JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

EFFECTS OF ANTIDIABETIC ACTIVITY SYZYGIUM CUMINII LINN USING HERBAL DRUGS

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ABSTRACT

The effects of aqueous extracts of Syzygium cumini Linn, Gymnema sylvestre (Retz.) Schult, and Portulaca oleara-cea Linn. were compared. examined rats both normal and diabetic after being injected with streptozotocin (STZ). Oral glucose tolerance in normal, fasting rats was also investigated to see how extracts affected the metric. Watery S. cerevisiae extracts have been shown to have antimicrobial activity. .cumini (200 mg/kg) and G. Sylvestre (200 mg/kg) significantly lowered blood glucose in normal rats after 2 and 4 hours of treatment (p0.01). This research aims to determine whether extracts from jamun fruit and seeds are effective in lowering blood sugar levels in people with hyperglycemia. However, in both normal and hyperglycemic rats, jamun seed extract reduced glucose by 7.04 and 14.36 percent, while also increasing insulin levels by 3.56 and 7.24 percent. Jamun fruit/seed and its extracts may be used in a dietary regimen designed to reduce hyperglycemia. Fifteen different herbal diabetes treatments were gathered from health food shops. Syzygium cumini, Gymnema sylvestre, Aloe vera, Nigella sativa, Acacia nilotica, Commiphora myrrha, Portulaca oleracea, Punica granatum, Rhus coriaria, Coriandrum sativum, Trigonella foenum-graecum, Bambusa bambos, and Holarrhena antidysentery are some.

KEYWORDS Syzygium cumini, diabetic rats, Jamun seed and fruit extract, Insulin, Glucose

INTRODUCTION

Diabetes mellitus is a metabolic condition that alters carbohydrate, lipid, and protein metabolism due to insulin insufficiency or insulin malfunction, resulting in a wide range of typical clinical manifestations including hyperglycemia, polyuria, polydipsia, polyphagia, exhaustion, and irritability. Type I and Type II diabetes account for almost 90% of all cases of diabetes. The disease is a major killer worldwide. In 2000, it was projected that diabetes would affect 2.8% of the global population, but by 2030, that number was predicted to rise to 4.4%. An estimated 79.4 million Indians would have diabetes by 2030, up from 31.7 million in 2000. There will be around twice as many people living with diabetes in metropolitan areas of emerging nations between the years of 2000 and 2030. Diabetic nephropathy, retinopathy, hepatopathy, and cardiomyopathy are just a few of the significant complications that may arise from the disease. The potential for fatality is elevated in the presence of certain serious complications. It is suggested that patients begin treatment as soon as possible and maintain a regular dosing schedule in order to prolong their lives and reduce the likelihood of problems. Treatment options for lowering blood sugar levels in people with diabetes include many medication groups. However, these medications also have a number of potential side effects and cannot completely reverse diabetes. 4 Several different plant extracts are utilized for the treatment of diabetes. In many regions of India, the medicinal herb Syzygium cumini (S. cumini) is used to cure diabetes.

LITERATURE REVIEW

Muhammad Qamar et.al (2022) In its native Asia, the fruiting plant Syzygium cumini (genus Myrtaceae) is often known to as "Jamon." The team behind this study set out to assemble the most recent data on S. cumini's botany, traditional usage, phytochemical components, pharmacological activity, nutrition, and potential food applications. Women who have undergone abortions in the past have been given S. cumini to ward against diabetes and diarrhoea. Primary and secondary metabolites found in S. cumini include carbohydrates, proteins, amino acids, alkaloids, flavonoids, phenolic acids, and anthocyanins. These metabolites are responsible for the plant's therapeutic potentials, which include antioxidant, anti-inflammatory, analgesic. Jams, jellies, wines, and fermented goods have all benefited from the use of various S. cumini fruit pieces to improve their nutritional value. These days, you may even find S. cumini in edible films! As a result, we think that S. cumini's body components, extracts, and isolated chemicals may be put to use in the food business, particularly as food preservatives and packaging materials. Further study is needed to isolate and purify chemicals from S. cumini that may be used to treat a wide range of diseases. Furthermore, low-cost drugs with a low therapeutic index need to be developed via clinical trials.

