Poorva Dubey and Sunita Mishra

Abstract
Diabetes mellitus is a metabolic disorder characterized by abnormal elevated levels of blood glucose due to complete or relative insufficiency of insulin secretion or insulin resistance as well as disturbances in carbohydrate, fat and protein metabolism. Abelmoschus esculentus, AE (okra or lady’s finger) is a flowering plant and cultivated throughout the tropical and temperate region in the world. Okra is an important tropical vegetable and source of dietary medicine. This plant is popular with various health benefits which include anti-diabetic properties. This paper will provide the overview of the research framework and give an insight of the experimental procedure to be implemented to investigate the differential parameter in the blood of streptozotocin-induced diabetic rat in response to Abelmoschus esculentus (AE) treatment.

Keywords: Diabetes mellitus, Abelmoschus esculentus, streptozotocin, insulin resistance

Introduction
Diabetes can be described as a disease in which glucose in the blood increased. Diabetes affected considerable percentage of population throughout the world. Epidemiologic data indicated that 2.8% of the world's population was diabetic in the year 2000 and it may progress to 4.4% of the world's population by 2030. It affects all age groups of people and ethnic groups. It’s become a major health challenge worldwide. Diabetes is fundamentally a condition of disordered glucose metabolism, it is reasonable to ask whether the type of dietary carbohydrate can influence the risk and course of this disease. The management of diabetes without any side effects is a challenge to the present medical system as the treatment for diabetes is relatively limited with significant side effects. There is a lot of interest growing in the use of natural products as an alternative approach to current medications. Plant sources have become a major target to explore new drugs.

The streptozotocin-induced diabetic rat is still considered as an important means for the pathophysiology and pharmacology studies of diabetes mellitus.

Review of Literature
Okra
Okra (Abelomuschus esculentus L.) belongs to family Malvaceae and is grown as summer vegetable throughout the tropical and sub-tropical region of the world. It contains vitamin A, B, C as well as fat, carbohydrate, fiber, iron, iodine and is a major protein source in nearly all developing countries. Its fruits contain glycosides, a small amount of Ca, P, Mg and K. A mucilaginous preparation from the fruit has set up an application as a plasma substitute or blood level expander. The high contents of linoleic acid and amino acid in the seed render it an adequate supplement to legume based diets. Young capsules are emollient, demulcent and diuretic. Seeds are stimulants, cordial and antispasmodic. Okra leaves are considered good cattle feed and are also used as an emollient, antiscorbutic, chronic ulcers, spermatorrhoea and continual dysentery.
Nutritive and phytochemical profiling of different parts of okra

<table>
<thead>
<tr>
<th>Parts</th>
<th>Form</th>
<th>Name of the Medicinal system where it is used</th>
<th>Used for</th>
<th>References</th>
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<tbody>
<tr>
<td>Fruit</td>
<td>Infusion of the fruit</td>
<td>Indian ethno medicine</td>
<td>For treating dysentery and diarrhoea in acute inflammation and irritation of the stomach, bowels, and kidneys catarhal infections, arduous urinae, dysuria, diuret ic, plasma replacement and gonorrhoea.</td>
<td>Odedra, &amp; Nathabhai, 2009; Lim, 2012; Maramag, 2013; Smit, Neeraj, &amp; Preeti, 2013; Sayana et al., 2014 [10, 11, 12, 13, 14]</td>
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<td></td>
<td>muclage</td>
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<td></td>
<td>Immature fruit</td>
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<tr>
<td>Leaves</td>
<td>Extract of leaves and</td>
<td>Indian ethno medicine</td>
<td>Extract of leaves mixed with egg albumin and applied on hair which makes black and silky hair.</td>
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<td></td>
<td>roots</td>
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<td>Leaves</td>
<td>Extract of leaves</td>
<td>Indian ethno medicine</td>
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<tr>
<td>Root</td>
<td>Extract of roots</td>
<td>Indian ethno medicine</td>
<td>Demulcent and emollient poultice.</td>
<td>Barrett, 1994; Yesilada et al., 1951; Babu, &amp; Srinivasan, 1995; Odedra, &amp; Nathabhai, 2009; Lim, 2012 [15, 16]</td>
</tr>
<tr>
<td></td>
<td>The juice of the roots</td>
<td>Indian ethno medicine</td>
<td>To treat cuts, wounds and boils.</td>
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<tr>
<td>Seeds</td>
<td>An infusion of the</td>
<td>Traditional medicine of Nicoragua's Atlantic Coast and</td>
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<td>Crossley &amp; Hilditch, 1952; Martin, 1982; Vaidya &amp; Nanoti, 1989; Calisir et al., 2005; Jarret et al., 2011; Lim, 2012; Smit et al., 2013 [20, 21, 22, 23, 11, 13]</td>
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<td>Treatment of syphilis.</td>
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<td></td>
<td>Infusion of the roots</td>
<td>Traditional medicine of Turkish folk medicine</td>
<td>Used as stomachic, to treat diabetes, ulcer, used as laxative and treatment of jaundice.</td>
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<td>Indian ethno medicine</td>
<td>Antispasmodic, cordial and stimulant.</td>
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<td></td>
<td>Infusion of the roasted</td>
<td>Indian ethno medicine</td>
<td>Has sudorific properties</td>
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<td>In managing increased blood glucose concentration</td>
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<td>Remedies for tumour</td>
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<td>Turkey</td>
<td>Diabetes mellitus therapy.</td>
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<td>Flower</td>
<td>The decoction of the</td>
<td>Indian ethno medicine</td>
<td>Used for the treatment of bronchitis and pneumonia.</td>
<td>Lim, 2012; Marwat et al., 2011 [11, 24]</td>
</tr>
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<td>leaves and flowers</td>
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Diabetics and okra seed relation

