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INVESTIGATION OF CHEMICAL COMPOSITION AND THERAPEUTIC POTENTIAL OF *CAESALPINIA CRISTA* POWDER IN DIABETIC MALE PATIENTS

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Abstract
Around 60% of the world's population uses traditional medicines derived from medicinal plants. Diabetes is a metabolic disorder that manifests as either a lack of insulin production by pancreatic beta cells or a failure of the body to properly use the insulin that is generated. Fever nut is an herb that has been used in herbal treatments for many years to manage a range of diseases due to its antioxidants, phytochemical, saponin, and polyphenol content The present study was carried out to investigate the chemical composition and therapeutic potential of *Caesalpinia crista* powder in diabetic male patients. Physicochemical screening, including proximate profile, minerals, and antioxidant potential, was also investigated for this purpose. The percentages of fat, protein, and fibre in fever nut (*Caesalpinia Crista*) were found to be 29.3%, 9.5%, and 3.6%, respectively. The DPPH and FRAP levels were found to be 102.3112.06 and 56.3411.27, respectively. Furthermore, the anti-diabetic effects of fever nut powder were evaluated on human male subject. Male Diabetic Patients were divided into three equal groups based on inclusion and exclusion criteria. One group was considered control group G_0 given no treatment and the other two groups were considered as treatment groups G_1 and G_2 received 500mg/day and 1000mg /daycapsules of *Caesalpinia crista* powder orally every day for the duration of 2 months. After each week, both treatment groups G_1 and G_2 had minute significant reductions in fasting blood glucose levels and random blood glucose levels. After two months, the overall decline in the G_1 group was from 196.50±10.32 to 195.01±9.05 in fasting blood glucose levels and from 197.989±.24 to 197.031±5.21 in random glucose levels. At the end of the study, the fasting blood glucose level in G2 was reduced from 194.11±10.67 to 192.01±8.03, and the random blood glucose level was reduced from 219.96a11.01 to 218.01b15.02. HBA1C levels reduced considerably in treatment groups G_1 and G_2, with values lowering from 9.57±1.95 to 9.512±.04 in G_1 and from 10.85±1.95 to 9.851.70 in± G_2. According to the findings of this study, Caesalpinia crista has a significant amount of antioxidants and polyphenols both of which have therapeutic potential and can be used to treat and control diabetes mellitus.
Keywords: *Caesalpinia crista*; Diabetes; Antioxidants; Fiber

Introduction

Diabetes mellitus (DM), the most common endocrine condition, affects more than 100 million individuals globally (6% of the population). Hyperglycemia and the associated protein, lipid, and carbohydrate metabolic dysfunctions influence multiple physiological organs and restrict their normal functioning. The detrimental effects of hyperglycemia and corresponding metabolic problems on the typical structure and activity of organs throughout the body are the primary contributors of these alterations, which develop gradually. Both structural and functional damage to the organ system's vasculature can lead to micro- and macro vascular issues (1).

These problems influence several human organs, such as the kidneys, heart, eyes, and nerves, leading to organ damage, dysfunction, and ultimately organ failure. Eye problems lead to retinopathy, which eventually results in blindness. Kidney-related issues lead to nephropathy and potentially fatal renal failure. Heart-related issues include, for example, hypertension and coronary heart disease (2).

Herbal remedies have a big impact on people's health all over the world. Medical practitioners use healing plants to both cure patients' illnesses and keep patients healthy. It is crucial to identify the specific components of plant medicines that make them effective for the different treatments. (3). The role of herbal remedies in determining the wellbeing of people worldwide is powerful. In medicine, healing plants are used to treat people's diseases and as a potential way to keep them healthy (4).

Numerous medicinal plants are known to be used to treat conditions like digestive disorders, circulatory diseases, metabolic issues, liver disorders, and central nervous system disorders. Phytochemicals are the components in herbs that are used in the treatment of different diseases (5).

Material and Methods

Area of research

The research was carried out at the University of Faisalabad in the Department of Nutrition and Dietetics.

Collection of raw material

Fever nut powder was purchased online from Daraz and was covered in polythene bags to avoid any contamination.

Preparation of raw material

Fever nut powder was filled in gelatin capsules and given to the patients according to dosage of 500mg and 1000mg for the time of 60 days.

Chemical Characterization of Fever net powder

Fever nut powder was evaluated for moisture, crude ash, fat, protein, and crude fiber in accordance with the association of official analytical chemists' standard operating protocols of(AOAC) (6).

