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Research Article

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Pharmacognostic and antidiabetic study of *Clitoria ternatea*

Manish Gunjan[1]*, Ravindran M[1], Sengamalam R[1], Goutam K Jana[1], A.K Jha[1]

***Corresponding author:**

1 Manish Gunjan

MUCH/,I poh, Malaysia
Mob-+0162647280
Email:-
manish_14us(at)yahoo.com

Abstract

Aparajita means "The Undefeated". This plant is a trailing creeper with the usual Indigo Blue colour flowers and the rare white ones which is more of a pale cream with a hint of green at the edges. In Kerala it is called the Sankhu Pushpam or Conch Shell flower although it hardly resembles a Conch shell. It actually resembles a quaint Snapdragon flower with it's front open. Graphically it represents the cutout of an inverted womb. May be that explains their close affinity to Indian Midwives, particularly the White variety. Aparajita grows throughout India. It is a beautiful-looking plant, hence cultivated in gardens. It is a perennial twining herb having 7 leaflets, which are elliptic and obtuse. There are few varieties with white, violet and blue flowers. The pods are 5-7 cm long, flat with 6 to 10 seed, in each pod. The flowers resemble in shape to cow□s ear, hence the synonym- gokarnika. Chronic administration of plant extracts (100mg/kg) for 14 days reduces the blood glucose level of the diabetes induced animals as compared to diabetic control group. There was significant decrease in the blood glucose level in the 7th [$p<0.01$] and 14th [$p<0.001$] days of the diabetes induction, showing antidiabetic effect. The effect was comparable to that of standard antidiabetic drug Glibenclamide. The aim of this research is to explore the antidiabetic activity of this plant which will be helpful in the future investigations.

Keywords-Diabetes, hypoglycemic activity, chronicle administration, indigenous herbs

Introduction

A mention was made on good number of plants for the cure of diabetes or madhumeha and some of them have been experimentally evaluated and the active principles were isolated in India [1,2]. The phytochemicals identified from traditional medicinal plants are presenting an exciting opportunity for the development of new types of therapeutics [3]. Moreover, during the past few years some of the new bioactive drugs isolated from hypoglycemic plants showed antidiabetic activity with more efficacy than oral hypoglycemic agents used in clinical therapy. Many ethno botanical surveys on medicinal plants used by the local population have been performed in different parts of the world including Morocco, Saudi Arabia, Taiwan, Trinidad and Tobago [4 -7]. A number of reviews have been published on plants screened for

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hypoglycemic activity in India [8-12]. It is also reported that adherence to vegetables (including cruciferous vegetables, green leafy vegetables, yellow vegetables, alliums vegetables, tomatoes and others) and legumes (including soybean, peanut, etc.) is inversely associated with the risk of type 2 diabetes (T2D) in a large Chinese population [13,14]. Aparajita means "The Undefeated". This plant is a trailing creeper with the usual Indigo Blue colour flowers and the rare White ones which is more of a pale cream with a hint of green at the edges. In Kerala it is called the Sankhu Pushpam or Conch Shell flower although it hardly resembles a Conch shell. It actually resembles a quaint Snapdragon flower with it's front open. Graphically it represents the cutout of an inverted womb. May be that explains their close affinity to Indian Midwives, particularly the White variety. Aparajita has several synonyms in Ayurvedic scriptures like gokarnika, ardrakarni, girikarnika, supuspi, mohanasini, sveta etc. It is one of the herbs mentioned in all ancient scriptures of Ayurveda. It is a perennial twining herb having 7 leaflets, which are elliptic and obtuse. There are few varieties with white, violet and blue flowers. The pods are 5-7 cm long, flat with 6 to 10 seed, in each pod. The flowers resemble in shape to cow□s ear, hence the synonymgokarnika. The botanical name of aparajita is *Clitoria ternatea* and it belongs to family Fabaceae, Pipilionaceae. The root bark contains starch, tannin and resin. The seeds contain a fixed oil, a bitter acid resin (the active principle), tannic acid, glucose (a light brown resin) and ash. A lactone-aparajitin from leaves, sitosterol from seeds, taraxerol from roots and sitosterol and anthoxanthin from seed are isolated [15]. These data show that a reliable, cost saving therapy with traditionally used plants could be a possibility to lower the problems of untreated diabetes because of a lack of synthetic drugs. On the other side medicinal plants contain an enormous potential for the development of new drugs and the efficient treatment of diabetes. In our study we could show that plants taken are able to inhibit the amylase activity of *Clitoria ternatea* on which very few or none work has been published or performed as a whole extract. This mechanism belongs to first line therapies in diabetes treatment.

Materials and methods

Preparation of extracts by hot extraction method

The coarsely powdered leaf drug of *Clitoria ternatea* about 200gm was extracted with water i.e (aqueous extraction) by continuous extraction method using soxhlet apparatus. The aqueous extract was filtered and concentrated to a dry mass by using oven. A greenish black color residue was obtained.

Animals used

Wistar Albino rats (150-180gms) were selected for these studies. Six rats were taken for each group. The rats were used after an acclimatization period of 7 days to the laboratory environment. They were provided with food and water.