Author Bishambar Dayal et al (2012) [25] have propounded that an advanced Glycation End Products (AGES) were associated with the micro-vascular complications in diabetes and other age-related neurodegenerative diseases. Authors have investigated the effect of glycosylation of bovine serum albumin (BSA) in the presence of okra seed extracts. The degree of protein glycation with glucose was assessed by tryptophan AGE, AGE-induced cross-linking by sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE) and Nano Drop spectrophotometry. Fluorescence spectra (excitation at 360 nm and read at 460nm) of BSA solution incubated for 90 days with okra seed extracts showed significant inhibitory potential (45-50%) at 0.1mg/ml concentration in a dose dependent manner. Intensity of fluorescence spectra combined with densitometry measurements exhibited 50% inhibition of glycation of BSA. Authors propose that the fluorescence emission spectra were altered by glycation when incubated with okra seed extracts and thus inhibited the advanced glycation end products. Further studies were however, needed to understand the bioactive compounds present in okra seed extracts in in vivo models.

Priya Singha et al (2014) [26] had recurred an overview on okra (Abelmoschus esculentus) and it’s importance as a nutritive vegetable in the world. Okra a commercial vegetable crop belongs to family Malvaceae. It originates from Ethiopia and is widely spread all over tropical, subtropical and warm temperate regions of the world. It plays an important role in the human diet and is a good source of protein, carbohydrates, vitamins, calcium, potassium, enzymes, and total minerals which are often lacking in the diet of developing country. Its medicinal value has also been reported in curing ulcers and relief from hemorrhoids. Okra has found medical application as a plasma replacement, or blood volume expander and also useful in genito-urinary disorders, spermatorrhoea and chronic dysentery. The fruits of okra have reawakened beneficial interest in bringing this crop into commercial production. Okra (Abelmoschus esculentus (L.) Moench) is a medicinal plant of immense importance with large pharmacological applications. Besides having the above mentioned nutritional and medical, industrial properties, it has been used as an ingredient of many herbal formulations, which are used for the cure of various ailments, in particular the regulation of blood pressure, fat, diabetes, chronic dysentery, genitourinary disorders, simple goiter and ulcer.

Research frame work

Primary treatment of raw materials

The cleaning of okra seed done manually remove damaged seeds, dust particles, seeds of other grains/crops and other impurities such as metals and weeds washed in tab water.

Preparation of okra seed flour

The okra seeds were placed into the dry grinder. It was grinded until seeds became flaky.

|~ 86 ~|
Experimental design for checking efficacy of okra seed

**Animals and Maintenance:** This study 46 male albino rats has been taken, with the weight of 180 gm-200 gm. They have maintained in a well ventilated room exposed to ambient condition. Environmental conditions such as humidity, heat, light, and ventilation were kept constantly for 24 hours daily during the period of the study. Soaked *Cicer arietinum* have provided to the animal as food and clean water ad libitum. The animals has access to pellet diet for a week after this washout period. The rats were allowed to acclimatize for a period of 07 days before the commencement of treatments. Handling of animals done accordance with relevant institutional and ethical guidelines as approved for scientific study.

**Experimental diabetes induction**

Animals fasted overnight and diabetes has induced diabetic by single intraperitoneal injection of streptozotocin (60 mg/kg body weight) prepared in 0.1 M Citrate buffer at pH 4.57. To overcome drug induced hypoglycemia, animals were allowed to drink 5% glucose solution overnight. Citrate buffer alone injected to control rats. In this group total 46 rats were taken and 36 rats were induced with STZ and after induction period of 3 days 6 rats were sacrificed for confirmation of diabetes. Animals with fasting blood glucose levels > 200 mg/dl were considered as diabetic and taken for the study. Further the rats were divided into following groups:

**Experimental Design for Inducing Diabetes in Rats**

1. **Control Group (Negative Control):** In control group 10 rats taken. They had only fed with the pellet diet and water throughout the study period. The weights of the rats checked biweekly.

2. **Stz Control (Positive Control):** In this group 10 rats taken and, acclimatized for 7 days and reweighed. They were induced with Stz. In between feeding period the weight of the rats checked biweekly.

3. **Okra seed Group:** There were 20 rats taken in this group. They were also induced with Stz. The rats were acclimatized for 7 days and reweighed. In between feeding period the weight of the rats were checked biweekly. The group will further divided into two subgroups (n=10) in each group as low okra seed group (given 250 mg of okra seed) and high okra seed group (given 500 mg of okra seed).

**Collection of blood specimen**

After completion of the treatment period, the animals were kept on overnight fast before sacrificed from each animal in the control and test group via cardiac puncture after each of the animal had been anaesthetized with ether at the end of the exposure. The blood will be collected from heart. After that blood centrifuged at 2500 rpm for 25 minutes to separate serum. After centrifugation by using clean pipette, serum collected and placed into 1.5ml of eppendorf tube. The serum was stored at -20°C until the analysis.

**Biochemical Analysis**

From the collected blood serum, the biochemical markers such as Blood Glucose Level, Total Cholesterol, Low Density Lipoprotein (LDL), High Density Lipoprotein (HDL) and Serum Creatinine (Cr), SGOT and SGPT were determined by using enzopak kit for different estimation.

**Conclusion**

This paper provides a research framework for streptozotocin-induced diabetic rat after the treatment of okra seed investigate by the analysis of blood serum in. The expected findings may reveal the anti-diabetic properties of okra seed. The limitation of the stude is the study include the animals experimental ranging from ethical consideration, The physiological status of every rat may not be the same and will give different results.

**References**


3. Walter Willett, JoAnn Manson, Simin Liu Glycemic index, glycemic load, and risk of type 2 diabetes. *Am J
Clin Nutr. 2002; 76:274-S-80S. Printed in USA.


