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"Phytochemical Investigation And Hypoglycemic Evaluation Of *Artemisia Indica* Willd Medicinal Plant"

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KEYWORDS
streptozocin-induced diabetic, Artemisia indica Linn, DPPH assay, Dunnett's post ect.

ABSTRACT:
In this study, the herb Artemisia indica, which has been utilized for therapeutic purposes for centuries, is investigated to see whether or not it possesses any potential anti-diabetic properties. Based on the findings of research that evaluated acute toxicity, Research has demonstrated that a terpenoids, alkaloids, and flavonoid-rich hydroalcoholic extract of Artemisia indica leaves is a safe food option It was discovered through experiments conducted on rats that had developed diabetes as a result of streptozotocin that the extract possesses powerful anti-diabetic capabilities. A comparison was made between the treatment groups and the control group, which consisted of people who had diabetes. Dental glucose tolerance, insulin serum levels, and fasting blood glucose levels were all significantly improved in the treatment groups. According to the results of the histological analysis, the pancreatic islets' structural integrity had been maintained in addition to the finding that there was an increase in the expression of insulin in beta cells. Additionally, Throughout the trial, the extract not only displayed a significant degree of antioxidant activity, but it significantly reduced oxidative stress indicators. Additional research into the molecular mechanisms and medicinal uses of Artemisia indica is urgently required because of the plant's potential to function as a natural anti-diabetic.

1. Introduction

Hyperglycemia is the hallmark symptom of diabetes mellitus, a metabolic disorder. Inadequate insulin production or insulin resistance in disease-target tissues causes these high levels.Yeah, that's right. The deadly and untreatable disease known as diabetes mellitus has been identified. Acute and chronic hyperglycemia both impact the cardiovascular system in different ways. Many distinct variables can cause these consequences. Microvascular problems like retinopathy, neuropathy, and nephropathy can be caused by hyperglycemia [2]. Chronic hyperglycemia alters glucose, lipid, and protein metabolism and is associated with a range of illnesses [3]. Some illnesses involve chronic hyperglycemia. The number of persons diagnosed with diabetes is rising globally; in the US, India, and China alone, over 30 million people have the disease [4]. The use of dietary supplements in the management of type 2 diabetes has been the subject of some investigation. Research on these supplements has focused on their possible effects on fatty acid availability, gluconeogenesis restriction, and lipolysis enhancement.

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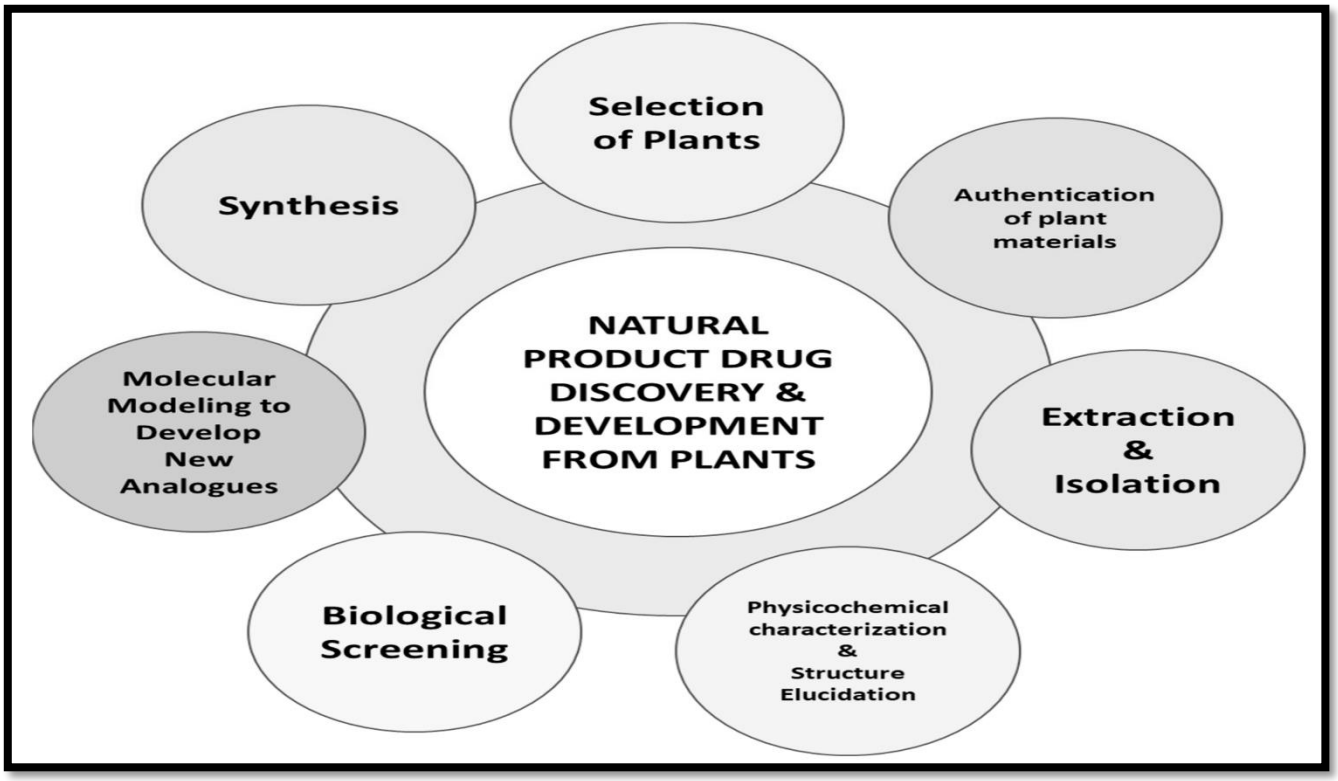