Antioxidant Potential

The procedure for determining whether Casesalpinia crista extracts reduce the production of 2, 2-diphenyl-1-picrylhydrazyl (DPPH) radicals was modified .It was done using a 100 M solution of DPPH in methanol. Plant extracts with GAE contents ranging from zero to twenty-five grams received one milliliter of the DPPH solution added to them. After a thorough blending, the ingredients were left alone for 20 minutes at room temperature and without light. The absorbance of the solution was measured at a wavelength of 517 nm (7).

Phytochemical Analysis

Total phenolic and flavonoids content was measured by following the procedure which is explained by of caesalpinia crista powder (8)

Anti-Diabetic Potential of Fever Nut powder

Human Study Paradigm

The biochemical evaluation was carried out to explore the effectiveness of fever nut powder on diabetes .Eligible subject patients that were taken from nearby clinic based on their biochemical examination and blood glucose level with age group 40-55 years.

Thirty patients were taken for study and divided into 3 groups evenly. Each group contains 10 individuals. G_0 as control group and G_1 and G_2 as treatment group. Control group was not given any treatment. Group G_1 was given 500mg/day and Group 2 was given 1000mg/day, in the form of gelatin capsules before breakfast. The study was conducted with the consent of patients and without any pressure of being a part of the study.

Inclusion Criteria

Gender	**Male**
Age	**40-55**
Health complication	**Non-insulin dependent type 2 diabetic, non-smoker**

Exclusion Criteria

Gender	**Females**
Age Group	Below 45 and above 60
Health complication	Type 1 diabetes mellitus, smoker,

Treatment plan

Groups	No of patients	Dosage
G0	10	0
G1	10	500mg
G2	10	1000mg

$G_{0=}$ Control group was taking Medication (G1= Experimental group was taking 500mg of fever nut powder daily and G_2 was taking 1000mg of fever nut powder in the form of capsules after breakfast. The research period was about 2 months fasting and random blood glucose level was determined every week.

Biochemical Profile

Determination of FBS

A fasting blood sugar test is used to determine the level of glucose in the blood. Diagnosis of gestational diabetes, diabetes, or prediabetes. Blood is taken from an arm vein. Avoid eating or drinking anything other than water for eight to twelve hours before the test. The patients' fasting blood glucose levels were measured before the experiment started, then every 7 days for the following two months, and finally at the completion of the trial.

Determination Of RBS

Any time, a random blood glucose reading can be taken. Blood sugar levels of 200 mg/dL (11.1 mmol/L), which are regarded as the diagnostic limit, are indicative of diabetes. Before the study started, every 7 days for two months of the trail random blood glucose levels were checked.

Collection of blood samples

Determination of HbA1C

HBA1C of the participants were tested before the initiation of study and after 1 month of treatment

and at the end of the trail.

Physical Parameters

Body weight

The body weight of the patients was checked before the initiation of the trail after one month and at the end of trail. The body weight of the G_0 remained the same and there was slight reduction in the weight of group 1 and group 2 at the end of study.

Water Intake

Water intake of the patients was recorded before the initiation of trail after one month and at the end of trail. Water intake of the patients was also increased after two months at the end of trail.

Statistical Analysis

Results obtained from the study was analyzed through statistical analysis (13).

Result and Discussion

Characterization of Fever Nut (*Caesalpinia Crista*) Powder

For proximate analysis, a fever nut powder illustration was provided. The methods employed for the analysis were in accordance with AOAC. Investigations of Fever Nut Powder's varying quality credits were conducted. For instance, moisture, Ash, fiber, proteins, and fats. These six quality credits make up the complete part of proximate investigations.

Table 4.1 Proximate composition of fever nut powder

Proximate features	Values (%) ± S.D.
crude fat	40.12±0.01
moisture content	11.91±0.02
crude protein	13.01±0.98
crude fiber	04.91±0.61
crude ash	02.94±1.78
nitrogen free extract	63.90±4.72

The proximate composition of fever nut powder is shown in table. Fever nut powder consists of 40.12% crude fats 11.91% moisture crude protein13.01% and crude fiber o.41% crude ash 02.94% and NFE 63.94%.