Meharban Asanaliyar et.al (2021) As this article's introduction suggests, diabetes mellitus is a critical public health issue in India and across the globe. Herbal extracts of many kinds have been used for ages in Indian Ayurvedic medicine to help diabetics maintain healthy blood sugar levels. Due to its anti-diabetic properties, Syzygium cumini (L.) Skeels has been widely extracted in both water and organic solvents. A thorough study was done to define and evaluate the effects of a hydro-ethanolic seed extract (SCE) of Syzygium cumini in a mouse model of type 2 diabetes mellitus. With the use of the medication streptozotocin, adult male Wistar albino rats were given a high-fat diet (over the course of 12 weeks) to create a model of diabetes mellitus. Diabetic rats were identified by a fasting blood glucose (FBG) level more than 200 mg/dL. After 21 days, diabetic rats were divided into five groups and administered either vehicle, pioglitazone (10 mg/kg), 100 mg/kg, 200 mg/kg, or 400 mg/kg of SCE daily. Each group's fasting glucose, insulin, and lipid levels were measured before and after medication was administered by analysing serum samples taken at the start and end of treatment. Insulin resistance was measured using the homeostasis model assessment of insulin resistance (HOMA IR), and beta cell activity was measured using the same method. The research data was analysed using analysis of variance (ANOVA). Our data show that at larger dosages, the SCE formulation reduces fasting blood glucose, serum lipids, and HOMA IR while concurrently increasing serum insulin and HOMA IR. Wistar rats given 100 and 200 mg/kg body weight of SCE showed statistically significant anti-diabetic effectiveness, with improvements in pancreatic beta cell activity and reductions in insulin resistance.

Dr. Vijay Bhushan Sharma et.al (2019) Jamun, also known as jambul, java plum in English, and Syzygium cumini (Linn) Skeeels in botany, is a traditional ingredient in Indian folk medicine. Ayurvedic practitioners employ its fruits, seeds, bark, and leaves to cure anything from bleeding ailments to cancer. Its seeds have gained notoriety as a powerful treatment for diabetes. The jamun fruit is astringent in taste and may either be sweet or sour. Jamun Vinegar, made from these fruits, has been shown to be effective in treating a variety of gastrointestinal issues, including diarrhea, constipation, irritable bowel syndrome, and vomiting. It's also been shown to be helpful for gastrointestinal issues including indigestion. Diarrhea, sysentery, and diabetes are all treatable using a powder made from jamun seeds. When treating nausea, vomiting, abnormal bleeding, or metrorrhagia, jamun leages are often recommended.

Jasmeen Kaur et.al (2017) We developed an isocratic HPLC method employing methylxanthoxylin (MXX) as a marker to standardise the five commercially available products made from S. cumini seeds. This method validation was carried out in accordance with ICH Q2(R1) guidelines. MXX was chromatographically separated using a C18 column using methanol and water as the mobile phase at a flow rate of 0.5 mL/min. A reading of 280 nm was obtained for the eluent. The method's response was linear across a wide range of concentrations, from 1 to 200 g/mL. The Limit of Quantitative Determination (LQD) and Minimum Detectable Concentration (LOD) were 0.17 and 0.530 g/mL, respectively. The protocol used for the analysis of MXX in plant extracts was precise, accurate, and robust. The MXX content in the seed extract was 0.0433%w/w, whereas in the products it varied from 0.026 to 0.041%w/w. The MXX concentration was found to be equivalent to the pure seed extract only in DIABECON tablets and D-FIT soft gelatinous capsules, and to be much lower in the other formulations.

METHODS

Plant material

Seeds of Syzygium cumini, leaves of Gymnema sylvestre, and Portulaca oleracea were identified and confirmed as authentic by Dr. M.P. Sharma, Taxonomist, Department of Botany, Jamia Hamdard University. Jamia Hamdard's Phytochemistry Research Laboratory, located in the Department of Pharmacognosy and Phytochemistry within the Faculty of Pharmacy, has received samples of gift certificates.

