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Evaluation of Anti-hyperglycemic activity of *Kakamachi (Solanum nigrum Linn.)* leaves on Wistar albino rats.

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ABSTRACT

INTRODUCTION: Diabetes mellitus is a clinical syndrome characterized by Hyperglycaemia due to absolute or relative deficiency of insulin. Diabetes and its complication pose a major threat to future public health resources throughout the world. According to National Urban Diabetes Survey (NUDS), the prevalence of diabetes is high in urban India; due to change in lifestyle leading to reduced physical activity and increased obesity. Based on a compilation of studies from different parts of the world, the World Health Organization (WHO) has projected that the maximum increase in diabetes would occur in India. Now India has been declared as a "capital of diabetes" because it is one of the five countries which have highest sufferers of Diabetes Mellitus. In *Ayurvedic* classics it is explained that *mehaghna* is one of the *karma* of drug *Kakamachi.* The present research work was conducted to analyse the Anti-hyperglycemic action of the drug *Kakamachi* (leaves).

METHDOLOGY: Kakamachi leaves were collected from natural habitat. Macroscopic and microscopic study of the leaf was carried out. Pharmacognostic and Phytochemical tests are performed as per the standards of Ayurvedic Pharmacopoeia. Anti-hyperglycemic activity of Kakamachi leaves evaluated in Wistar albino rats using Fructose induced diabetes model. Statistically results were analyzed by using Anova test followed by dunnet's test. **RESULTS:** Anti-hyperglycemic activity of *Kakamachi* leaves showed significant reduction in the hyperglycemia ($p<0.001$) when compared to Control group. **CONCLUSION:** Aqueous extract of *Kakamachi* leaves at the dosage of 200mg\kg significantly reduced the Fructose induced hyperglycemia ($p<0.001$)in comparison with Control group.

KEY WORDS: Anti-hyperglycemic, *Kakamachi* (Solanum Nigrum.Linn)

Introduction:

Nowadays changing food habits and lifestyle cause *Medovaha srotas* disorders as obesity, *Prameha(Diabetes)* etc. In the present era, health survey shows an epidemic of diabetes. In *Ayurveda Prameha* is described along with its signs, symptoms, etiopathogenesis and its 20 types. *Vyutpatti* of word *Prameha* is "*Prakarshenaprabhuta prachuravaramvarmehati*", *Prabhutamutrata* (polyuria) is the main symptom of *Prameha* is caused by *Dustakleda* which gets converted into *Mutra*. *Madhumeha* is one of the type among these 20, *Madhumeha* can be correlated with Diabetes mellitus on the basis of similarities in the signs and symptoms.[1] Diabetes mellitus is a chronic metabolic disorder caused by a failure in insulin production or a decrease in insulin sensitivity and function, affecting the lipid and carbohydrate metabolism. Hyperglycemia, an inevitable ramification of diabetes, is linked with several deleterious effects associated with this disease.[2] There are currently approximately 40.9 million patients with diabetes mellitus in India and this number is expected to rise to about 69.9 million by the year 2025. This high burden of diabetes is likely to be associated with an increase in associated complications.[3] In search of natural origin medicines for combating such metabolic syndromes with fewer side effects, there been an exponential growth in the field of herbal medicine and these drugs are gaining popularity both in developing and developed countries. Many traditional medicines in use are derived from medicinal plants, minerals and organic matter.

Several Hypoglycaemic drugs are explained in *Ayurvedic* treatise under the heading of *Prameha chikitsa* in different terminologies like *Pramehahara*, *Pramehaghna, Mehaghna,* and *Mehahara. Kakamachi (Solanum nigrum Linn.)* is one such drug found as a weed in cultivated grounds, roadsides or waste places and throughout the greater parts of India, It is popularly known as black night shade belongs to the Solanaceae family. *Kaiyyadeva Nighantu* explained *Pramehahara* action of this drug under *Oushadivarga*.[4] *Acharya Charaka* explained properties of *Kakamachi* under *ShakaVarga*.[5] *Acharya Sushruta* mentioned this drug under *Surasadigana*.[6]

Kakamachi has *Tikta Rasa*, *Ushna virya* and *Katu vipaka* and is used in the diseases like *Kusta*, *Visarpa*, *Shotha*, *Yakritvikara*, *Kamala*, *Pandu, Vrana, Karnashoola, Hridroga, Prameha* etc.[7]

AIM: Evaluation of Anti-hyperglycemic activity of extract of leaves of *Kakamachi*(Solanum nigrum Linn.)