Fig.1 The process flow diagram for the development of drugs derived from plant-based natural products

2. Herbal remedies and their medicinal uses

The potential of natural items, especially plants, to lower the risk of acquiring diabetes has attracted interest, in contrast to synthetic chemicals. There are fewer side effects and less toxicity in these natural products [7, 8]. A significant portion of diabetes patients, almost 70% according to the World Health Organisation (WHO) [9], get their antidiabetic chemicals from plants. "Mugwort" is the common name for the Astereaceae family perennial shrub Artemisia indica, which can reach a height of two to eight metres. Its native habitats include the northern parts of India and the cold temperate zone of Asia. The effects include those against parasites [10], spasmodic and bronchodilator mechanisms [11], hypertension [12], allergies [13], liver protection [14], bacteria [15], and pain [16] are just a few of the many pharmacological activities demonstrated by Artemisia indica. There is evidence for each of these pharmacological effects. There is a great deal of variation within populations of the widely dispersed and extremely polymorphic Artemisia indica Linn. Several intraspecific taxa within this species have been recognized and identified because of this. Artemisia indica Linn is rich in a wide range of phytochemicals. Phenols, alkaloids, glycosides, terpenoids, tannins, saponins, steroids, and flavonoids are all part of these components. Additionally, it has become a naturalised species after being transported to North America [17]. The antispasmodic, expectorant, bactericidal, and anthelmintic properties of Artemisia indica are particularly well-respected. Research has shown that various sections of the plant, particularly the aerial parts, have potential medicinal uses [18]. For instance, treating infections affecting the central nervous system and increasing hunger are two common uses for an infusion of Artemisia indica. The tomentum, the plant's delicate hair, is also utilised as moxa, a conventional kind of heat treatment [19]. This study looked into antioxidant and antidiabetic properties. The compounds' properties were evaluated using two methods: the DPPH assay and the streptozocin-induced diabetes model.

3. Material and methods [20]

The process of collecting and verifying plant

The Artemisia indica species of plants was obtained from the upper part of the Dehradun district. Plant expert and head of Aligarh's Department of Agriculture at Mangalayatan University, Professor Pramod Mishra, is also a taxonomist. The discovery was made by him. The herbaria of Aligarh's Mangalayatan University's Department of Pharmacy received a voucher sample of the plant. This sample's voucher number was 202200106.

Methods for Making Artemisia indica Plant Extract [21]

For three weeks, the plant's freshly formed aerial parts were allowed to dry naturally in a cool, shaded area. During this time, the material was constantly being

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moved about to prevent the growth of fungus. In order to get a coarser consistency, the aerial parts were ground into a powder after the plant had dried. Next, the solvents n-butanol, n-hexane, ethyl acetate, chloroform, and methanol were employed in a hot extraction process. The extraction was carried out using the Soxhlet equipment. After the solvent extraction was finished, it was evaporated using a rotary evaporator (Heidolph Laborata 4000 efficient, Germany) operating at 450^0 C.

The powdered extract and wild Artemisia indica plant are shown in Figure 2.

4. Analysis of Artemisia indica's phytochemical profile [22]

Scientists tested the Artemisia indica extract using a plethora of phytochemical tests. Among the solvents utilized in the research mentioned here were methanol, chloroform, ethyl acetate, n-butanol, and n-hexanol. The various active components found during these trials included triterpenoids, alkaloids, glycosides, saponins, and tannins.

Test animals

A total of several experiments made use of mature Sprague Dawley rats ranging in weight from 150 to 200 grams. In addition to providing the rats with an abundance of clean water and regular food, the institution also took care of the animal house facilities.