Preparation of jamun extract

About 100 grams of air-dried, powdered plant material was cooked in 250 milliliters of water for 1 hour before being filtered. The filtrate was frozen for further analysis after being dried. In order to conduct these experiments on animals, the dried extracts were dissolved in 1% Tween 80 in water. The Unani formulation Qurs ziabitus utilizes a dosage of plant medications, and this dose, 200 mg=kg, was chosen in association with that dose (Hakim, 1997). The extracts of jamun were made using a binary solvent, i.e. ethanol water (50% v/v). Volumetric flasks were filled with around 50 g of sample, then solvent was added.

Serum glucose and insulin levels

Kim et alGOD-PAP .'s technique was used to determine the glucose concentration in the sera, and Ahn et alinsulin .'s assay was used to determine insulin levels in each study.

Chemicals

We utilized only Sigma Chemical Company reagents and chemicals, which are of the highest quality for analytical application (St. Louis, MO, USA). For blood sugar monitoring, we used strips from Life scan Inc.'s OneTouch Glucometer system (USA).

Animal treatment

University of Jamia Hamdard's Central Animal Facility Wistar albino rats weighed between 150 and 200 grammes and were given full access to food and drink on a 12 hour light/12 hour dark cycle. Extracts were all taken orally. Experimentation on animals was sanctioned by the institution's animal ethics committee.

Effect of extracts on the blood glucose of normal fasted rats

The zoo's animal population was split into five categories. The car was distributed to and tested on Group I as a control. The glibenclamide reference medication (3 mg/kg) was given to group II, while using extracts of S. G. cumini, S. sylvestre, and P. oleracea (200 mg/kg). Blood sugar was measured before and 2, and then 4, hours after an extract was given.

Effect of extracts on the blood glucose of streptozotocin-induced diabetic rats

Streptozotocin (STZ) (50 mg/kg) freshly produced in citrate buffer was injected intraperitoneally once, producing diabetes in the animals (pH 4.5). The rats used as controls were given a placebo. After 48 hours after receiving a streptozotocin injection, diabetes was verified by measuring blood glucose levels. Blood glucose levels in excess of 250 mg/dl were used to select the animals for the investigation. Diabetic animals were arbitrarily divided into six groups. The creatures in Group I were the norm, so to speak. The type 2 diabetes control group (Group II). The levels of glucose in the blood were checked before extracts were given, and again 2 and 4 hours later.

RESULT

Statistical analysis

Statistics are presented as mean standard error of the mean. To determine statistical significance

Table 1. Blood sugar response to medication aqueous extract in normally fasted rats

Groups	Treatment	Blood glucose level mg=100 ml					
		Initial		2 h		4 h	
I	Control	86.16	3.10	83.83	3.54	84.11	3.42
II	Glibenclamide (3 mg=kg)	84.83	2.85	46.83	4.57a	48.5	4.64a
III	Syzygium cumini (200 mg=kg)	84.66	3.15	54.12	4.02a	55.63	3.72a
IV	Gymnema slyvestre (200 mg=kg)	79.33	2.81	58.33	4.86a	63.16	3.75a
V	Portulaca olearacea (200 mg=kg)	79.66	3.04	82.31	3.05	84.16	3.54

All values are mean ±SEM.

[a]P<0.01 when compared with control.

analysis of variance using just one factor, then a test of statistical significance using Dunnett's t-distribution. It was found that there was a statistically significant difference between the groups when the p-value was less than 0.05.

Watery S. cerevisiae extracts have been shown to have antimicrobial activity. the cumini and the letter G. Normal animal blood glucose levels were considerably (p0.01) lowered by sylvestre at 2 and 4 hours (Table 1). These S. aureus aqueous extracts have been shown to have antimicrobial and antifungal properties. both the cumini and the G. The blood glucose level was considerably lower 90 and 180 minutes after a glucose load in the presence of sylvestre (p0.01, p0.05). They were only somewhat effective in lowering the peak increase in glucose after 30 minutes (Table 2).