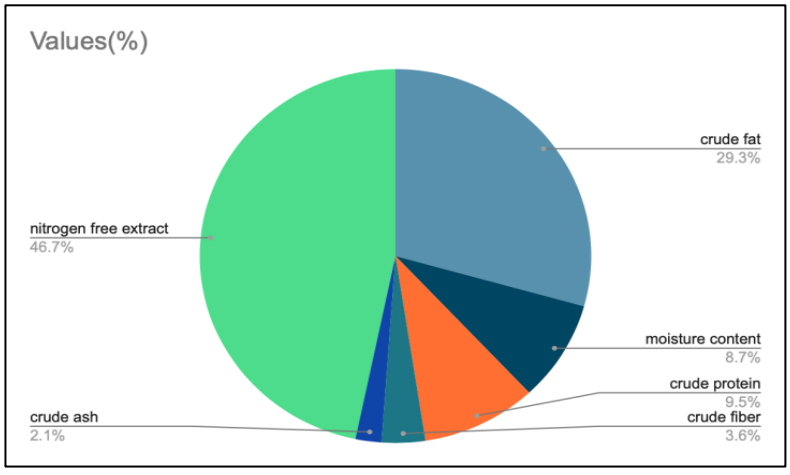


Figure 4. 1Proximate composition of fever nut powder

The result showed the chemical composition of fever nut powder. The percentage of crude fat, protein moisture content, fiber and NFC are shown in figure

Mineral element analysis of fever Nut Powder

Dietary minerals have demonstrated to reduce diabetes risk and improve glycemic control and blood lipids in patients with diabetes. The current results showed the percentage of Zn, Na, potassium, and magnesium. The amount of potassium in fever nut powder is more than other minerals. Investigation from several studies low potassium levels release less insulin, have higher blood sugar levels, and are more likely to get type 2 diabetes than those with normal potassium levels.

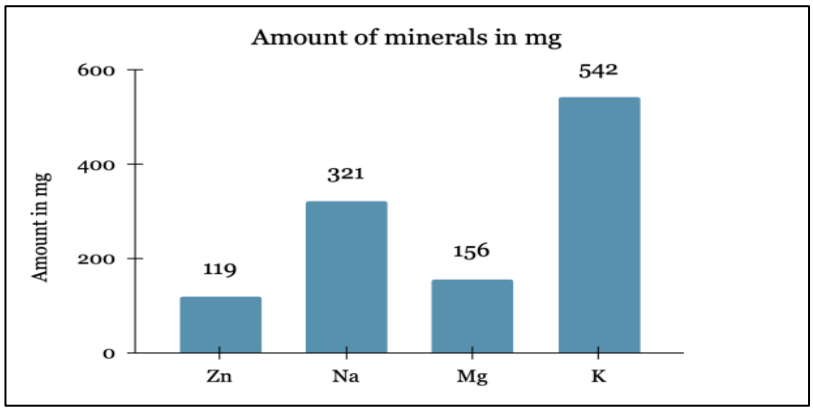


Figure 4. 2Mineral content of fervent powder

Antioxidant Activity of *Caesalpinia crista*

Like most plants fever nut herb has many bioactive phytochemicals polyphenols, flavonoids and cancer preventing agents. Polyphenols are the phytochemicals which are present in plants and protect the body from oxidative stress and damage. They are helpful in the treatment of different diseases like hyperlipidemia, cardiovascular diseases, and diabetes. They reduced inflammation from the body and cure different diseases. (Table 4.2).

Table 4.2 Antioxidant Content of fever nut powder

DPPH	102.31±12.06
FRAP	56.34±11.27

The current results showed that fever nut powder had antioxidant potential DPPH (102mg TE/g) and the FRAP values are56.34±11.27.

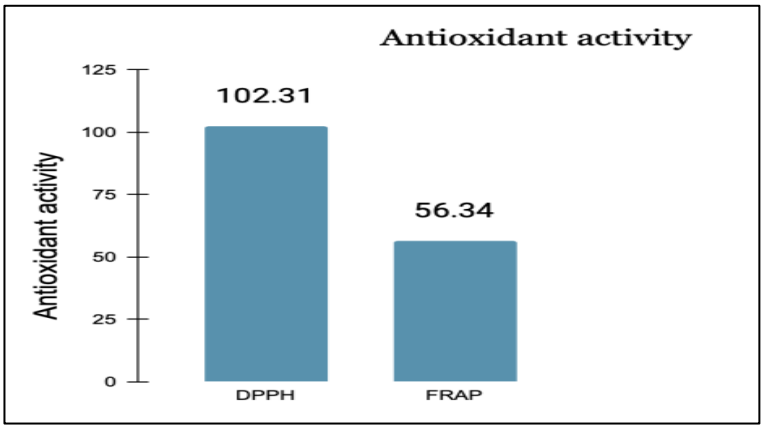


Figure 4. 3 Antioxidant Content of fever nut powder

The results showed the antioxidant DPPH and FRAP percentages in fever nut powder. The value of DPPH is 102.31.and the value of FRAP is 56.34.which are highly beneficial in treatment of different metabolic disorder including diabetes.