Antidiabetic activity [16]

Preparation of diabetic rats

Hyperglycemia was induced by intra peritoneal injection of freshly prepared aqueous solution of alloxan monohydrate (SD fine Chemicals Pvt. Ltd., Biosar) 150 mg /kg, to overnight fasted rats. Control rats receive similar volume of vehicle, normal saline (2 ml/kg body weight) alone. Animals that did not develop Hyperglycemia after 48 hr of alloxan injection were rejected and new animals were used. Immediately after confirmation of diabetes, rats were classified into six groups of six rats each.

Results and discussion

Experimental animals

Group I received normal saline and served as Control. Group II treated with alloxan monohydrate 150 mg/kg served as diabetic Control. Group III is treated with Plant extract (100 mg/kg). Group IV is treated with glibenclamide (2.5mg/kg) and served as reference standard. Treatment continued for 14 consecutive days. Before the treatment (0 day), and at the end

of 7th and 14th day plasma levels were estimated using the glucose oxidase method [17] (Table no.-1). The results were analyzed by students, t-test, which shows the antidiabetic potential of the plant.

Table-1. Antidiabetic studies

Groups	Dose (ml/kg)	Treatment (Days) (Mean ± SE, n= 6)		
		0	7	14
Control (Normal Saline)	2ml/kg	85.3 ± 5.6	85.8 ± 3.5	80.8 ± 5.4
Diabetic control (Alloxan)	150	256.3 ± 17.5	256 ± 16.2	256.3 ± 16.7
PE-01	100	256 ± 16.0	161.3 ± 11.2*	125.6 ±9.9**
Glibenc-lamide	2.5	250 ± 12.3	145 ± 8.2*	115.3 ±6.2**

Data are expressed as mean ± S.E., n = 6, * p< 0.01 Vs Control, **p < 0.001 Vs Control

histological examination. The photomicrographs of histological studies are taken.

Histopathology studies

Extensive damage to the islets of langerhans and reduced dimensions of islets were found in control animals. Restoration of normal cellular populatation and size of islets with hyperplasia were seen in extract treated groups. The partial restoration of normal cellular population and enlarged size of β-cells with hyperplasia were indicative of the antidiabetic potential of the plant.

Other studies

TLC was performed and the result was tabulated and it was found that the calculated Rf value shows the presence of antidiabetic constituents. Phytochemical and Physical Evaluation were carried out which were useful for the investigations. The phytochemicals identified from traditional medicinal plants are presenting

Table no.-2. Pathological parameters

Treatment	Protein mg/dl	Urea mg/dl	TGL mg/dl	HDL mg/dl	LDL mg/dl	VLDL mg/dl	Total Cholesterol
Normal	1.91 ± 0.06	22 ± 0.23	76.12 ± 4.12	24.5 ± 1.32	39.12 ± 4.13	15.22 ± 0.82	78.84 ± 6.27
Diabetic control (Alloxan)	7.1 ± 0.43	34.0 ± 0.47	114.22 ± 7.43	73.79 ± 4.7	145.41 ± 1.2	22.8 ± 1.48	242 ± 7.38
PE-01 (100 mg/kg)	5.7 ± 0.41	25.3 ± 1.5	94.32 ± 3.8	42.3* ± 2.9	46.12** ± 2.57	17.68 ± 0.86	100.20 ± 6.20
Glibenclamide (2.5 mg/kg)	5.8 ± 0.14	26.8 ± 1.0	87.74* ± 5.9	46.4* ± 3.4	41.8** ± 1.5	15.3 ± 0.95	87.94 ± 5.94

Values are expressed as Mean ± SE., n = 6, * p < 0.01 Vs Control, ** p < 0.001 Vs Control

Histological assay

On the 14th day, pancreatic tissues were taken from animals, which were fasted overnight, under ether anaesthesia. The whole pancreas from each animal was removed after killing the animals, was placed in 10% formaline solution, and immediately processed by the paraffin technique. Sections of 5µm thickness were cut and stained by haematoxylin and Eosin (H & E) for

an exciting opportunity for the development of new types of therapeutics. Aqueous extracts of *Clitoria ternatea* plant showed anti-hyperglycemic activity in streptozotocin treated rats and this effect is because of increase in glucose uptake and glycogen deposition in isolated rat hemi diaphragm. Present studies besides confirming hypoglycemic activities of the experimental herbal samples; help identify more

potent indigenous hypoglycemic herbs (in crude extract) from the comparative study of the reported experimental results. These data show that a reliable, cost saving therapy with traditionally used plants could be a possibility to lower the problems of untreated diabetes because of a lack of synthetic drugs.