Based on the data, it seems that S. G and cumini. The blood sugar levels of healthy animals dropped after being given sylvestre. Experiments showed that hypoglycemia could be sustained for 4 hours despite the presence of counterregulatory hormones including glucagons, catecholamines, and cortisol, which regulate the equilibrium of blood glucose levels in normal physiology (Gerich, 1988). Normal rats had a hypoglycemic response, indicating that these extracts have pharmacological value. Hypoglycemic principles in these plants could work like sulfonylureas by stimulating the pancreatic b-cells to secrete insulin in healthy animals (Akhtar et al., 1984).

Table 2. Fasting rats during an oral glucose tolerance test when a medication extract is added to water

Groups	Treatment	Blood glucose level mg=100 ml Initial	30 m	90 m	180 m
I	Control	82.182.32	128.43 3.35	120.61 3.67	111.23 3.94
II	Glibenclamide (3 mg=kg)	84.322.12	108.15 3.36	96.34 2.62^{a}	89.45 2.81^{a}
III	Syzygium cumini (200 mg=kg)	86.831.86	110.5 2.33	100.83 2.15^{a}	91.33 3.46^{a}
IV	Gymnema slyvestre(200 mg=kg)	82.161.42	108.16 3.19	98.52 2.81^{a}	88.34 2.3^{a}
V	Portulaca olearacea (200 mg=kg)	82.5 2.36	123.4 4.33	112.33 3.98	102.33 3.71

The blood glucose levels of the control animals reached a high of 120-130 mg=100 ml after 30 minutes of an oral glucose tolerance test (GTT). S. cumini and G. sylvestre aqueous extracts decreased peak values at 30 minutes following a glucose load, indicating greater hypoglycemic efficacy from the extracts. The islets of Langerhans b-cells may produce insulin in response to elevated glucose levels, which may be the underlying process.

Insulin

Data explained that food had a little effect on insulin level, despite the fact that the difference across trials was not statistically significant. Mean values reveal that the control group in Study I displayed (8.74 0.30), while the experimental group showed (8.33 0.31) and

Table 3 Insulin levels in rats: varying effects of food and time intervals

Studies	Diet	Study intervals (Days) 0	30	60	Means
Study I	Control	8.73 ± 0.30	8.74 ± 0.31	8.76 ± 0.29	8.74 ± 0.30^{a}
	Nutraceutical (FE)	8.21 ± 0.31	8.35 ± 0.32	8.44 ± 0.32	8.33 ± 0.31^{b}
	Nutraceutical (SE)	8.05 ± 0.28	8.21 ± 0.29	8.33 ± 0.29	8.19 ± 0.28^{b}
	Means	8.33 ± 0.30	8.43 ± 0.31	8.51 ± 0.29	–
Study II	Control	12.34 ± 0.53	12.19 ± 0.52	12.09 ± 0.51	12.20 ± 0.52^{a}
	Nutraceutical (FE)	11.59 ± 0.54	12.02 ± 0.56	12.31 ± 0.57	11.97 ± 0.56^{a}
	Nutraceutical (SE)	11.10 ± 0.49	11.55 ± 0.53	11.90 ± 0.55	11.52 ± 0.53^{b}
	Means	12.68 ± 0.50^{b}	11.92 ± 0.51^{ab}	12.10 ± 52.00^{a}	–

Levels were present in both the Nutraceutical (FE) and Nutraceutical (SE) diet groups. Rat insulin levels increased steadily throughout the trial period when jamun fruit was included in the diet, from 8.21 to 8.44 mU/mL in the Nutraceutical (FE) group and from 8.05 to 8.33 mU/mL in the Nutraceutical (SE) group, respectively. The Nutraceutical (FE) and the Nutraceutical (SE) groups were clearly distinct, with the FE group showing a 2.82% rise in insulin and the SE group showing a 3.56% increase (Table 2). Mean blood insulin concentrations in Study II rose steadily from their starting points. Rats with hyperglycemia in this research had a mean insulin level of (12.20 0.52) mU/mL in the control diet group, but levels of (11.52 0.53) and (11.97 0.50) mU/mL in the Nutraceutical (SE) and Nutraceutical (FE) groups, respectively. The highest percentage rise during the course of the research was seen for the Nutraceutical (SE) diet, which went from (11.10 0.49) to (12.90 0.55) mU/mL (7.24%). Nutraceuticals, however, increased by just 6.19 percent over the course of 60 days, from 11.59 0.54 to 12.31 0.57 mU/mL.

