, Lipton India Ltd). The rats were placed into various groups depending on the selection of size and body weight, were they acclimatized for period of two weeks under standard environmental condition such as temperature and relative humidity under a 12 h light/dark cycle prior to the experiments.

Induction of Diabetes in Rats

Induction of experimental diabetes in male wistar rats kept in Animal House were done with intraperitoneal injection of streptozotocin (STZ) injection at the dose of 45 mg/kg body weight in citrate buffer following the process of (Dikshit, *et al*, 2012.).

The diabetic potentiality of the rats was monitored by estimation of the blood glucose level of each rat 24 hours before the inducement of the streptozotocin, which was to ensure the actual glucose level of the rats under normal circumstances.

Collection of Blood Sample and Blood Glucose Determination.

Blood samples were drawn from tail tip of rat at weekly intervals till the end of study (i.e., 2 weeks). Fasting blood glucose estimation and body weight measurement were done on day 1st, 3rd 7th and 15th days of the study. Blood glucose estimation can be done by electronic go check easy touch simple glucometer using glucose test strips. The samples of blood are obtained from rats which were fasted overnight for estimation of fasting blood glucose before the injection of streptozotocin on the same day. The STZ are injected intèrperitonealy at 45mg/kg with the citrate buffer to the animal.

RESULTS

Table 1: Shows the Results of the Phytochemical Evaluation of the Extract of *L. Cylindrica*

S.No.	Name of Phytochemicals	Result
1	Flavonoids	+
2	Saponin	+
3	Glycoside	+
4	Alkaloids	+
5	Terpenoids	+
6	Tannins	+
7	Reducing Sugars	-

Key: (+) stands for present and (-) stand for negative

Table 2: Hypoglycemic Potential of the Methanol Leaf Extract of *Luffa Cylindrica* in Rats

Treatment	0^{th} Day		3^{rd} Day		7^{th} Day		15^{th} Day	
Control	**x GIv (mg/dI)**	**Wt (g)**	**Glvl (mg/dI)**	**Wt (g)**	**GIv (mg/dI**	**Wt (g)**	**GIv (mg/dI**	**Wt (g)**
Negative	85.83	188.0	104.0	180.0	127.8	188.0	98.3	202.0
Positive	102.5	129.3	331.7	129.3	587.5	157.0	632.4	147.0
200	104.0	194.5	621.6	110.0	521.3	144.0	370.2	148.0
400	97.0	144.2	385.4	153.0	219.6	176.0	186.2	188.0
600	97.1	136.1	223.4	196.0	215.2	198.0	126.3	207.0
Standard	97.5	129.3	375.0	154.2	262.0	155.0	167.0	156.0

Key: Wt(g) weight of rats in gram, x GIv(mg/dI) glucose level

DISCUSSION:

The preliminary phytochemical analysis of the ethanol leaf extract of *Luffa Cylindrica* showed that the leaf contained some bioactive secondary metabolites such as steroids, alkaloids, flavonoids, tannins and saponins. Literatures reviewed has strongly supported the used of theses metabolites as anti-diabetes agents, while the acute toxicity earlier reported for this plant was safe up to the dose of 3000 mg/kg in rats and mice respectively. The acute hypoglycemic action of glibenclamide is the stimulation of the insulin release and the inhibition of glucagon secretion. Findings indicate the effectiveness of glibenclamide in moderate diabetic rats, and ineffectiveness in severe diabetic animals. Plants elicit their actions against diabetes in a similar manner with drugs by improving insulin sensitivity, increasing insulin production and/or decreasing the amount of glucose in blood as a result of the action of one or many of the metabolites present in it as supported by literatures.

The major advantage of herbal medicine seems to be their perceived efficacy, low incidence of serious adverse effects and low cost. In recent times many traditionally used medicinally important plants were screened for their anti-diabetic potential by various investigators on experimental animals. Treatments of Type 2 diabetes mellitus patients with conventional available oral hypoglycemic agents are always associated with several adverse effects. Therefore, herbal drugs are gradually gaining popularity in the treatment of diabetes mellitus.

The results of this study revealed that the extract of *Luffa Cylindrica* at the doses of 400 and 600 mg/kg body weight orally demonstrated a significant decrease in the blood sugar levels dose dependently, thus considered valuable as hypoglycemic and anti-hyperglycemic agent in normal-glycemic, glucose overloaded induced diabetic rats; and improved the altered serum biochemical parameters towards normal. The finding of this study is in line with the findings of Nabila Ibrahim 2015 who reported that the Oral administration of Moringa oleifera extract at a high dose diabetic rats is considered as a strong anti-hyperglycemic, reduced the blood glucose and increased the insulin level.

Similarly, the continuous oral administration of the extract for fifteen days has significantly reduced the blood sugar level to 126.3 mg/dI against the protection provided by the standard drug 167.0 mg/dI thus, the extract may be considered to have advantage over the used of standard drug. Similarly, despite the observed medicinal potentials of *Luffa Cylindrica* it is imperative to study it mode of action, chronic toxicity and histopathological effect before it should be taken as plant-drug.

Conclusion

In the present investigation, oral administration of ELC to glucose overloaded rats exhibited improved oral glucose tolerance, normal-glycemic rats showed hypoglycemic effect, and on continuous treatment up to 15th induced diabetic rats demonstrated prominent reduction and normalization of elevated blood sugar levels i.e. anti-hyperglycemic compared to the respective control rats. Therefore, it can be concluded that the ethanol extract of *Luffa Cylindrica* possessed remarkable anti-diabetic potential against induced diabetes in Wister Albino rats.

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