Protective Role of *Andrographis paniculata* on the Blood Sugar of Albino Rats

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Abstract

The hypoglycemic potential of ethanolic extract of hole plant of *Andrographis paniculata* was evaluated by normoglycemic rats. The plant extract was subjected to the study of presence of different phytoconstituents. Now a day, Diabetes mellitus has become a real problem of public health in developing countries. This is a metabolic disorder characterized by disarrangements in carbohydrate, protein and fat metabolism caused by the complete or relative insufficiency of insulin secretion and /or action. This is due to defective or deficient insulin secretary response. This results into impaired glucose use, which is a characteristic feature of diabetes mellitus i.e. resultant hyperglycemia. Elevated blood glucose level causes dehydration of the tissue cells as glucose does not diffuse easily through the pores of cell membrane and increased osmotic pressure. Present investigation is therefore designed to determine the effect of crude ethanolic extract of *Andrographis paniculata* on blood sugar of albino rat after daily oral administration of dose at the level of 250mg/kg b. wt. for five and seven days respectively. It was noticed that the chronic administration for longer duration leads to significant decrease in blood sugar compared to control. Thus it can be concluded that *Andrographis paniculata* also has the anti-diabetic property.

Keywords: *Andrographis paniculata*, Albino rats, Blood sugar, Hyperglycemia, Antidiabetic property**.**

Introduction

Andrographis paniculata the Kalmegh of Ayurveda is an erect annual herb extremely bitter in taste in each and every part of the plant body. The plant is known in north-eastern India as ‘Maha-tita’, literally ‘king of bitters’ and known by various vernacular names. It is also known as ‘Bhui-neem’, since the plant, though much smaller in size, shows similar appearance and has bitter taste as that of Neem. Since ancient times, *Andrographis paniculata* is used traditional Siddha and Ayurvedic of medicine as well as in tribal medicine in India and some other countries for multiple clinical applications. The therapeutic value of Kalmegh is due to its mechanism of action which is perhaps by enzyme induction. The plant extract exhibits antityphoid and antifungal activities. Kalmegh is also reported to possess antihepatotoxic, antibiotic, antimalarial, antihepatitic, antithrombogenic, anti-inflammatory, antisnakevenom and antipyretic properties to mention a few, besides its general use as an immunostimulant

agent[1]. A recent study conducted at Bastyr University, confirms anti-HIV activity of andrographolide.

In recent times, focus on plant research has increased all over the world and a large body of evidence has collected to show immense potential of medicinal plants used in various traditional systems. *Andrographis paniculata* is also a medicinal plant. It has been used widely as medicinal and food plants despite their reputation for being poisonous. The unripe fruit of *Andrographis paniculata* contain the highest concentration of toxin particularly Andrographolide[1]. The level of toxin in the berries is greatly reduced by ripening[2, 3]. The ripe berries are eaten raw as fruits and are used in pies and preservative in many regions of the world. All parts of this plant are used in the traditional medicine as a remedy for treating various diseases like, cough, cold, asthma, skin diseases and liver problem.

Now a day, Diabetes mellitus has become a real problem of public health in developing countries[4]. It is actually a chronic disorders related to abnormality of carbohydrate, fat and protein metabolism. This is due to defective or deficient insulin secretary response. This results into impaired glucose use, which is a characteristic feature of diabetes mellitus i.e. resultant hyperglycemia. Elevated blood glucose level causes dehydration of the tissue cells as glucose does not diffuse easily through the pores of cell membrane and increased osmotic pressure. Present investigation is therefore designed to determine the effect of crude ethanolic extract of *Andrographis paniculata* on blood sugar of albino rat after daily oral administration of dose at the level of 250mg/kg b. wt. for five and seven days respectively. It was noticed that the chronic administration for longer duration leads to significant decrease in blood sugar compared to control.

MATERIALS AND METHODS:

Collection and Extraction of Plant Material: Whole plant of *Andrographis paniculata* except root was collected locally from the Jaunpur region and dried in shade till total moisture is removed from the plant. These air dried plants were powdered in an electric grinder. The extraction process was done with the help of Soxhlet apparatus. Solvent was ethanol. Extracts were kept in desiccators for the removal of remaining moisture.