Experimental Study Design for Human Male Subjects

Preparation And Distribution of Fever Nut Powder

The purpose of present study was to elucidate the therapeutic potential of fever nut powder against diabetes in human male subjects. The study was carried out for 60 days diabetic male subjects were selected and divided into three groups. Experimental group G_1 (n=10,500mg/day). Experimental group G_2 (n=10,1000mg/day). G0(diabetes control group they were not given any treatment they were taking their prescribed medicines. G_1 (Diabetes treatment group 1) were given 500mg fever nut powder per day and G_2 (Diabetes treatment group 2) were given 1000mg/day for 60 days. The fasting and random glucose levels were measured before the initiation of study and every week for 60 days. HBA1C patients were also evaluated before the commencement of the study and at the end of study

Method of administration: oral intake

Dosage:500mg/day(G1), 1000mg/day(G2)

Time period:8weeks

Participants of the study were given 500mg and 1000 mg of fever nut powder after meal twice a day morning and evening.

The fever nut powder which was given to the patients showed remarkable decrease in FBS, RBS and HBA1C in treatment group G1 and G2.

Changes In Fasting Blood Glucose Level (FBS)

The average mean value indicates a significant change between G_1 and G_2 as compared to the control group G0. In group G2 the fasting blood gulcose level declined from194.11^{c}±10.67 to192.01^{c}±8.03 and in group G1 the fasting blood glucose level diminished from196.50^{a}±10.32 to195.01^{b}±9.05 and in G0 minute changes were observed it declined from197.03^{a}±13.01to1 95.50^{b}±8.90 in fasting blood sugar level.

Table 4.3 Mean + standard deviation for FBS level.

Groups	0-day	1 month	2 months
G0	197.03^{a}±13.01	196.50^{a}±11.31	195.50^{b}±8.90
G1	196.50^{a}±10.32	195.67^{b}±10.71	195.01^{b}±9.05
G2	194.11^{c}±10.67	193.21^{c}±8.36	192.01^{c}±8.03

Monthly Changes In RBS

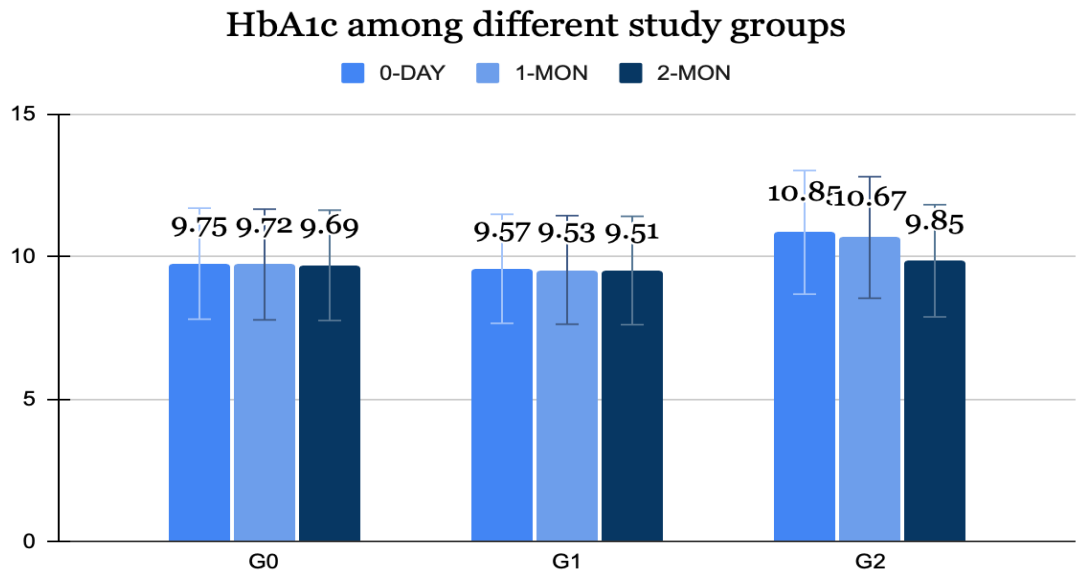
A notable difference was observed in G1 and G2in comparison to G0.In G1 the random blood sugar declined from197.98^{a}±9.24, 197.63^{a}±10.28 to197.03^{a}±15.21 and in Group 2 the blood sugar level decreased from219.96^{a}±11.01, 219.03^{a}±13.56 to 218.01^{b}±15.02 and in G0 the value of FBS in elevated from 208.05^{a}±10.09, 209.69^{a}±26.02 to $208.6.00^{a}$±14.31.