Table no.-3. TLC study

S.N	Distance Travelled by solute	Distance Travelled by solvent	Rf value
1	11	12	0.08
2	7.9	12	0.65
3	5.7	12	0.47
4	3.5	12	0.29
5	2.4	12	0.2
6	1.4	12	0.11

Table no .-4. Physical Evaluation

S.N	Parameters	Values %
		Clitoria ternatea
1	Loss on drying	25.4%
	Ash Values	
2	Total Ash	10%
	Acid insoluble ash	1.05%
	Water soluble ash	1.5%
	Sulphated ash	7%
3	**Extractive Values**	
	Water soluble extractives	18%
	Alcohol soluble extractive	5%

Table no. -5. Phytochemical investigation of leaves of *Clitoria ternatea*

S.N	Drug	Extracts	Yields (%)
1	*Clitoria ternatea*	Aqueous	15.5

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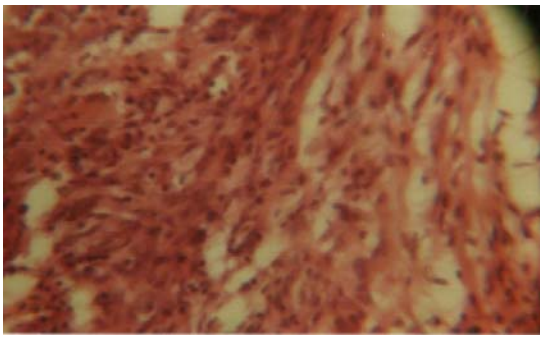
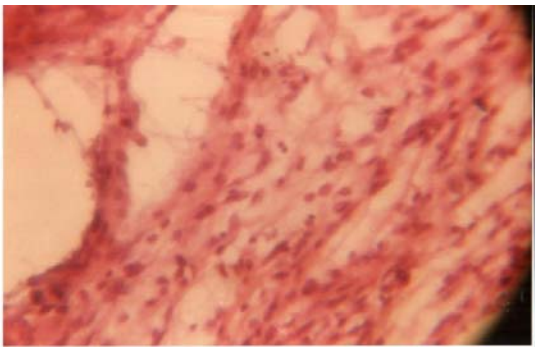
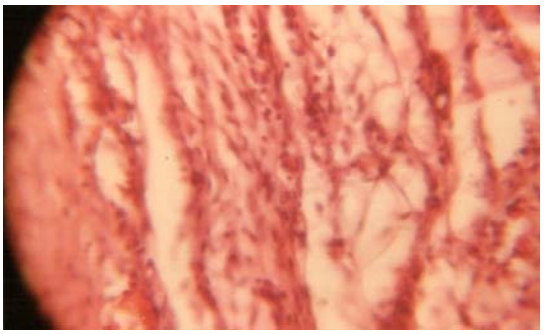


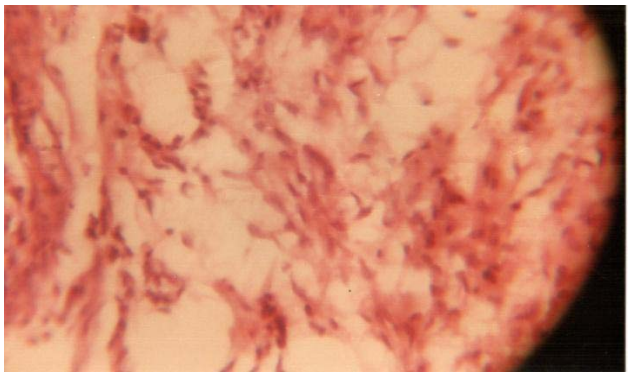
Pancreas – Normal



Alloxan induced beta cell degeneration

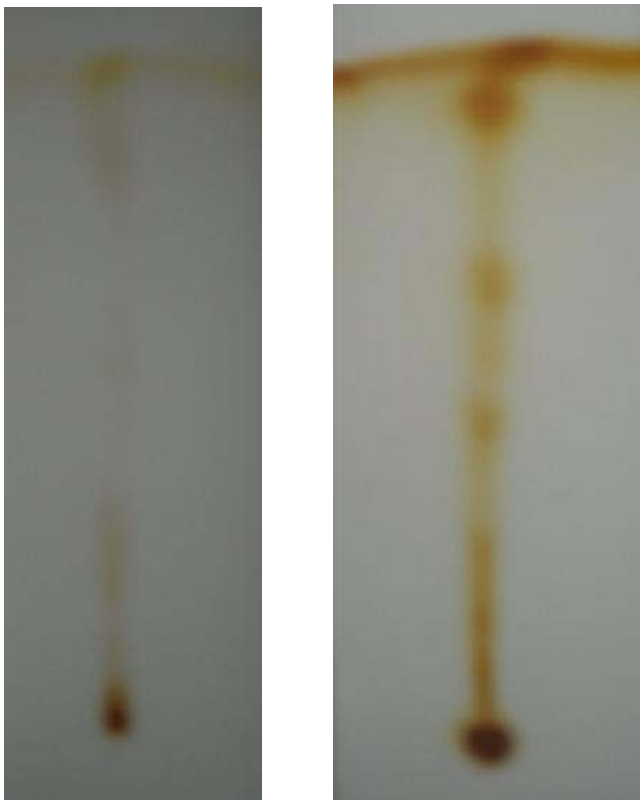


PE- 01 – 100 mg/kg



Gliblenclamide 5 mg/kg

Fig-1. Histological study



In day light **After treatment with iodine vapour**

Fig-2. TLC Profile

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