Possible active principles of herbs responsible for antidiabetic effects

Table 4 lists the chemical ingredients identified via a literature search as being responsible for the antidiabetic effect of these plants.

Table 4. Please provide a list of the active ingredients in these preparations that provide the desired antidiabetic benefits.

No.	Ingredient names	Active ingredient names
1	*Syzygium cumini* (L.) Skeels	Alkaloid (jambosine), glycoside (jambolin) and mycaminose (Ayyanar and Subhash-Babu, 2012; Kumar et al., 2008)
2	*Gymnema sylvestre* (Retz.) R.Br. ex Sm.	Gymnemic acid (Kanetkar et al., 2007)
3	*Nigella sativa* L.	Thymoquinone, volatile oil of *N. sativa* (Bamosa, 2015)
4	*Aloe vera* (L.) Burm.f.	Glucomannan polysaccharides (Yagi et al., 2009)
5	*Acacia nilotica* (L.) Delile	Heteropolysaccharide or high molecular weight polysaccharides (Sharma, 1985)
6	*Commiphora myrrha* (Nees) Engl.	Furanosesquiterpenes (Al-Romaiyan et al., 2020)
7	*Portulaca oleracea* L.	Poly-unsaturated fatty acids, glutathione, flavonoids, polysaccharides, glutathione, antioxidants and vitamins (El-Sayyed, 2011)
8	*Punica granatum* L.	Oleanolic acid, ursolic acid and gallic acids (Katz et al., 2007)
9	*Rhus coriaria* L.	Gallic acid, methyl gallate, kaempferol and quercetin (Shidfar et al., 2014)
10	*Coriandrum sativum* L.	Polyphenolics and volatile components (Asgarpanah and Kazemivash, 2012)
11	*Trigonella foenum-graecum* L.	Dietary fiber, saponins, 4-hydroxyisoleucine and pectin (Gupta et al., 2001)
12	*Bambus bambos* (L.) Voss.	β-sitosterol glycoside and stigmasterol (Nazreen et al., 2011)
13	*Holarrhena antidysenterica* (Roth) Wall ex A.DC.	Steroidal alkaloids, flavonoids, triterpenoids, phenolic acids, tannin, resin, coumarins, saponins and ergostenol (Sinha et al., 2013)
14	*Swertia changii* S.Z. Yang, C.-fan Chen & Chih H.Chen	Magniferin, swertiamarin and amarogentin (Phoboo et al., 2010)
15	*Curcuma longa* L.	Curcumin, demethoxycurcumin, bisdemethoxycurcumin and ar-turmerone (Kuroda et al., 2005)
16	*Rumex vesicarius* L.	More research is needed to identify the constituents responsible for antidiabetic activity of this plant.

CONCLUSION

In conclusion, our research shows that the oral glucose tolerance test scores of both normal and streptozotocin-induced diabetic rats were improved by the administration of aqueous extracts of S. cumini and G. sylvestre. The jamun fruit and seed have medicinal use as a dietary supplement for treating hyperglycemia and other dietary-related disorders. Extracts of jamun seeds and fruits were shown to be effective in controlling glucose and insulin levels in the present study. In a similar vein, hyperglycemia and hyperinsulinemia were controlled when patients were given extracts from jamun seeds. The herbs used in the diabetes herbal remedies sold in Indian health food shops have been shown to have antidiabetic actions, therefore these remedies may help control diabetes and its consequences. Multiple modes of action and potentially different active components are responsible for the antidiabetic benefits of the many herbs included in these preparations.

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