Table 4.4 Mean + Standard Deviation for RBS

Groups	0-day	1 month	2 months
G0	208.05^{a}±10.09	209.69^{a}±26.02	$208.6.00^{a}$±14.31
G1	197.98^{a}±9.24	197.63^{a}±10.28	197.03^{a}±15.21
G2	219.96^{a}±11.01	219.03^{a}±13.56	218.01^{b}±15.02

Changes In HBA1c

A notable drop was observed in G1 and G2 in contrast to G0. In G1 the level of HBA1C declined from 9.57^{b}±1.95, 9.57^{b}±1.95 to9.51^{b}±2.04 and in G2 the level of HBA1C 10.85^{c}±1.95, 10.67^{c}±1.48 to 10.67^{c}±1.48 and in G0$9.75^{a}$±1.34, 9.75^{a}±1.34 to 9.62^{a}±1.47.



Changes In Water Intake

Water intake of the patients was measured before the initiation of study. At the end of study, a significant change in water intake was observed the intake of water was increased in both treatment groups G1 and G2.G2 showed more significant result.

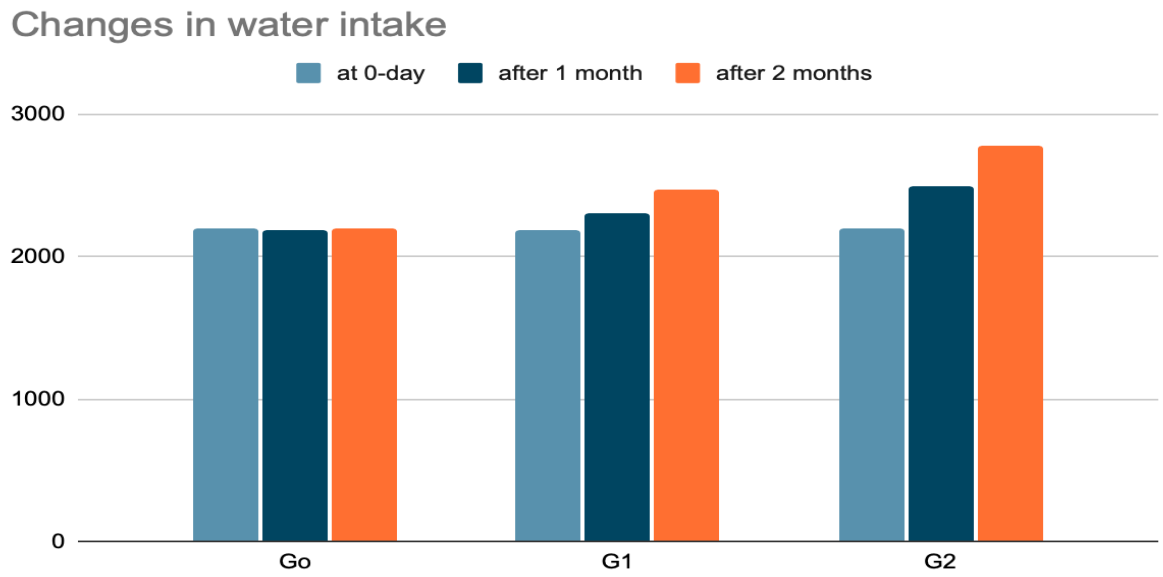


Figure Graphical representation of water intake at o day one month and two months in G_0, G_1 and G_2

The graph depicted that the consumption of water increased in treatment group G1 and G2 after one and two months while the intake of water in control group G0 remained same.

Conclusion

The *Caesalpinia crista*, often known as the fever nut, has a nutritional profile that is rich in vitamins, minerals, proteins, and carbs. It is used to treat diabetes and other metabolic problems and has therapeutic potential. In addition to having a healthy profile, fever nuts are rich in antioxidants and

bioactive substances that are used to treat diabetes and other health problems. Compared to other conventional medications, it offers greater advantages. It has the antioxidant capacity to treat metabolic illnesses like diabetes, hypertension, hyperlipidemia, and cardiovascular diseases. The current study was conducted to evaluate the fever nut powder's ability to lower blood sugar levels in diabetic male patients. Fever nut powder was administered orally to the patients at doses of 500 mg daily and 1000 mg daily for two months; results revealed a decrease in fasting blood glucose level, random blood glucose level, and HBA1C.

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