Animals: Mature albino rats of *Sprague-Dawley* strain weighing about 150-200gm were obtained from the defense research laboratories, Gwalior and were used for study. They were fed with standard rat pellet diet (Amrut, Delhi) and water ad- *libitum* and maintained under standard

laboratories conditions temperature 24-28ºC, relative humidity 60-70%. The study was permitted by the Institutional animal ethics committee (IAEC).

Experimental Protocol: A dose at a concentration of 250mg/kg b. wt. was prepared. Animals were divided into two groups each having 5 rats. Group-I rats received normal standard diets and vehicle only. Group-II is experimental, which receive different dose of *Andrographis paniculata* extract.

Blood Sampling: The rats were fasted over night and sacrificed under light anesthesia (ether inhalation) at the end of 5 and 7 days after treatment. Blood samples were collected from the retro- orbital plexus of treated rats. The samples were taken in to tubes with anticoagulant. From this sample blood sugar was estimated by a standard method of Asatoor and King[5].

RESULT AND DISCUSSION:

The blood sugar levels of the control rats remained almost static during 7 days (Table-1). When oral dose (250mg/kg b.wt.) of *Andrographis paniculata* was administered daily for 5 days and 7 days, there was a successive decrease in the blood sugar level.

TABLE 1: EFFECT OF DAILY ADMINISTRATION OF *Andrographis paniculata* EXTRACT ON THE BLOOD SUGAR (MG/DL OF BLOOD) OF ADULT ALBINO RATS

N = 5	Blood Glucose Level (mg/dl of blood)	
	5th day	7th day
Control (vehicle only)	95±4.01	96±3.90
Treated with *Andrographis paniculata* (250 mg/kg b. wt.)	78.13±2.89	70±3.04

Medicinal plant extracts have been valuable anti-diabetic agents and may involve one or more active components responsible for blood glucose reduction[6, 7]. The preliminary phytochemical screening of these fractions of *Andrographis paniculata* aqueous extract revealed the presence of alkaloids and Andrographolide which may be responsible for the observed antidiabetic effects of these fractions by possibly stimulating insulin release from pancreatic beta cells. In consonant with this study, some researchers reported that alcoholic extract of leaves of *Cinnamomum tamala* (Bayberry) produced hypoglycemic activity in alloxan induced diabetic rats when administered orally for two weeks at a dose of 250 mg/kg[8]. Mohammad *et al*.[9] has earlier reported the hypoglycemic activity of aqueous extract of *G. lucidum* in Wistar rats. Over 400 medicinal plants are available globally for the medication of

diabetes mellitus, with a few having been subjected to scientific authentication to ascertain their effectiveness as anti-diabetic agents[10]. Substances with hypoglycemic properties would be effective in the management of diabetes mellitus[11].

Andrographis paniculata plant extract is known to possess a variety of pharmacological activities. Andrographolide, the major constituent of the extract is implicated towards its pharmacological activity. A study has been conducted on the cellular processes and targets modulated by andrographolide treatment in human liver cells (hepatocytes) and immune cells. Andrographolide treatment inhibited the in vitro proliferation of different tumor cell lines, representing various types of necrosis. The active compound of *A. paniculata* exerts direct anticancer activity on cancer cells by cell cycle arrest at G0/G1 phase through induction of cell cycle inhibitory protein p27 and decreased expression of cyclin dependent kinase 4 (CDK4). Immunostimulatory activity of andrographolide is evidenced by increased proliferation of lymphocytes and production of interleukin-2. Andrographolide also enhanced the tumor necrosis factor α production and CD marker expression, resulting in increased cytotoxic activity of lymphocytes against liver cells, which may contribute for its indirect hepatoprotective activity control blood sugar in albino rats[12].

This protective effect of the extract may be mainly attributed to steroidal saponins, namely andrographoline I and II, which may possess antioxidant and detoxifying effects. Therefore, a dietary intake of *Andrographis paniculata* fruits supplies our body with nutrients that offer protection against numerous diseases. Further studies are warranted to elucidate the mechanisms of action and to explore its medicinal value.

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