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Regulation of α-amylase Activity and Blood Glucose Levels in Diabetic Sprague-Dawley Male Rats by the Aqueous Extract of *Andrographis paniculata*

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Hypoglycemic effect of *Andrographis paniculata* leaf extract and its glucose uptake inhibition effect in rat invivo models has been studied.Hypoglycemic studies were carried out in glucose loaded and starch induced diabetic albino rats.Blood glucose levels were estimated at 10, 20, 30, 60, 120, 240 and 360 min after administration of methanolic extract of A.paniculata by using One Touch digital glucose reader in both 200 and 500 mg/kg body weight.The blood glucose levels were significantly depleted in the animals administered with aqueous leaf extract of A.paniculata in both 200 and 500 mg/kg body weight. The aqueous extract of *A. paniculata* is very effective at regulating the activity of α-amylase and regulating blood glucose levels. There was a dose-response decrease in glucose absorption by the extract. The leaf extract of *A. paniculata* has in vivo efficacy for inhibition of starch absorption and may prove beneficial in weight reduction in individuals consuming large amounts of starch. It also may inhibit starch-induced hyperglycemia in normal and diabetic subjects.

Key words: *A. paniculata*, Dose-dependent, a-amylase,Starch.

Diabetes, a chronic metabolic disorder is characterized by abnormal blood glucose levels, and often, insulin resistivity. With the number of diabetic cases ever increasing, there is a very pressing need for the development of new, improved remedies that are more effective than existing remedies and devoid of the many harmful side effects that are present in the existing drugs[1,2].There are a number of herbal remedies that are well known and accepted by traditional medicine systems, but little to no scientific data exists about their effectiveness[3].

Andrographis paniculata colloquially known as *'Kalmegh'* is often crowned as the 'King of Bitters' due to its extreme bitter taste. It is rich in phytochemicals and is well known as the source of andrographolide, a very well characterized diterpenoid which is extremely effective as a remedy for cold and cough. However, no studies have been carried out into the antidiabetic activity of the plant[4]. This study is aimed at characterizing the same.

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MATERIALS AND METHODS

Chemicals and Reagents

All the chemicals, reagents and kits used in this study were procured from Sigma Aldrich Pvt. Ltd. India, Mumbai. All the glassware used were of analytical grade and procured locally.

Plant Material & Extract Preparation

Andrographis paniculata leaves were obtained from the local market in Vellore, Tamil Nadu, India. The methanolicextract was prepared based on the previously optimized procedure[5].

Experimental Animals

Healthy male Sprague-Dawley Rats weighing 250-300 g were chosen for the study.

The study was approved by the Institutional Animal Ethical Committee at Sainath Scientific Agencies under registration number: 282/99/ CPCSEA.

Starch Induced Diabetic Models

Male Sprague Dawley rats weighing 250-300gms were housed in a temperature (21-25°C) and humidity (40-50%) controlled room. During a 24 to 48 hour adaptation to their environment the rats were fed a standard laboratory diet with free access to tap water. Sixteen hours prior to the experiment food but not water is withheld. Animals were randomized based on pre-dose blood glucose levels. Groups of rats receive by stomach tube 2.5 g/kg raw starch in a water suspension without or with doses (200, 500 mg/ kg) of the extract. After 10, 20, 30, 60, 120 and 240 min blood glucose levels was determined by using One Touch digital glucose reader in 200 mg/kg group and After 10, 20, 30, 60, 120, 240 and 360 min blood glucose levels was determined by using One Touch digital glucose reader in 500 mg/kg group. Tail dissection technique was used to collect the blooddrop on glucose reader [6-9].

Toxicity study

ACUTE

On the basis of toxicity study ,it was observed that the methanolicextracts of *Andrographis paniculata* were non-toxic and did not induce death at the highest single dose, 2000mg/kg B.W per oral.No toxic symptoms like behavioral changes, locomotion, convulsions were observed

CHRONIC

During 30 consecutive days of treatment by oral route with methanolic extract of *A.paniculata*, at a dose 100mg/kg B.W no toxicity signs or death were recorded in control and treated mice.Likewise, during 30days of toxicity test, B.W measurements did not reveal any significant changes in B.W gain of control & treated groups in rats.

RESULTS AND DISCUSSION

The most challenging goal in the management of diabetes mellitus is to achieve blood glucose level as close to normal as possible.The results of the study are given in Figures 1 and 2. As can be inferred from the figures, the aqueous extract of *A. paniculata* is very effective at regulating the activity of á-amylase and regulating blood glucose levels. Moreover, the extract is an effective regulator of blood glucose levels, and its activity is linked to the concentration administered.It is clear from the data that the blood glucose levels of control diabetic animals continued to increase whereas treated diabetic rats showed significantly reduced glucose levels. *In vivo* study showed administration of methanolic leaf extracts of *A. paniculata* produced a significant reduction in blood glucose level in a dose dependent manner.These results are very similar to the results of the *in vitro* study[5,10].

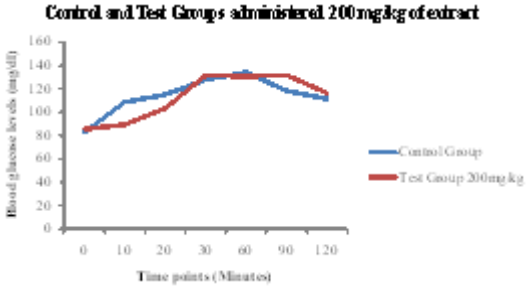

Fig. 1. This graph shows the blood glucose levels of the rats at specific time intervals after administration of 200 mg/kg bw of the extract. The value depicted here is the mean value of 6 rats in each group.

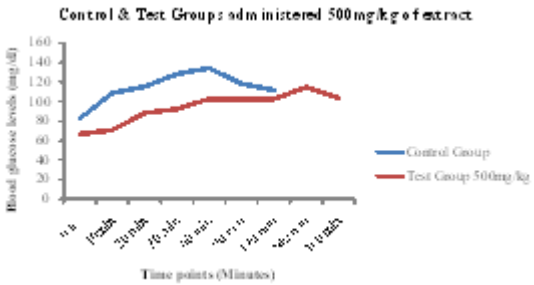

Fig. 2. This graph shows the blood glucose levels of the rats at specific time intervals after administration of 500 mg/kg bw of the extract.The value depicted here is the mean value of 6 rats in each group

CONCLUSION

It is apparent that *A. paniculata*serves as an effective antidiabetic agent both *in vitro* and *in vivo*. It could be used as a treatment for diabetes in the future, after some more detailed studies into the toxicity and mechanism of action are carried out.

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