5. Planned experiments to test antidiabetic effects [24]

After the rats fasted for twelve hours the night before, they were separated into seven groups of eight. The first group consisted of individuals who did not have diabetes and were given normal saline to serve as a control. The second group, which was used as a control for diabetes, received a 5% concentration of Tween-80 suspension. The common medicine glibenclamide was given orally to the third group at a dosage of 500 µg/kg. Oral administration of Artemisia indica methanolic extract was done at doses of 200 mg/kg for Group 4 and 400 mg/kg for Group 5. In each of the nine groups, 200 mg/kg of Artemisia indica chloroform, ethyl acetate, n-butanol, or n-hexane extracts were given orally. For fifteen days, the medicine—a combination of fractions and crude extract—was taken orally beginning at nine in the morning. On days 1, 4, and 7, we checked the patient's weight and blood glucose levels

6. Insulin resistance Hyperglycemia caused by streptozocin:

Injecting Sprague Dawley rats with a 50 mg/kg dose of streptozotocin (STZ) diluted with 0.9% normal saline into their intraperitoneal vein caused hyperglycemia. A full 24 hours prior to receiving the STZ injection, the rats were told to fast. Three days following STZ administration, blood was drawn from the rats' tail veins. The blood glucose levels were measured using a German-made SD glucometer and one-touch Glucometer strips. When rats' fasting blood glucose levels exceeded 300 mg/dl, researchers deemed them diabetic and chose them for further testing.

7. Statistical analysis

Results for both weight and blood sugar were shown as means plus or minus the SEM. The two datasets were compared using the students' t-test. In cases where we needed to compare more than two groups, we used one-way ANOVAs using Dunnett's post hoc multiple comparison test.

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8. Findings and Analysis

Ratio of plant extracts to total yield

In Table 1 we can see a summary of the percentage yields of several plant extracts.

Table 1: Results from various plant extracts as a percentage

Various Plant extracts	Sample Weight	Yield in Percentage (%)
The Crude methanol extract	450 gm	90.33
The n-hexane component	150 gm	21.5
Fraction of chloroform	300 gm	53.33
The ethyl acetate	100 gm	15.12
n-butanol components	200gm	20.30
Liquid fraction	200 gm	40.56

Initial investigation into phytochemicals

Table 2. Preliminary phytochemical analysis of several extracts from Artemisia indica

Plant extracts	Content of Flavonoids	Content of Glycosides	Content of Alkaloids	Content of Saponins	Content of Tannins	Content of Terpenoids
Methanolic crude extract	++	++	++	++	++	++
portion of n-hexane	++	_	++	++	++	++
A portion of chloroform	++	++	_	++	_	++
The percentage of ethylacetate	++	++	_	++	++	_
the portion of n-butanol	_	++	_	++	_	_
Hydrated component	_	++	_	++	_	_

+ (Positive): Phytochemical components are present
- (Negative): They are not. Study on acute oral toxicity

The plant extracts have an LD50 value of 2000 mg/kg, according to investigations on acute oral toxicity. The following studies utilised the methanolic extract at dosages of 200 mg/kg and 400 mg/kg, together with chloroform, ethyl acetate, n-butanol, and n-hexane at 200 mg/kg each.

Artemisia indica's antihyperglycemic action

In rats with normal and diabetic glucose metabolism, Table No.3 shows the effects on blood sugar levels of various fractions of Artemisia indica, including the crude methanolic extract and glibenclamide.

S. No.	Groups	Dose (mg/kg)	1st day	4th day	7th day	10th day	15th day
1	Diabetic control	0.4ml	271.3±37	284.7±20	300.8±50	306±34	316.7±50
2	Normal Saline control	0.4 ml	88 ±22	92.3±9	92.3±6	91.3±7	91.5 ±5
3	Drug Gliben clamide	0.3 ml	260.8±33	220.7±45**	380.5±50**	350.8±53**	300.2±40**
4	Methanol Extract	150	477.7±18	476.3±32	445.7±20**	400.5±12**	350.3±12**
5	Methanol Extract	300	350.7±53	370.2±9	400.8±10**	420.8±7**	410.6±20**
6	Fraction of Chloroform solvent	150	380±52	340.8±48**	352.1±26**	330.2±14**	340.8±23**
7	Fraction of Ethylacetate	150	350±38	330±23	307.3 ±31	380.3±34	310.3±42
8	fraction of n-butanol	150	472±32	476.5±48	493.8±30	497±18	490.2±48
9	fraction of n-hexane	150	275±45	278±45	286±28	289±28	276±44

Table 3: Glubenectide and Artemisia indica extracts were administered orally to rats with type 2 diabetes mellitus (STZ) to determine their impact on blood glucose levels.

The mean ± SEM represents the eight parameters that are specific to each group. A significant difference (**p < 0.01) was seen when the diabetic control group was

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examined simultaneously using Dunnett's multiple comparison test and one-way ANOVA.