MATERIALS AND METHODS:

Collection of plant material: The leaves of the Kakamachi (Solanum nigrum. Linn) plant were collected from natural habit. The plant was identified and authenticated with the help of Pharmacognostical study by *Dravyaguna* faculty.

Preparation of Plant Extract: The leaves of Solanum nigrum.Linn were extracted using the cold maceration technique. Two hundred grams of the coarse powder was soaked with distilled water in a conical flask and placed on a shaker at 120 rpm for 3 days at room temperature. The extract was filtered using muslin cloth and Whatman® grade 1 filter paper and the marc was re-extracted for the second and third times by adding another fresh solvent. The fluid extract was dried in a lyophilizer and stored in a desiccator until used for the experiment.

Animals: The study was carried out on healthy Wister albino rats weighing about 150-250gm, they were

obtained from well established animal house. The temperature and humidity were kept at optimum and animals were exposed to natural day and night cycles. Experimental procedures were undertaken according to the principle guidelines of animal care with prior permission from Institutional Animal Ethical Committee (IAEC).

Requirements: Albino Rats, Syringe, Needle, Standard and test drugs, Feeding tube.

Dose fixation: 1\10th (200mg\kg) of lethal dose (2000mg/kg) taken for study as per OECD guidelines 425.

Table no. 1: Showing grouping and dosage of Animals.

Group	Drug	Dose	Route of Administration
Group I	No	-	-
Group II	Pioglitazone	15mg/kg	Oral
Group III	Aqueous extract of *Kakamachi* leaves(AESN)	200mg/kg	Oral

Procedure[8]

The adult healthy Wistar Albino rats were fed with 30% fructose in drinking water for 30 days and biochemical parameters were estimated. Animals exhibited hyperglycaemia were selected for further treatment. The selected rats were allowed to continue to receive fructose until the end of the study. The examined animals were divided into 3 groups, each consisting of six rats as follows. The control rats received 10ml of distilled water, Test group was given oral administration of Aqueous extract of *Kakamachi* leaves in lower dose (200mg\kg) and the Standard group was given pioglitazone (15mg/kg) orally.

Data Analysis:

The data is expressed as mean ± standard Deviation (SD). Results were analysed using one-way ANNOVA followed by Dunnet's test. Differences were considered as Statistically significant at $P<0.05$, when compared with control.

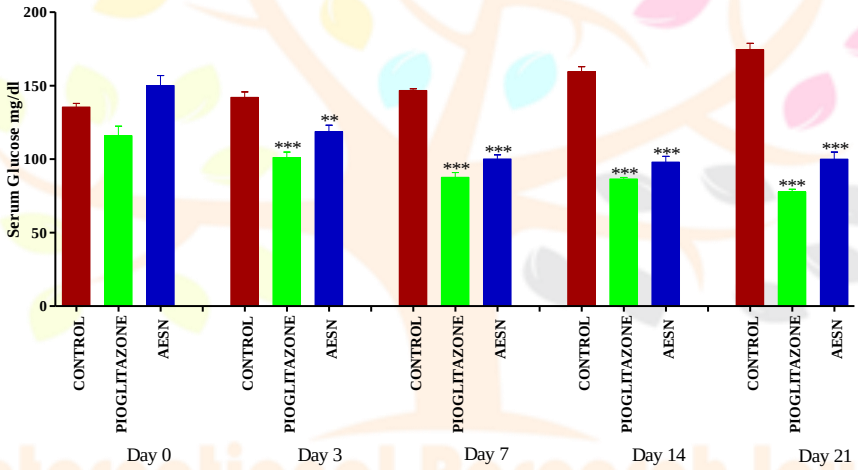
RESULTS:

In the current study, Anti-hyperglycemic activity was performed by fructose induced diabetes method. The standard drug pioglitazone (15mg/kg) showed significant anti-hyperglycemic activity ($p<0.001$) by decrease in blood glucose level 101.1±3.669, 87.69±3.189, 86.53±0.993 and 77.79±1.733 at 3rd, 7th, 14th and 21st day respectively as compared to control group. At the same, Aqueous extract of *Kakamachi* 200mg/kg showed significant anti-hyperglycemic activity ($p<0.001$) by decrease in blood glucose level 118.8±4.307, 100.1±2.872, 98.09±3.812, and 100.0±4.773 at 3rd, 7th, 14th and 21st day respectively. Both Test group and Standard group showed significant result compered to control group

Table no. 2: Showing Effect of aqueous extract of *Kakamachi* (Solanum nigrum. Linn.) on fructose induced Hyperglycemia in Wistar albino rats

Groups	Serum glucose (mg/dl)				
	0th day	3rd day	7th day	14th day	21st day
Control- (Group-I)	135.5±2.508	142.1±3.643	146.8±1.170	159.5±3.439	174.6±4.338
Pioglitazone 15mg/kg (Group-II)	116.0±6.412	101.1±3.669***	87.69±3.189***	86.53±0.993***	77.79±1.733***
AESN 200mg/kg (Group-III)	150.1±6.824	118.8±4.307**	100.1±2.872***	98.09±3.812***	100.0±4.773**
All the values are expressed as Mean± SEM, n=6, One way Analysis of Variance(ANOVA) followed by multiple comparison dunnet's test. **p<0.01, ***p<0.00 as compared to the control group					

Graph no. 1: Showing Serum glucose (mg/dl) level



DISCUSSION:

Diabetes mellitus is a clinical syndrome characterized by Hyperglycaemia due to absolute or relative deficiency of insulin. Treatment should aim to lower blood glucose to near normal levels.

Experimental study was conducted to evaluate Anti-hyperglycemic activity of aqueous extract of Kakamachi(Solanum nigrum.Linn.) leaves in Wister albino rats which were fed with 30% fructose in drinking water for 30 days. The fructose induced rats exhibited significantly elevated blood glucose and biochemical parameters were estimated.

Animals which exhibited hyperglycemia were selected for further treatment. The selected rats were allowed to continue to receive fructose until the end of the study.

The examined animals were divided into 3 groups, each consisting of six rats. Then Serum glucose level was checked at 0th , 3rd , 7th , 14th and 21st day with the help of Trinder's method.

In this study it was observed that, the Aqueous extract of *Kakamachi* drug (AESN) in dose 200mg\kg started to show significance at 3rd day only and it then gradually decreased at 7th, 14th and 21st day.

Studies in the past few decades revealed that the whole *Kakamachi (Solanum nigrum Linn.*) herb contains steroidal saponins, steroidal alkaloids, flavonoids, coumarin, lignin, organic acids, volatile oils, polysaccharides, and other ingredients as constituents[9] which may shown to have anti-hyperglycemic activity. Thus, the plant contributes to its anti- hyperglycemic activity.

From Ayurvedic point of view, the *Mehahara karma*(Anti-hyperglycemic activity) of *Kakamachi*(Solanum nigrum Linn.) may be due to it's properties like *Tikta Rasa, Laghu- Ruksha guna, Ushna Veerya, Katu Vipaka.*

The study shows test drug is having *Mehahara karma*(Anti-hyperglycemic activity).

Aqueous extract of *Kakamachi* leaf has shown effective reduction in blood glucose level in Fructose induced hyperglycemia in Wister albino rats and also have more significance in hyperglycemia compared to control group.

CONCLUSION:

The result of the present study concluded that Aqueous extract of *Kakamachi* leaf has shown the significant reduction in the blood glucose level in Fructose induced hyperglycemia in Wister albino rats at the dose of 200mg\kg when compared to Control group($P<0.001$). Thus, this study concluded that the drug *Kakamachi* (Solanum nigrum Linn.) have *Mehahara* (anti-hyperglycemic) karma. Moreover, the study indicated that the leaf also has medicinal property apart from its common usage as leafy vegetable.

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