Artemisia indica's Impact on the Body Mass Index of Diabetes Rats

Weight changes in rats treated with glibenclamide and its extracts are summarized in Table 4. In Table 4, we can see how different Artemisia indica extracts affected the weight of diabetic rats produced by STZ

S.No.	Treatments	Dose(mg/kg)	The percentage change in body mass index (g) between days					% Weight loss or gain
			0	4	7	10	15	
1	[a]Normal (Control)	0. 4 ml	143±0.5	145±9	155±0.9	160±0.9	170±3	
2	[b]Diabetic (Control)	0.4 ml	150± 7	150±5*	146±5**	143±3*	145±4***	-11.5
3	[c]Glibenclamide	0.5	165±4	159±3*	162±6*	165±4**	170±5**	+ 10.8
4	[c]Crude methanolic Ext	150	162±3	165±5*	160±7*	150±5**	164±4**	+8.8
5	[c]Crude methanolic Ext	300	164±4	165±6*	158±4*	152±3**	165±6**	+8.1
6	[c]Chloroform fraction	150	161±5	164±5*	160±3*	172±4**	177±5**	+12.6
7	[c]Ethylacetate fraction	150	163±7	157±4	140±2	149±4	145±4	-10.7
8	[c]n-butanol fraction	150	154±5	169±3	155±4	160±3	154±4	-13.0
9	[c]n-hexane fraction	150	165±6	158±2	150±5	152±4	143±5	-12.0

The mean ± SEM represents the values. Usually, eight different species are shown in each picture. A Student t-test was conducted to compare the normal control group (a) to the diabetes control group (b). The results are as follows: *p˘0.05, **p˘0.01, ***p0.001. The significance values for the one-way ANOVA with Dunnett's posthoc multiple comparison test were **p~0.01 for the group treated with glibenclamide and extracts (c) and *p<0.05 for the diabetic control group (b).

% Change in B.W = Initial weight (g)- Final weight (g) X 100 Initial weight (g)

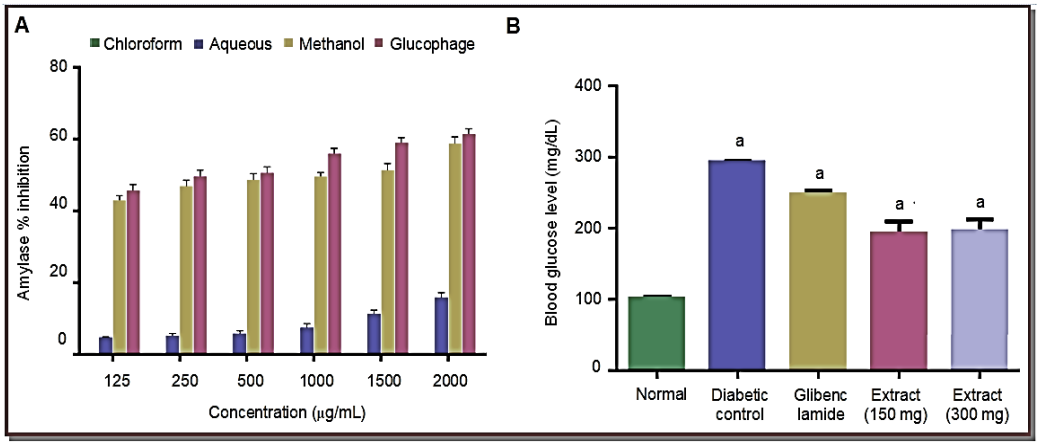

Fig.3 The antidiabetic response of various concentrations of extracts in the bar graph.

9. Conclusion

Results from studies and theoretical considerations indicate that Artemisia indica extracts in methanol, chloroform, ethyl acetate, n-hexane, and n-butanol exhibit potent antioxidant and anti-diabetic impacts. The results of the study in rats with diabetes mellitus demonstrated that the STZ extracts could be beneficial in managing the disease. The rats' weight and lipid profiles improved, and their blood creatinine, SGPT, SGOT, and ALP levels decreased. These extracts also have a strong ability to neutralise DPPH radicals, which stand for 2,2-diphenyl-1-picrylhydrazyl. Based on the available evidence, Artemisia indica may one day be employed as an anti-oxidant treatment. These facts lend credence to the long-standing practice of using Artemisia indica to treat diabetes mellitus. Despite this, conducting further research is necessary to isolate and purify the plant extracts' bioactive compounds. These studies would pave the way for a more thorough understanding of the molecular mechanisms behind the reported effects. A more specific and effective treatment for diabetes can be developed by first identifying and characterising the individual active molecules, and then by investigating the potential therapeutic targets of these compounds.

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